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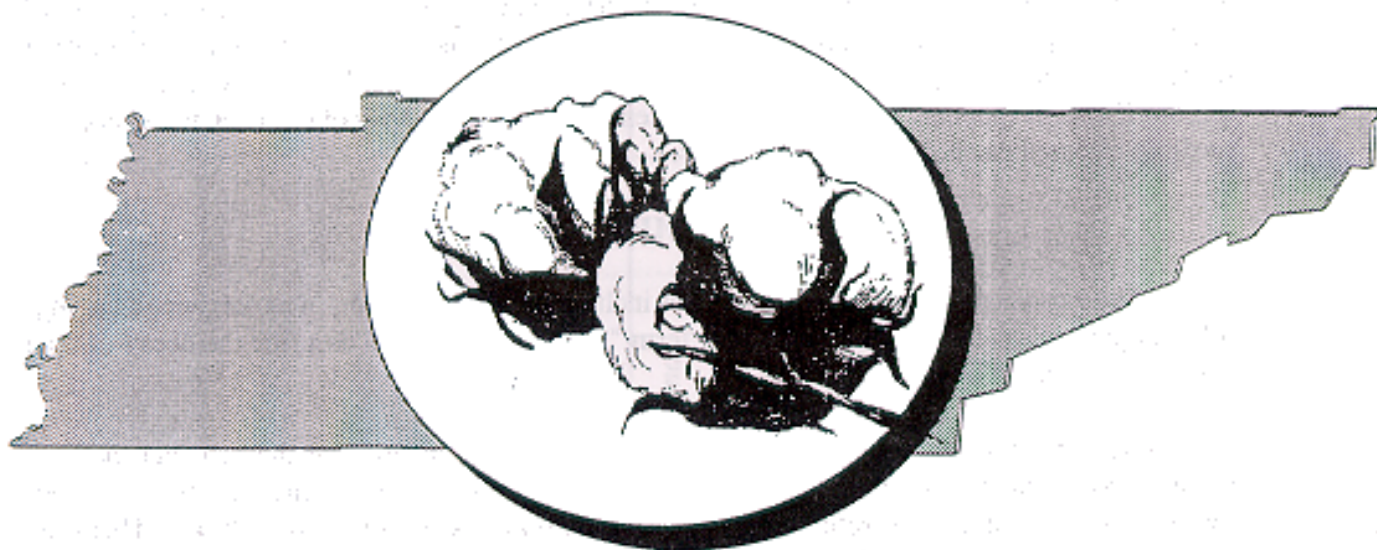
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COTTON DISEASE AND NEMATODE CONTROL

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by
MELVIN A. NEWMAN*



***PROFESSOR, EXTENSION PLANT PATHOLOGIST
DEPARTMENT OF ENTOMOLOGY & PLANT PATHOLOGY
JACKSON, TENNESSEE**

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COTTON DISEASES

Cotton is a major crop in parts of the African Tropics, Australia, China, Egypt, India, Mexico, Pakistan, Soviet Union, the Sudan, United States, and warmer regions of Central and South America. Diseases have always been a problem wherever cotton is grown. Toward the end of the 19th century, concern was voiced about the increasing toll taken by diseases each year in the U.S. In 1887, studies were undertaken to determine the loss to *Phymatotrichum* root rot in the black lands of Texas. In 1899, Atkinson reported in detail the serious damage caused in Alabama by *Fusarium* wilt, anthracnose, bacterial blight and nematodes. These pioneering works have been followed by nearly a century of research and education on cotton diseases. In 1936 in Jackson, Mississippi, a small group of cotton pathologists organized the Cotton Disease Council, which has met annually except during World War II. This group shares information concerning the control of cotton diseases and studies ways to estimate disease losses. It has developed general guidelines for assessing yield reduction in cotton-growing states.

SEEDLING DISEASES

Seedling diseases are presently causing great losses to cotton producers in Tennessee. They comprise the number one disease problem. The estimated loss is an average of 10.3 percent annually based on a range of five to 22 percent since 1989. The average seedling disease loss for the U. S. Cottonbelt is only 3.0% annually for the same period. During cool, wet planting seasons, such as 1989, 1990, 1993, 1997, 2002, and 2003, seedling diseases can become severe. Loss estimates do not include the cost of replanting or losses due to lateness of replanted cotton. Table 1 gives the average loss from the major diseases over the past 15-year period.

