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Infectivity and Persistence of *Ss* Nematodes on Pasture Mole Crickets in South-Central Florida[1]

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The Mole Cricket Task Force of the Institute of Food and Agricultural Sciences (IFAS), University of Florida, has applied approximately 22 billion beneficial nematodes to more than 20 ranches in south-central Florida to help suppress damaging mole crickets and bring economic relief to livestock producers. The results on infectivity (defined as the ability to enter a host) and persistence (ability to offer-long term control) are encouraging.

Pilot Project

Initially, in September of 2000, nematodes were applied in strips to distribute 1/8, 1/4, and 1/2 billion nematodes/acre on a 24-acre pasture in Polk City. Some plots in that pasture did not receive nematodes. Each treatment was replicated three times. This experiment was done to determine the rate of nematode spread within mole cricket populations on pasture at reduced nematode application rates. Six pitfall traps were installed on each plot and the number of mole crickets trapped were recorded weekly. Samples of mole crickets were analyzed for nematode infection monthly.

Mole crickets are very mobile and infected mole crickets spread the nematodes throughout that pasture within a few months (Table 1). In the fall of 2001, the entire pasture was flooded for several days and adult mole crickets relocated. Results show that the nematodes persisted in the soil through the fall and subsequent winter months and resumed breeding in adult mole crickets during the spring of 2002. The current mean nematode infection in mole cricket population on that pasture was 34% regardless of initial nematode application rate (Table 1). Mole cricket numbers have declined by 65-80% and pasture grass canopy ground cover in the spring of 2002 was 58-100%, representing a 45 to 200% increase relative to grass cover estimated in 2000.

Mole Cricket State Program Reestablishment

To promote widespread distribution of mole cricket-killing nematodes in Florida, the IFAS Mole Cricket Task Force extended its membership to include the Florida Department of Agriculture and Consumer Services Department of Primary Industries (FDACS-DPI), allied industrialists, and producer organizations such as the Florida

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Cattlemen's Association and Florida Turf Association in 2000. The enlarged Task Force successfully recruited MicroBio (U.K.), a subsidiary of Becker Underwood (USA), as the sole commercial producer and distributor of the mole cricket nematode (*Steinernema scapterisci, Ss).* MicroBio named their nematode product Nematac® S. The Florida Legislature provided the task force, through FDACS-DPI, with $300,000 in 2001 to reestablish a Mole Cricket State Program. The purpose of those funds was to support research/demonstration activities on biological control of mole crickets and conduct area-wide testing of the nematodes in Florida.

Phase 1

For the first phase of the State Program, Nematac S donated by MicroBio was applied in the spring of 2001 at seven ranches in Hardee, DeSoto, Pasco, and Polk counties. Sites had no pre-application history of *Ss* based on trapped mole cricket examination. Nematodes were applied with our slit-injector machine in strips at the 1/4 and 1/8 billion rates. Few adult mole crickets were trapped at these sites in the fall of 2001. In spring 2002, we observed no differences between the effects of 1/8 and 1/4 billion rates of nematode application on infection level, hence, the average nematode infection in mole crickets over treatments is shown in Table 2.

Phase 2

The second phase of the State Mole Cricket project on pasture involved nematode application to pasture and sod farms on 13 sites in south-central Florida. Nematac S product was applied with the slit-injector in strips at the 1/8 billion nematodes/A to all sites during fall 2001. Updates on nematode infection in trapped mole crickets from pastures and sods are provided in Tables 3 and 4, respectively. At Hollingsworth ranch in DeSoto Co., 1 out of the 5 pre-application mole crickets trapped was infected with the nematode. This was probably due to previous nematode application to turfgrass around the area in the 1990s. No other site had a pre-application history of nematodes.

With the exception of Deseret and Yates ranches, the nematodes seem to be spreading fast on pasture based on February-April, 2002 infection ratings (Table 3) and on sod farms too (Table 4).

Summary

The number of mole crickets trapped for evaluation rose in March and April 2002 making the data more reliable. Percentage of trapped mole crickets infected with nematodes ranged from 10 to 63% in March and 0 to 82% in April, 2002 for spring 2001-treated pasture sites (Table 2) and from 5 to 80 in March and 0 to 83 in April 2002 for fall 2001-treated pasture sites (Table 3). This suggests that successful nematode establishment is possible with either fall or spring application provided soil moisture is adequate. The level of infection on sod farms also ranged from 0 to 85% (Table 4). Bethel, Schroder-Manatee, and H & H sod growers applied their nematodes with a sprayer rig followed by 1" irrigation at Schroder-Manatee and Bethel but not at H & H sod farms. The slit injector machine was used to apply nematodes at Duda sod farm. Irrigation after spray application also seemed to promote nematode establishment. Most infected mole crickets will die in the soil and will not be recovered using trapping methods, so percentage infection reported is likely to be quite conservative.

