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Nematode Management Investigations in Mississippi, 1997

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INTRODUCTION

This summary of 1997 nematode management trials on cotton and turf was prepared for industry cooperators, colleagues at other universities, and other interested persons. The information presented is not an endorsement or recommendation. It is intended for private use, and it may not be reproduced without permission.

All locations on producer-cooperator plantations received adequate moisture supplied by standard irrigation practices.

Trade names are used throughout this report for clarity, except where they are unavailable. A list of all chemicals used in this research -- including trade, common, and chemical names when available -- and company sources is included in the Appendix. Nematicides are expressed as formulated rate per acre as suggested by the manufacturers.

Data presented in this report were statistically analyzed using the Statistical Analysis System (SAS Institute Inc., Cary, N.C.). Data were subjected to ANOVA appropriate for the experimental design used, and means were separated using the least significant difference test. All statistical tests were performed at the 5% level of significance.

Application Methods. Temik 15G was applied at planting in the seed furrow with a Case 900 Early Riser planter equipped with a granular chemical applicator.

SM-9, ACT, Turf Ease II, and Safe-T Green 18 were applied as a broadcast application with a CO_2-charged backpack field plot spray system. A total volume of 20 gallons per acre was applied through four 8003 flat fan nozzles spaced 18 inches apart at 30 pounds per square inch (psi). SM-9 was thoroughly incorporated into the top 1 or 2 inches of soil by light incorporation. In turf, Safe-T Green 18 was watered in with 1 inch of water supplied by an overhead sprinkler irrigation system.

Clandosan 618, Nemacur 10G, Sustane 5-2-4, Sustane 5-2-4 + Iron, and Neo-Trol were applied with a hand-held granular rotary field spreader. All treatments were watered in with 1 inch of water by an overhead sprinkler irrigation system.

Nematode Counts. Population densities of plant-parasitic nematodes were determined at planting and at monthly intervals for the entire growing season. Ten soil cores, 1 inch in diameter and 8 inches deep, were collected from the two center rows of each plot in a systematic randomized sampling pattern. Cores from each plot were thoroughly mixed, and a 250-cubic-centimeter subsample was collected. Nematodes were extracted using a combination of gravity sieving and centrifugal flotation (sucrose sp. gr. 1. 13).

Root-Knot Nematode Management with Vydate C-LV Applied as a Foliar Spray

Objective: Vydate C-LV was examined in Minter City, Mississippi, for the management of the root-knot nematode (*Meloidogyne incognita*) in an established cotton production system. Each Vydate C-LV treatment received an in-furrow application of Temik 15G at 3.5 pounds of formulated material per acre at the time of planting. Temik 15G also was applied in the seed furrow at planting at 3.5 and 5 pounds per acre to provide a comparison of nematode management between Temik 15G standard treatments and the Vydate C-LV foliar applications. The insecticides Gaucho and Di-Syston 8EC were included to examine their utility in a nematode-infested field and to serve as insecticide-treated controls. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots.

Temik 15G was applied at planting with a Case 900 Early Riser planter equipped with granular chemical applicators. Vydate C-LV was applied as a foliar spray at the 6th true leaf stage and again 14 days later. Vydate C-LV was applied with a CO_2-charged backpack field plot spray system. A total volume of 10 gallons per acre was applied through two 8003 flat fan nozzles spaced over each row at 30 psi. All rows not treated with Vydate C-LV received a foliar spray of Orthene 75S at 4 ounces of formulated product per acre.

Cultivar: Sure Grow 125.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 38 inches wide; blocks separated by 20-foot alley.

Application date:

May 11, 1997	Temik 15G in-furrow treatments.
June 3, 1997	Orthene 75S applied to all treatments.
June 25, 1997	Vydate C-LV at the 6th true leaf stage.
	Orthene 75S to all treatments that did not receive Vydate C-LV.
July 9, 1997	Vydate C-LV 14 days after 6th true leaf stage.
	Orthene 75S to all treatments that did not receive Vydate C-LV.

Planting date: May 11, 1997.

Seed rate: 210 seed per row.

Nematode

sample date: May 11, June 16, July 17, August 1, and October 4, 1997.

Stand counts: Measured June 16, 1997.

Plant heights: Measured August 4 and October 4, 1997.

Harvest date: October 4, 1997.

Results: See Table 1, Table 2, Table 3, Table 4, Table 5, and Table 6.