CAUSE

A number of organisms are associated with cotton seedling diseases. The organisms include both seed- and soil-borne fungi and bacteria. The soil-borne fungi, *Rhizoctonia solani* and *Pythium* spp., are the most important causes of seedling diseases in Tennessee. *Rhizoctonia solani* is the fungus most commonly associated with seedling diseases; however, during cool, wet seasons *Pythium* spp. may become more prevalent. *Thielaviopsis basicola* is being found to cause seedling diseases more frequently each year.

SYMPTOMS

The various phases of seedling diseases include seed-rot, root-rot, preemergence damping-off, and postemergence damping-off. The term "seed-rot" is used to describe the decay of seed before germination.

Root-rot (or black-root) may occur anytime after germination of the seed but may not become conspicuous or cause severe damage until after the emergence of the seedling. **Preemergence damping-off** refers to the disease condition in which the seedling is killed between germination and emergence from the soil. The death of seedlings resulting shortly after their emergence from the soil is termed **postemergence damping-off**. The latter is referred to as "**sore shin**" when only stem girdling occurs. *Rhizoctonia* is usually the cause of sore shin.

**Table 1. Cotton Disease Loss Estimate for Tennessee
1989-2003**

<i>Disease</i>	<i>Percent Loss to State Crop</i>														
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SEEDLING DISEASES (<i>Rhizoctonia solani</i> , <i>Pythium</i> spp., <i>Fusarium</i> spp., etc.)	18.0	15.0	9.0	7.0	10.0	8.0	6.0	5.0	9.5	7.0	5.0	4.0	8.5	20.0	22.0
BOLL ROTS	5.0	2.0	4.0	5.0	3.0	2.0	3.0	4.0	3.0	3.0	2.0	3.0	5.0	5.0	2.0
VERTICILLIUM WILT (<i>Verticillium dahliae</i>)	0.4	0.2	0.15	0.3	0.1	2.0	1.0	1.5	1.0	1.5	0.75	0.25	0.1	0.1	0.25
FUSARIUM WILT (<i>F. oxysporium</i> f. sp. <i>vasinfectum</i>)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	.01	.01	0
BACTERIAL BLIGHT (<i>Xanthomonas malvacearum</i>)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASCHOCHYTA BLIGHT (<i>Ascochyta gossypi</i>)	0.2	0.1	0.1	.05	.05	.05	0.1	0	0.02	0.02	0.01	.20	2.0	2.0	0.2
NEMATODES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.80	1.0	1.0	1.5	2.1
LEAF SPOTS (<i>Alternaria</i> , <i>Cercospora</i> , <i>Phomopsis</i> , etc.)	0.4	0.5	1.0	1.0	0.5	0.75	0.75	1.0	0.5	0.5	0.25	0.5	0.5	0.3	1.0
Total Percent Loss to Disease	24.21	18.01	14.46	13.56	13.86	13.01	11.06	11.7	14.23	12.43	8.82	9.06	17.11	28.91	27.55

COMMENTS: Loss estimates were taken from research and extension demonstrations and general observations taken across the state by Melvin A. Newman, Extension Plant Pathology.

SEEDLING DISEASE CONTROL

Seed treatments: Fungicide seed treatments give control of seed-rot and some control of preemergence damping-off. However, seed treatments give little, if any, control of postemergence damping-off and root-rot. Seed treatment is quite effective in controlling seed-borne diseases.