In all three studies, the percentage of trapped mole crickets infected with the nematodes increased steadily from winter through spring in 2002. Infected mole crickets are expected to die within a few days. The nematodes have done a good job in breeding within the mole crickets and their offspring continue to attack other adult mole crickets in 19 of the 21 test sites. Nematodes have persisted in the soil through flood and cold winter months. There has been dramatic recovery of pastures in most cases.

We will continue to monitor the nematode spread and grass recovery. Meanwhile, the nematodes became commercially available to ranchers and sod growers this spring and marketing information may be obtained from Becker Underwood's local representative, Gabe Diaz-Saavedra, at 941-350-7291. Information on application can be obtained from your local extension agent or from the Range Cattle REC at 863-735-1314 ext 211.

Table 1. Mole crickets infected with nematodes after September 2000 application.

	Amount of pasture plot treated				
Date	1/2	1/4	1/8	0	LSD 0.05
	(# of mole crickets trapped), % infected				
Apr. 2001	(21) 86	(19) 84	(20) 80	(17) 41	15
May 2001	(5) 80	(7) 43	(4) 50	(6) 33	17
Feb. 2002	(5) 60	(1) 100	(10) 20	(4) 50	25
Mar. 2002	(6) 33	(3) 33	(1) 0	(2) 50	22
Apr. 2002	(17) 30	(13) 23	(18) 42	(16) 38	18

Table 2. Monthly percentage of trapped mole crickets infected with beneficial nematodes following spring 2001 Nematac S application.

		Date						
Ranch	County	Apr. 2001	May 2001	Jun. 2001	Dec. 2001	Feb. 2002	Mar. 2002	Apr. 2002
		- - - - - - - - - - - - - - - (# mole crickets trapped) % infection - - - - - - - - - - - - - - -						
H. Keller	Hardee	(14) 57	(15) 33	(9) 55	(3) 33	(15) 67	(12) 50	(42) 45
Peace River	Hardee	-- --	-- --	(2) 0	(0) --	(6) 67	(8) 63	(11) 82
L. Bryant	Hardee					(0) --	(2) 50	(3) 0
W. Wise	DeSoto	(2) 50	(5) 80	(1) 100	(4) 0	(0) --	(24) 25	(7) 14
Al Bar	Pasco	-- --	-- --	-- --	-- --	-- --	-- --	(29) 70
M. Nutt	Pasco	-- --	-- --	-- --	-- --	-- --	-- --	(6) 50
H. Combee	Polk	-- --	-- --	-- --	-- --	(11) 36	(21) 10	(38) 29

Table 3. Percentage of trapped mole crickets infected with beneficial nematodes following fall 2001 application of Nematac S at 1/8 billion nematodes/A to pastures.

Ranch	County	Fall 2001*	Jan. 2002	Feb. 2002	Mar. 2002	Apr. 2002
		- - - - - - (# of trapped mole crickets) % infection - - - - - -				
D. Barber	Oseola	(23) 0	(0) --	(6) 83	(0) --	(35) 71
Deseret	Orange	(5) 0	(0) --	(2) 0	(20) 10	(22) 27
Tom Kibler	Manatee	(4) 0	(0) --	(0) --	(10) 70	(4) 0
M. Taylor	Manatee	(2) 0	(0) --	(1) 100	(10) 50	(13) 38
J. Payne	Highlands	(9) 0	(0) --	(7) 57	(19) 5	(18) 78
Hollingsworth	DeSoto	(5) 20	(11) 91	(0) --	(15) 80	-- --
B. Keating	Hardee	(3) 0	(4) 25	(0) --	(4) 50	(16) 83
J.B. Starkey	Pasco	(6) 0	-- --	-- --	-- --	(10) 30
Yates	Orange	(2) 0	(0) --	(0) --	(0) --	(1) 0
* Pre-application ratings.						

Table 4. Percentage of trapped mole crickets infected with beneficial nematodes following fall 2001 application of Nematac S at 1/8 billion nematodes/A to sod farms.

Sod farm	County	Fall 2001	Jan. 2002	Feb. 2002	Mar. 2002	Apr. 2002
		- - - - - - (# of trapped mole crickets) % infection - - - - - -				
Duda	Polk	(9) 0	(1) 100	(0) --	(13) 85	(8) 63
Schroder-Manatee	Manatee	(1) 0	(0) --	(0) --	(2) 50	(9) 44
Bethel	DeSoto	(9) 0	(0) --	(0) --	(4) 75	(8) 38
H & H	Osceola	(1) 0	(0) --	(1) 0	(10) 0	(6) 17