Root-Knot Nematode Management with Temik 15G Applied as an In-furrow and Sidedress Treatment

Objective: Temik 15G was examined in Minter City, Mississippi, for the management of the root-knot nematode (Meloidogyne incognita) in an established cotton production system. Temik 15G was applied at planting in the seed furrow at the formulated rates of 3.5, 5, and 7 pounds per acre. In combination with the 5-pound Temik 15G application, sidedress applications of 5 and 10 pounds per acre were applied 51 days after planting. The insecticide Gaucho was included to examine its utility in a nematode-infested field and to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips and/or plant bugs were detected in the untreated control plots.

Cultivar: Sure Grow 125.

Experimental design: Randomized complete block with five replications.

Plot design: Four-row plots; rows 40 feet long, 38 inches wide; blocks separated by 20-foot alley.

Application date:

May 11, 1997	In-furrow treatments.
June 3, 1997	Orthene 75S applied to all plots.
June 25, 1997	Orthene 75S applied to all plots.
July 1, 1997	Temik 15G sidedress treatments.
July 9, 1997	Orthene 75S applied to all plots.

Planting date: May 11, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 11, June 16, July 17, August 1, August 22, and October 4, 1997.

Stand counts: Measured June 16, 1997.

Plant heights: Measured August 4 and October 4, 1997.

Harvest date: October 4, 1997.

Results: See Table 7, Table 8, Table 9, Table 10, Table 11, and Table 12.

Comments: The Temik 15G 5-pound, in-furrow + 10-pound, sidedress treatments may not be indicative of the actual result expected by this treatment. This problem is a result of equipment failure during application.

Root-Knot Nematode Management with Temik 15G in Non-Delta Cotton Production

Objective: Temik 15G was examined in Hamilton, Mississippi, for the management of the root-knot nematode in an established non-Delta cotton production system. Temik 15G was applied at planting in the seed furrow at the formulated rates of 3.5, 5, and 7 pounds per acre. The insecticide Gaucho was included to examine its utility in a nematode-infested field and to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control.

Cultivar: Deltapine 20.

Experimental design: Randomized complete blocks with five replications.

Plot design: Four-row plots; rows 40 feet long, 38 inches wide; blocks separated by 20-foot alley.

Application date: May 20, 1997.

Planting date: May 20, 1997.

Seed rate: 210 seed per row.

Nematode sample date: N/A.

Stand counts: Measured June 20, 1997.

Plant heights: N/A.

Harvest date: October 29, 1997.

Results: See Table 13 and Table 14.

Effect of Di-Terra for the Management of the Root-Knot Nematode

Objectives: Di-Terra was examined in Minter City, Mississippi, for the management of the root-knot nematode (*Meloidogyne incognita*) in an established cotton production system. Di-Terra was applied in the seed furrow at planting at the formulated rates of 25, 50, and 75 pounds per acre. These Di-Terra treatments were compared to a 5-pound-per-acre application of Temik 15G, which served as the standard nematicide treatment. The insecticide Di-Syston 8EC was included to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots. Di-Terra and Temik 15G were applied at planting with a Case 900 Early Riser planter equipped with granular chemical applicators.

Cultivar: Sure Grow 125.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 38 inches wide; blocks separated by 20-foot alley.

Application date:

May 11, 1997	All in-furrow treatments, Di-Terra, Temik 15G, and Di-Syston 8EC.
June 3, 1997	Orthene 75S applied to all treatments.

Planting date: May 11, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 11, June 16, July 17, August 1, and October 4, 1997.

Stand counts: Measured June 16, 1997.

Plant heights: Measured August 4, 1997.

Harvest date: October 4, 1997.

Results: See Table 15, Table 16, and Table 17.

Effect of ACT on the Yield of Sure Grow 125 Cotton in a Field Infested with the Root-Knot Nematode

Objective: ACT was examined in Minter City, Mississippi, for the management of the root-knot nematode (*Meloidogyne incognita*) in an established cotton production system. ACT was applied in the seed furrow at planting. The ACT treatment was compared to a 5-pound-per-acre application of Temik 15G, which served as the standard nematicide treatment. Di-Syston 8EC was included to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots.

ACT was applied with a CO_2-charged in-furrow plot spray system. A total volume of 10 gallons per acre was applied through a single 8003 flat fan nozzle positioned to direct the spray into the opened row at 30 psi.

Cultivar: Sure Grow 125.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 38 inches wide; blocks separated by 20-foot alley.

Application date:

May 11, 1997	All in-furrow treatments.
June 3, 1997	Orthene 75S applied to all treatments.