Soil treatments: Postemergence damping-off and root-rot can be controlled to some extent by soil treatment (see Table 2). Three methods of applying soil fungicides are recommended in Tennessee. These methods are the **hopper-box method**, the **in-furrow spray method**, and the **in-furrow granule method**. **These methods should be used in addition to the recommended seed treatments. IN FIELDS WHERE SOIL-INCORPORATED, PREPLANT HERBICIDES OR GRANULAR, SYSTEMIC INSECTICIDES ARE USED, BE SURE TO USE A SOIL FUNGICIDE. Producers are advised to use the seedling disease point system on Table 3 to determine if fungicide application is necessary.**

Hopper-Box Method: Mix recommended fungicides thoroughly with fuzzy, reginned or acid delinted seed just before planting. Mixing may be done in a container, such as a tub, or alternating layers of seed and fungicide as they are placed in the hopper. **Application of the fungicide in the hopper-box may change the seeding rate, and recalibration of the planter may be required.** Because of handling and mixing the hopper-box materials, clogging of the planter and abrasive action of the chemical, this method is not as desirable as the in-furrow methods. Although less expensive, it is also less effective, but when used properly, gives better results than seed treatments alone, especially under lower disease pressure.

In-Furrow Spray Method: This method consists of applying a soil fungicide into the seed furrow and to the covering soil during the planting operation. Application is best accomplished with two spray nozzles mounted on the planter. A cone-pattern nozzle is suggested for applying the material into the furrow behind the planter shoe. This nozzle should be placed far enough behind the shoe to prevent wetting and clogging of the seed spout. The second nozzle should be placed so as to direct the spray into the covering soil in front of the press wheel. The recommended height for the front nozzle is 1½ inches above the original soil surface, with a TX6 tip and 2 to 3 inches above the soil for the back nozzle with a TX3 tip. Where space is limited and two nozzles cannot be used, substitute one nozzle with a TX8 or TX10 tip. Use 3-5 gallons of water per acre.

In-Furrow Granule Method: Granular fungicides or fungicide-insecticide combinations have given good control of seedling disease. They can be applied with applicators used for other granular chemicals and eliminate the need for additional spray equipment and water with the spray method. Effective control with granules depends on proper placement in the furrow between the seed spout and the covering device.

When using a single delivery tube, attach a flared baffle to the end at approximately a 45 to 90-degree angle to the row to obtain a 2-3 inch wide band. Granules then fall into the furrow from the seed drop to the covering device.

Cultural Practices: Certain cultural practices can help considerably in controlling seedling disease (see Table 3). Turning under crop residues as early as possible is suggested. Also, crop rotation with soybeans, corn, or grass will help prevent the buildup of organisms pathogenic to cotton seedlings. A well-prepared seedbed greatly enhances the chances of a good stand. Planting on beds has been shown to be of considerable value in some seasons by providing better drainage and warmer soil temperatures. Use certified seed or high quality seed with a germination of 80% or higher and plant only when soil temperatures reach 65-70°F and are expected to remain that high or higher for an extended period of time.

Table 2 Soil Fungicide Treatment for Cotton

<i>Fungicide</i>	<i>Formulation</i>	² <i>Rate/Acre</i>
(Use higher rates where severe disease is expected)		
In-furrow Granular Fungicides		
Terraclor Super X	18.8G	6 - 10 lbs.
⁴ Terraclor	15G	5.5 - 10.6
Ridomil PC 11G	11G	7 - 10 lbs.
Ridomil Gold PC	10.5G	7 - 10 lbs.
In-furrow Fungicide + Insecticide Combinations		
Terraclor Super X-Di-Syston	6.5G-1.63G-6.5G	12 - 15 lbs.
¹ Terraclor Super X + Di-Syston EC	17.5-4.3-17.5	4 - 5.5 pts. (40 inch row spacing) (5-6 3/4 fl.oz/1000 row ft.)
In-furrow Sprays		
Ridomil Gold EC + Terraclor	4 EC + 2 EC	1 - 2 ozs. + 3 - 6 pts.
Ridomil Gold EC + PCNB2-E	4EC + 2EC	1 - 2 ozs. + 2 - 4 qts.
³ Rovral	4F	3.4 - 6.9 ozs.
Terraclor Super X	2.5 EC	3-6 pts.
³ Terraclor	2 EC	3 - 6 pts.
Ridomil PC Liquid (Twin Pak)	PCNB-24% @ 2 qts./A + Ridomil-25.1% @ 5 ozs./A	2 qts. and 5 ozs. (1 jug/5 acres)
³ Quadris	2.08F	5.5 - 8.25 ozs.
Hopper-box Dusts and Slurries (not as effective as in-furrow methods under severe disease conditions)		
		Rate/100 lbs. seed
Delta Coat AD (HB Slurry)	3.5% - 30%	11.75 ozs.
Prevail (HB Dust)	15%-15%-3.12%	8-16 ozs.

