Pasteuria sp. for Biological Control of the Sting Nematode, *(Belonolaimus longicaudatus)*, in Turfgrass

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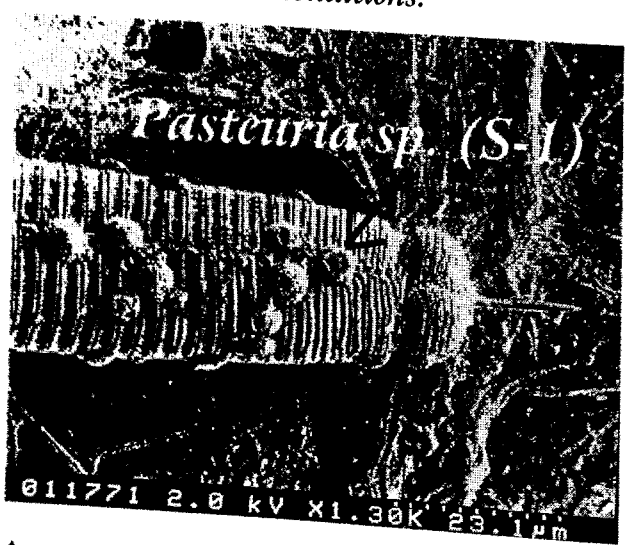
Goals:

- *Examine bacteria ultrastructure with transmission electron microscopy and begin describing a new species of Pasteuria that we have discovered parasitizing the sting nematode, Belonolaimus longicaudatus.*
- *Perform host range studies on this new Pasteuria sp.*
- *Begin studies to elucidate the population dynamics of this new Pasteuria sp. on sting nematode grown on St. Augustinegrass in laboratory pot cultures under controlled conditions.*



A new species of bacterium (*Pasteuria* sp. S-1) which attacks sting nematodes was discovered at the University of Florida by Dr. Robin Giblin-Davis. Scanning electron microscope work reveals the "fried egg" bacteria attached to the sting nematode.

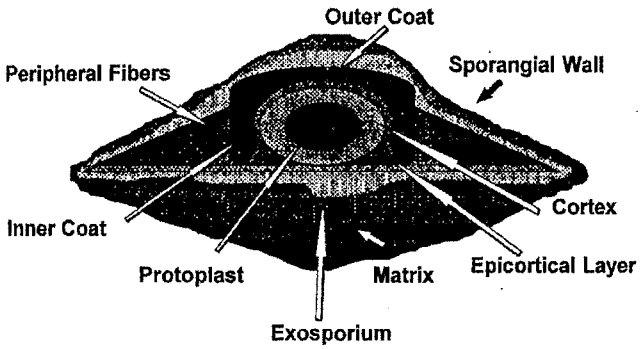
This research project is describing a new species of bacterium in the genus *Pasteuria* that was discovered parasitizing the sting nematode, *Belonolaimus longicaudatus* in Florida. They are hopeful that this obligate bacterial parasite of nematodes [*Pasteuria* n. sp. *(S-1)*] will have some potential for inoculative biological control in golf course greens against the sting nematode; a destructive ectoparasite that can reduce the root dry weight of turfgrasses and other crops in sandy soils by as much as 30 to 50 percent.

In 1995, ultrastructural studies of the bacterium were completed with transmission electron microscopy (TEM) and low-temperature scanning electron microscopy (SEM) that show *Pasteuria* n. sp. (S-1) is a new species. These studies have helped to finish elucidating the development and life cycle of this bacterium. Excellent photomicrographs illustrating all aspects of the biology of *Pasteuria* n. sp. (S-1) have been produced by the project. Use of the new technique of low temperature SEM has helped to visualize spore morphology outside and inside the infected nematodes without the usual artifacts associated with TEM.

A second population of this bacterium was isolated from a golf course in Gainesville, FL. TEM is being used to confirm that it is ultrastructurally similar to *Pasteuria* n. sp. (S-1). This will give Dr. Giblin-Davis a better idea of the possible distribution of this bacterium within Florida.

A population dynamics study (390 days long) was completed on *Pasteuria* n. sp. (S-1) in laboratory pot cultures of the sting

Pasteuria sp. (S-1)



nematode on the model turfgrass host (FX-313 St. Augustinegrass) under controlled conditions. There were four treatments: 1) no sting nematodes with no bacteria, 2) sting nematodes (99 $\pm$ 10) with no bacteria, 3) sting nematodes (99 $\pm$ 10) plus 10 sting nematodes encumbered with 8 $\pm$ 6 spores of *Pasteuria* n. sp. (S-1), and 4) sting nematodes (99 $\pm$ 10) plus 25 sting nematodes encumbered with 8 $\pm$ 6 spores of Pasteuria n. sp. (S-1). The assumption was that inoculated sick nematodes would not add to the population growth of the healthy sting nematodes but would die and release bacteria that would negatively affect the healthy population. Unfortunately, the results demonstrate that this was not the case.

The population of the healthy sting nematodes were increased by the addition of "sick" nematodes, suggesting that spore encumbrance is not a good indicator of spore production or nematode health. Root dry weights for the different treatments confirmed that the greatest root loss occurred in the treatments with the most nematodes. Although spore encumbered sting nematodes were recovered throughout most of the 390-day study, the levels were never greater than one percent from treatments receiving spores. This suggests that inoculative release of "sick" nematodes will be an unacceptable method for establishment and population suppression work.

In 1995, a monthly survey of 6 different sites of hybrid bermudagrass (fairway conditions) at the Ft. Lauderdale Research and Education Center where *Pasteuria* n. sp. (S-1) occurs naturally at different levels was initiated to monitor its suppressive effects on sting nematodes at three different soil depths. Soil temperature was also monitored at these different depths. After 6 months of sampling, locations that started with low levels of spore encumbrance had higher numbers of sting nematodes than areas that started with high encumbrance levels. These results suggest that *Pasteuria* n. sp. (S-1) might help produce suppressive soil for the sting nematode. This new information is encouraging but the survey work will require at least one year before any conclusions can be made.