Planting date: May 11, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 11, June 16, July 17, August 1, and October 4, 1997.

Stand counts: Measured June 16, 1997

Plant Measured August 4, 1997.

heights:

Harvest date: October 4, 1997.

Results: See Table 18, Table 19, and Table 20.

Reniform Nematode Management with Vydate C-LV Applied as a Foliar Spray

Objective: Vydate C-LV was examined in Glen Allan, Mississippi, for the management of the reniform nematode (*Rotylenchulus reniformis*) in an established cotton production system. Each Vydate C-LV treatment received an in-furrow application of Temik 15G at 3.5 pounds of formulated material per acre at the time of planting. These treatments were compared to applications of Temik 15G alone; Temik 15G was applied at 3.5 and 5 pounds per acre in the seed furrow at planting. The insecticides Gaucho and Di-Syston 8EC were included to examine their utility in a nematode-infested field and to serve as insecticide-treated controls. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots.

Temik 15G was applied at planting with a Case 900 Early Riser planter equipped with granular chemical applicators. Vydate C-LV was applied as a foliar spray at the 6th true leaf stage and again 14 days later. Vydate C-LV was applied with a CO_2-charged backpack field plot spray system. A total volume of 10 gallons per acre was applied through two 8003 flat fan nozzles spaced over each row at 30 psi. All rows not treated with Vydate C-LV received a foliar spray consisting of 4 ounces per acre each of Orthene 75S and methyl parathion.

Cultivar: Sure Grow 501.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 40 inches wide; blocks separated by 20-foot alley.

Application date:

May 8, 1997	Temik 15G in-furrow treatments.
June 3, 1997	Orthene 75S applied to all treatments that did not receive Vydate C-LV.
June 30, 1997	Vydate C-LV 6^{th} to 7^{th} true leaf stage. Orthene 75S + Methyl Parathion to all treatments that did not receive Vydate C-LV.
July 14, 1997	Vydate C-LV 14 days after 6th to 7th true leaf stage. Orthene 75S + Methyl Parathion to all treatments that did not receive Vydate C-LV.

Planting date: May 8, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 8, June 19, July 14, July 30, August 29, and October 18, 1997.

Stand counts: Measured June 19, 1997.

Plant heights: Measured July 30 and October 18, 1997.

Harvest date: October 18, 1997.

Results: See Table 21, Table 22, Table 23, Table 24, Table 25, and Table 26.

Reniform Nematode Management with Temik 15G Applied as an In-Furrow and Sidedress Treatment

Objective: Temik 15G was examined in Glen Allan, Mississippi, for the management of the reniform nematode (Rotylenchulus reniformis) in an established cotton production system. Temik 15G was applied at planting in the seed furrow at the formulated rates of 3.5, 5, and 7 pounds per acre. In combination with the 5-pound-per-acre, in-furrow application of Temik 15G, sidedress applications of 5 and 10 pounds per acre were applied 53 days after planting. The insecticide Gaucho was included to examine its utility in a nematode-infested field and to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips and/or plant bugs were detected in the untreated control plots.

Cultivar: Sure Grow 501.

Experimental design: Randomized complete block with five replications.

Plot design: Four-row plots; rows 40 feet long, 40 inches wide; blocks separated by 20-foot alley.

Application date:

May 8, 1997	In-furrow treatments.
June 3, 1997	Orthene 75S applied to all plots.
July 1, 1997	Temik 15G sidedress treatments.

Planting date: May 8, 1997.

Seed rate: 210 seed per row.

Nematode

sample date: May 8, June 19, July 14, July 30, August 29, and October 18, 1997.

Stand counts: June 19, 1997.

Plant heights: Measured July 30 and October 18, 1997.

Harvest date: October 18, 1997.

Results: See Table 27, Table 28, Table 29, Table 30, Table 31, and Table 32.

Effect of Di-Terra for the Management of the Reniform Nematode

Objectives: Di-Terra was examined in Glen Allan, Mississippi, for the management of the reniform nematode (*Rotylenchulus reniformis*) in an established cotton production system. Di-Terra was applied in the seed furrow at planting at the formulated rates of 25, 50, and 75 pounds per acre. These Di-Terra treatments were compared to a 5-pound-per-acre application of Temik 15G, which served as the standard nematicide. Di-Syston 8EC was included to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots. Di-Terra and Temik 15G were applied at planting with a Case 900 Early Riser planter equipped with granular chemical applicators.

Cultivar: Sure Grow 501.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long , 40 inches wide; blocks separated by 20-foot alley.

