NEMATOCIDE APPLICATION WITH PRECISION TILLAGE

L. M. Carter, W. C. Hofmann, and J. H. Chesson

OBJECTIVES: 1. To determine the efficacy of deep application of a fumigating nematocide. 2. To develop safe and environmental acceptable methods of applying nematocides.

PROCEDURE: The 1990 study consisted of 6 treatments: a control plot with normal tillage and no nematicide (treatment A); a normal 8 gallon per acre (gpa) Telone application with 2 shanks 10 inches to each side of the intended drill operated 10 inches deep (treatment B); a 22 inch deep precision tillage control plot with no nematicide (treatment C); and 22 inch deep precision tillage application at rates of 4, 6, and 8 gpa of Telone (treatments D, E, and F). The precision tillage tool consisted of two 32-inch long sub-soil shanks mounted to a tool bar with disk type bedders mounted behind the bar on pivoting arms which allowed constant depth of furrowing. The subsoil shanks had a forward angle of 15 degrees and were operated 22 inches deep from original soil level (depth from the top of the resulting bed was approximately 32 to 34 inches). For nematocide application, a .25 inch ID tube was welded to the trailing edge of the subsoil shanks to release the nematocide at the bottom of the slot. All nematocide treatments were applied with an experimental metering device which was controlled by ground speed and depth. A peristaltic metering pump was used for each applicator. The speed of the meter was controlled by a electro/hydraulic servo commanded by a rotary pulse sensor attached to the ground metering wheel. The metering wheel was mounted such that the meter would only operate when the shanks were deeper than 50% of the intended depth. The field chosen was known to have a high and fairly uniform population of nematodes. The treatments were applied in a latin square design (6 replications) to allow greater control over nematode population variability. Two weeks after treatment application but before planting cotton, soil samples from the 1st, 2nd, and 3rd foot were obtained from each plot and placed in small pots with a seedling tomato plant. An estimate of the initial nematode population for each plot was obtained by rating the degree of nematode galling in the tomato roots on a scale of 0 to 4 with 0 indicating no galling and 4 indicating severe galling.

RESULTS: Predictably, the application of 8 gpa of Telone with a normal application reduced the galling on tomatoes to a low level. However, that same reduction was obtained with 6 gpa applied with precision tillage. Even at the 4 gpa rate applied with precision tillage the nematode galling was drastically

reduced suggesting that the efficiency of Telone can be substantially improved with deep application. Both applications methods were most effective in reducing the population in the second foot. We believe it is important to note that the effectiveness was greater for precision tillage application in the third foot compared to normal application.

There was an improvement in cotton yield related to precision tillage and to rate of Telone. With no nematicide, precision tillage increased the yield by 10%. However at 8 gpa of Telone the increase for precision tillage (tillage effect only) was 34%. The increase in yield with 8 gpa using normal application equipment was 16%. One way of interpreting these data is that precision tillage reduced the soil compaction limitation to root extension and the Telone reduced the nematode population, each contributing the increased yields. However, when the tillage effect and the nematocide are combined, the yield increase is greater than the sum of the individual effects. Perhaps a more important interpretation is that the low rate of 4 gpa of Telone applied with precision tillage produced a 19% yield increase compared to 8 gpa applied with normal equipment. These data suggest the possibility of dramatically reducing the applied rate of Telone with equal or better yields. An application of these findings could result in a two-fold advantage for the farmer, 1) lower input cost with greater yield and 2) reduced chemical applied to the soil and therefore less release to the air.

The metering system was judged to be practical for use by farmers. For farmer use, 1) higher quality (ie longer life) peristaltic meters should be purchased, 2) commercial sized, approved tanks, tubing and valves would be needed, and 3) the supply tubes to each shank should be equipped with a positive pressure-operated check valve. The experimental system prevented leakage during turns and reduced variation in application rate resulting from wheel slippage and acceleration or deceleration at ends of fields. With the deep application, there was absolutely no noticeable odor of the Telone suggesting that the method may meet the most stringent environmental rules.

FUTURE PLANS: A second year of data would be desirable before publication. However, the availability of Telone or similar products is uncertain for 1991. Therefore when the product is again available, the field study will be completed. In the meantime, the application methodology and experimental equipment should be cleaned up and published.

Treat	Application Method	Rate gpa	Nematode Galling Index on Tomatoes from Soil at 0-1'	1-2'	2-3'	Yield b/a
A	Normal	0	2.06	1.83	1.12	1.64
B	Normal	8	0.29	0.08	0.46	1.90
C	P.T.	0	1.83	2.21	1.98	1.82
D	P.T.	4	0.96	0.10	0.17	2.27
E	P.T.	6	0.40	0.40	0.15	2.38
F	P.T.	8	0.40	0.00	0.02	2.56