

Final Report, 15 December 2017

Title: Using Insect Pathogenic Nematodes for Control of Corn Rootworm and Other Soil-dwelling Pests of Corn

Principal Investigator: Dr. Pat Porter, Extension Entomologist

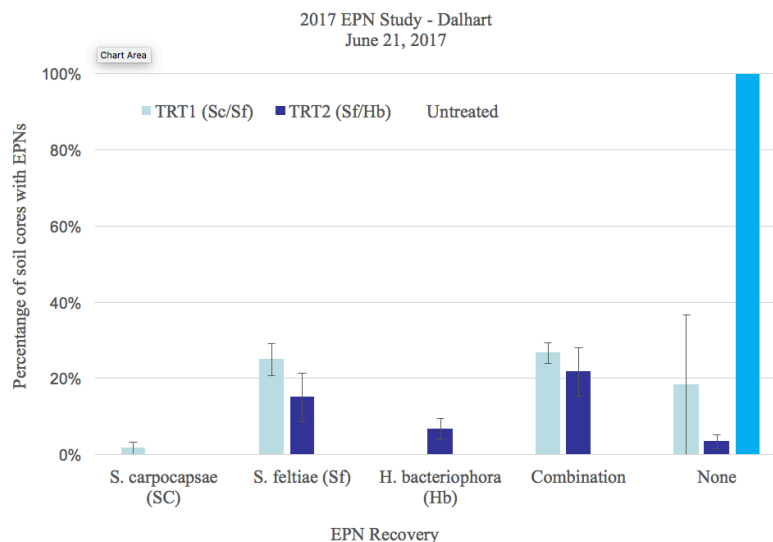
Co-Principal Investigator: Dr. Ed Bynum, Extension Entomologist

Three species of entomopathogenic nematodes from Cornell were applied to a field trial in a commercial corn field near Dalhart on May 11th under ideal conditions; the field was saturated due to a rain event the previous night. There were three treatments: 1) *Steinernema carpocapsae* + *S. feltiae*, 2) *S. feltiae* + *Heterorhabditis bacteriophora* and 3) untreated control. Each treatment was replicated four times, and plots were 16 rows x 40 feet. Application was made with a Solo hand-pump backpack sprayer that put out approximately 94 gallons per acre. Field personnel were Ed Bynum, Katelyn Kesheimer and Pat Porter.

The selection of these nematode species was made to evaluate which nematode or combination of nematodes would be most effective in controlling corn rootworm larvae. We did not expect to see much effect of the nematodes in this first year of the trial, but they appear to be working already.

On June 21st, we took 10 soil core samples from each plot and shipped them to Cornell for determination of nematode establishment. Overall, 27% of the *Steinernema carpocapsae* + *S. feltiae* soil samples were positive for the presence of nematodes, and 29% of the *S. feltiae* + *Heterorhabditis bacteriophora* soil cores were positive. Dr. Elson Shields, who provided the nematodes, considered these percentages of positive soil cores to be excellent nematode establishment (Figure 1).

Figure 1. Percentage of June 21st sampling date soil cores positive for nematode species.



On July 7th, we dug 10 plants from each plot and rated root damage based on the 1-3 Iowa scale, where 0 = no damage and 3 = all three nodes of roots pruned.

Table 1. Average root rating of corn from each of the treatments

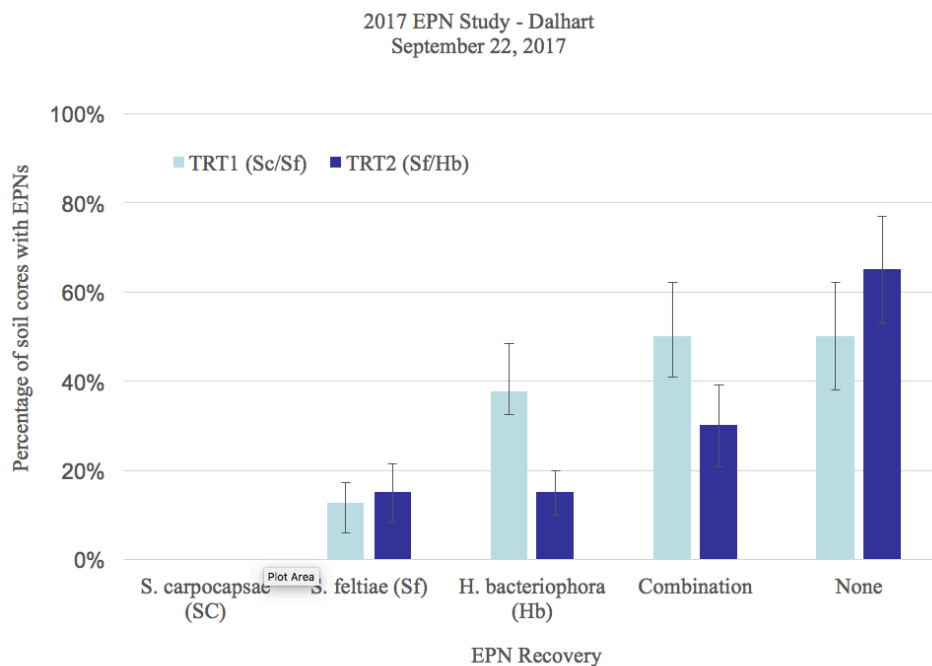
Treatment	Avg. Root Rating	Std. Deviation
Sc + Sf	1.43	0.62
Sf + Hb	1.81	0.62
Untreated	2.39	0.37

Treatments were not statistically different: $Pr > F = 0.2069$

While there was no statistical difference between treatments (Table 1) at this early date (and we did not expect to see any), we were quite surprised to see nearly a full node of root protection being offered by Sc + Sf before it was even fully established in the plots. Sf + Hb seems to be offering more than half a node of root protection as well.

We returned to the field on September 22nd, marked the plots with whisker flags so that we can find them again next year, and took a final set of soil core samples to determine nematode establishment. These were sent to Cornell for assay, and the results are presented below.

Figure 2. Percentage of September 22nd sampling date soil cores positive for nematode species.



The levels of *S. feltiae* and *H. bacteriophora* recovery are indicative of a large population increase as a result of reproduction on corn rootworm larvae. *S. carpocapsae* is an “ambush” nematode; it sits and waits in the top two inches of soil for the insect larva to pass by, and it is best when used against highly mobile insects near the soil surface. Dr. Elson Shields at Cornell

was not surprised that recovery of *S. carpocapsae* was low, since corn rootworm is not the ideal pest for this species. *S. feltiae*, on the other hand, is both an ambush and cruiser nematode and inhabits the top 8 inches of the soil profile, the zone where corn rootworm larvae live. *H. bacteriophora* is a cruising nematode that moves in the top 15 inches of soil looking for hosts. Thus the two nematode species inhabiting the root zone of corn plants established and increased in abundance. The increase in abundance can be attributed to successful killing of corn rootworm larvae.

In conclusion, we saw more rapid success this year than expected and are very much looking forward to digging corn roots and taking additional soil cores next year. We asked TCPB for \$1,400 next year to do this work. However, along with Cornell, Michigan State University and The Ohio State University, we have submitted a grant request to USDA AFRI to expand the research on entomopathogenic nematodes for control of corn rootworm next year. It has not yet been announced whether the grant request will be funded. If the grant is funded we will reduce our request to TCPB and only ask for the funds needed for the extra days needed to take samples and rate roots in the Dalhart field. (We are under the assumption the AFRI grant work will be in the same area and we can shift some of the costs for this current project to the Federal grant.)