Application date:

May 8, 1997	All in-furrow treatments.
June 8, 1997	Orthene 75S applied to all treatments.

Planting date: May 8, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 8, June 19, July 14, July 30, August 29, and October 18, 1997.

Stand Measured June 19, 1997.

counts:

Plant heights: Measured July 30, 1997.

Harvest date: October 18, 1997

Results: See Table 33, Table 34, and Table 35.

Effect of Nemacur 3E and Admire 2F for the Management of the Reniform Nematode

Objectives: Nemacur 3E and Admire 2F were examined in Glen Allan, Mississippi, for the management of the reniform nematode (*Rotylenchulus reniformis*) in an established cotton production system. Nemacur 3E and Admire 2F were applied in the seed furrow at planting. The Nemacur 3E, Admire 2F, and combination treatments were compared to a 5-pound-per-acre application of Temik 15G, which served as the standard nematicide. The insecticide Di-Syston 8EC was included to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots.

Nemacur 3E, Admire 2F, and Di-Syston were applied with a CO_2-charged, in-furrow plot spray system. A total volume of 10 gallons per acre was applied through a single 8003 flat fan nozzle positioned to direct the spray into the opened row at 30 psi.

Cultivar: Sure Grow 501.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 40 inches wide; blocks separated by 20-foot alley.

Application date:

May 8, 1997	All in-furrow treatments.
June 3, 1997	Orthene 75S applied to all treatments.

Planting date: May 8, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 8 and October 18, 1997.

Stand counts: Measured June 19, 1997.

Plant heights: Measured July 30, 1997.

Harvest date: October 18, 1997.

Results: See Table 36, Table 37, and Table 38.

Effect of Metham Sodium on the Yield of Sure Grow 501 Cotton in a Field Infested with the Reniform Nematode

Objectives: Metham Sodium was examined in Glen Allan, Mississippi, for the management of the reniform nematode (*Rotylenchulus reniformis*) in an established cotton production system. Metham Sodium was applied as a band over the row and lightly incorporated. It also was applied as a band in the seed furrow. Metham Sodium treatments were compared to a 5-pound-per-acre application of Temik 15G, which served as the standard nematicide. Di-Syston 8EC was included to serve as an insecticide-treated control. A control that did not receive an insecticide or nematicide also was included. All plots were treated with Orthene 75S at 4 ounces of formulated product per acre when thrips were detected in the untreated control plots.

Cultivar: Sure Grow 501.

Experimental design: Randomized complete block with five replications.

Plot design: Two-row plots; rows 40 feet long, 40 inches wide; blocks separated by 20-foot alley.

Application date:	May 8, 1997	All in-furrow and over-the-row incorporated treatments.
	June 8, 1997	Orthene 75S applied to all treatments.

Planting date: May 8, 1997.

Seed rate: 210 seed per row.

Nematode sample date: May 8, June 19, July 14, July 30, August 29, and October 18, 1997.

Stand counts: Measured June 19, 1997.

Plant heights: Measured July 30, 1997.

Harvest date: October 18, 1997.

Results: See Table 39, Table 40, and Table 41.

Effect of Telone II for the Management of the Reniform Nematode

Objective: Telone II was examined in Sumner, Mississippi, for the management of the reniform nematode (*Rotylenchulus reniformis*) in an established cotton production system. Telone II was injected approximately 12 inches deep by way of delivery tubes attached to the trailing edge of subsoil shanks. Rows were immediately hipped to reform the row and seal the fumigant in the soil. Telone II was injected 21 days before planting. The insecticide Gaucho was included for insect control in the untreated control plots.

Cultivar: DPL 33B.

Experimental design: A demonstration test with treatments applied as repeated strips across the field replicated five times.

Plot design: Ten-row plots in a modified skip pattern.

Application date:

April 17, 1997	Telone II injected.
May 8, 1997	Temik 15G at planting.

Planting date: May 8, 1997.

Nematode sample date: April 17, June 16, and August 4, 1997.

Stand counts: May 30, 1997.

Plant height: Measured June 6, June 13, June 24, June 27, July 3, and July 10, 1997.

Harvest date: October 26, 1997.

Results: See Table 42, Table 43, and Table 44.

