

Trade Show Presentation: 25 Years After the Discovery of Sting Nematodes in California: Summary of Research and Extension Efforts

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Introduction:

The Sting nematode (*Belonolaimus longicaudatus*) is an important pathogen on most agricultural and horticultural crops. This microscopic roundworm is native to sandy soils in the southeastern US. It feeds with its long mouth stylet near the root tips. This leads to stunting of the roots and to above-ground disease symptoms resembling effects of drought stress and malnutrition. Parasitism predisposes roots to secondary microbial attack. In 1992, University of California Riverside Nematologists discovered this invasive species in several golf courses centered around Rancho Mirage, CA. To limit the pathogen's potential spread, infested sites have been subject to State and county enforced compliance agreements. Soil and plant residues from infested properties may not be discarded without approved treatment.

Research Accomplishments:

As Sting nematode research at UCR has been restricted to USDA/CDFA enforced quarantine conditions, we developed a culture method to rear *B. longicaudatus* in vitro on excised corn roots. This technique allowed for the first time to observe and describe its complete life cycle. Also, we documented the local population dynamics which pinpointed the most efficacious timing for use of nematicides and biocontrol agents. Genetic comparison of Coachella Sting nematode populations with those from several southeastern states strongly suggested that the California invasion of this nematode originated from a single source population. When University of Florida Nematologists discovered an obligate bacterial parasite of *B. longicaudatus*, our group developed a trixenic culture to study its development and hyperparasitism.

Outreach Activities:

An important program aspect has been our outreach effort to golf course superintendents, pest control advisors, landscape professionals and the general public to educate about the nematode. Familiarity with the biology, ecology, and epidemiology of the sting nematode is considered key to reducing the dissemination risk. Since the original survey a quarter of a century ago, no new Sting nematode infestation has been reported from the Coachella Valley.

Acknowledgements:

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Introduction
In 1992, UCR Nematologists discovered the invasive Sting nematode (*Belonolaimus longicaudatus*) in golf courses in Rancho Mirage, CA. Native to the southeastern US, it is an important pathogen on most agricultural and horticultural crops. To limit the pathogen's potential spread, infested sites have been subject to State and county enforced compliance agreements. Soil and plant residues from infested properties may not be discarded without approved treatment. Here we highlight 2 decades of our research and extension activities.

Disease Symptoms & Host Range
Above-ground symptoms resemble effects of drought stress and malnutrition. Independent feeding on root tips can damage root systems and lead to stunting of crop plants.
More than 80% of all different plant species and cultivars were found hosts of the sting nematode (2014). Only when advised and approved based on root-traits.

In Vitro Culture
As UCR research with this nematode species has been restricted to USDA/CDFA enforced quarantine conditions, we developed a method to rear *B. longicaudatus* on excised corn roots.
A defined, constant, standardized medium allows for consistent development as well as for feeding and mating behavior.

Development & Life Cycle
Half a century after its first discovery in Florida, we described the entire life cycle of *B. longicaudatus*.

Population Dynamics & Genetic Diversity
Detailed observation of the nematode's population density in three Coachella Valley golf courses revealed temporal and spatial variation in population density. Timing for use of chemical or biological control agents.
Genetic comparison (AFND) of Coachella Valley sting nematode populations with those from other states suggested a single source population.

Hyperparasites
When Nematologists from the University of Florida discovered a bacterial parasite of the sting nematode, we initiated an investigation and molecular analysis of the parasite. It became available as a commercial biocontrol product (Bacterium).
Other sting nematode parasites, such as the nematode fungus, *Colletotrichum* spp., were frequently encountered in Rancho Mirage Golf courses.

Outreach
An outreach program helped to reduce the dissemination risk through field visits, presentations, and web-based information. Since the original discovery 25 years ago, no new sting nematode infestation has been reported from the Coachella Valley.

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