Evaluation of Selected Compounds for the Management of Plant-Parasitic Nematodes Associated with Mississippi Turf

Objective: Selected nontoxic biological compounds were evaluated for the management of plant-parasitic nematodes associated with turf grass. This test is located on an established putting green at the MSU Golf Course. Treatments included the granular formulated compounds Sustane 5-2-4, Sustane 5-2-4 + Iron, Clandosan 618, and Neo-Trol, as well as the liquid formulations Safe-T Green 18, Bolster, ACT, and Turf Ease II. All compounds were compared to the standard nematicide Nemacur 10G, which is a granular compound. Bolster, ACT, Turf Ease II, and Nemacur 10G were each applied once on June 23 at the rates shown in Tables 45-49. Clandosan 618, Sustane 5-2-4, Sustane 5-2-4 + Iron, and Safe-T Green 18 were applied on June 23, August 5, and September 29; rates shown in the tables are for the total amounts applied. There were three Neo-Trol treatments. Two included 5 and 10 pounds of Neo-Trol per 1,000 square feet applied on June 23. The third Neo-Trol treatment included an application of 5 pounds per 1,000 square feet on June 23, followed by a second 5-pound application on August 5. All plots were also examined for the presence of beneficial free-living nematode species. All beneficial trophic groups were combined as a single count.

The granular formulated compounds were applied with a hand-held rotary granular applicator. The liquid formulations were applied as broadcast sprays using a CO_2-charged backpack field-plot spray system. A total volume of 20 gallons per acre for each treatment was applied through four 8003 flat fan nozzles at 30 psi. All plots were irrigated with one-half inch of water immediately after spraying.

Cultivar: Bermuda grass cv. Turfgreen 328.

Experimental design: Randomized complete block with five replications.

Plot design: Plots were 5 feet wide and 10 feet long.

Application date: June 23, 1997 One-time applications of Bolster, ACT, Turf Ease II, Neo-Trol, Nemacur 10G; first applications of Clandosan 618, Sustane 5-2-4, Sustane 5-2-4 + Iron, and Safe-T Green 18; and the first application in the split treatment of Neo-Trol.

August 5, 1997 Second applications of Clandosan 618, Sustane 5-2-4, Sustane 5- 2-4 + Iron, and Safe-T Green 18; and the second application in the split Neo-Trol treatment.

September 29, 1997 Third applications of Clandosan 618, Sustane 5-2-4, Sustane 5-2-4 + Iron, and Safe-T Green 18.

Nematode sample date: June 23, August 5, and September 29, 1997.

Nematodes present:

Ring (*Criconemella*)
Sheath (*Hemicyclophora*)
Spiral (*Helicotylenchulus*).
Stubby root (*Paratrichodorus*)
Lance (*Hoplolaimus*)

Results: See Table 45, Table 46, Table 47, Table 48, and Table 49.

Appendix

Appendix Table 1. List of chemicals used in the Nematode Management Studies for 1997.				
Trade name	**Formulation**	**Company**	**Common name**	**Scientific description**
Bolster	--	Sustane Corp.	--	Plant growth supplement solubilized seaweed *Ascophyllum* nodosum humic extracts from leonardite
Clandosan	618	Igene Biotech, Inc.	Chitin	Poly-N-aceyl-D-glucosamine (Nitrogen)
Di-syston	8EC	Bayer	Disulfoton	o, o-diethyl-s-(ethylthio) ethyl (phosphorodithioate)
Nemacur	10G	Bayer	Fenamiphos	Ethyl 3-methyl-4-(methylthio) phenyl (1- methylethyl) phosphoramidate
Safe-T Green 18	--	SMI	--	Proprietary blend of linear secondary alcohols reacted with ethylene oxide
SM-9	--	SMI	--	Proprietary blend of linear secondary alcohols reacted with ethylene oxide
Sustane	5-2-4	Sustane Corp.	--	All natural slow release fertilizer
Sustane	5-2-4 + Iron	Sustane Corp.	--	All natural slow release fertilizer
Temik	15G	Rhone-Poulenc	Aldicarb	[2-methyl-2 (methylthio) propionaldehyde o -(methylcarboyl) oxime]
Vydate	C-LV	DuPont	Oxamyl	Methyl N' N' -dimethyl-N-[(methylcarbamoyl) oxy] - 1 -thiooxamimidate
Neo-Trol	--	Parkway Research Corp.	--	Ground Sesame plant
Telone II	--	Dow Agro Sciences	--	1, 3-dichloropropene
Metham Sodium	--	AMVAC	--	Sodium methyldithiocarbamate
Di-Terra	--	Abbott Laboratories	--	*Ascophyllum nodosum*
ACT	--	Quick-Gro, Inc.	--	Not available
Turf Ease II	--	Quick-Gro, Inc.	--	Not available