NOTES: In-furrow spray treatments are recommended in 3-5 gallons of water per acre. In-furrow granules can be applied in-furrow with Temik 15G or Di-Syston with a split-box method. See pesticide labels for other use instructions and precautionary statement.

¹ In-furrow liquid application: Apply the specified dosage to the soil around the seed and to the covering soil as it fills the furrow. Do not apply directly to the seed. The soil around the seed and the covering soil should be thoroughly mixed with the product. Use the higher rates when weather conditions are expected to be unfavorable for rapid germination and in fields having a history of disease problems or in no-till situations.

² Dosage rate at 38" row spacing.

³ Under cold, wet conditions where *Pythium* may be a problem, tank mix with Ridomil Gold 4EC or Terrazole 4EC for added control (see label for rates).

⁴ Use where *Pythium* will not be a major problem.

Table 3

COTTON SEEDLING DISEASE POINT SYSTEM

by Melvin A. Newman, Professor

The University of Tennessee, Agricultural Extension Service

	<u>Points</u>	_____
Soil Temperature: 3-Day Average at 4 Inches		
A. Less than 65 F	100	
B. 65 – 72 F	50	
C. Higher than 72 F	0	
Five-Day Forecast:		
A. Colder and wetter	100	
B. Colder	50	
C. Wetter	50	
D. Warmer	0	
Seed Quality: Cold Germination Value		
A. Less than 59%	100	
B. 60-69 %	50	
C. Higher than 70%	0	
Field History: Based on Seedling Disease in Previous Years		
A. Severe	100	
B. Moderate	50	
C. Low	0	
Tillage: Based on Field Preparation		
A. No-till	100	
B. Minimal tillage	50	
C. Conventional	0	
Row Preparation		
A. Firm beds present	0	
B. Beds not firm	50	
C. Bed absent	100	
Seeding Rate: Number of Seeds Per Row Ft.		
A. Low: 3 and lower	100	
B. Moderate: 5-6	50	
C. High: 7 and higher	0	
In-furrow Insecticide/Nematicide Applied: Temik, Di-Syston, Thimet, etc.		
A. Yes	100	
B. No	0	
Total: If Point Total Exceeds 150 In-Furrow Fungicide Application is Suggested		

This point system is a modified version from a three-year regional cotton project. It should be used as a guide to determine the need for an in-furrow fungicide. It is not a guarantee of economical return.

The point system (See Table 3) was tested in 1996-1998 by scientists, consultants, and growers in most areas of the Cotton Belt. One version of the system is not likely to fit all beltwide conditions. The seedling disease complex can vary greatly from field to field, and from year to year, depending upon several cultural and environmental conditions in Tennessee. See cotton seedling diseases on the Cotton Pickin' web site – ipmwww.ncsu.edu/cottonpickin.

The use of soil fungicides should be determined by the **presence and intensity** of the following factors:

- **Soil Temperature.** Low soil temperatures create conditions that will slow seed germination and seedling emergence, thus extending the vulnerable period for infection. Many soil-borne pathogens are active at lower temperatures.
- **Five-Day Forecast.** Environmental conditions during the first week of planting are important to consider. A critical factor to evaluate is the combination of low soil temperatures and high soil moisture. Any condition that slows germination and growth of the seedling favors the seedling disease complex.
- **Seed Quality.** Poor quality seeds germinate and emerge more slowly than good quality seeds under similar conditions. Slow germination and emergence extends the period seeds are vulnerable to infection.
- **Field History.** The history of each field should be evaluated to determine if it has had a stand-establishment problem, which may have been caused by factors including: soil type, drainage, soil pH, and levels of organic matter.
- **Tillage.** A no-till, or stale, seed bed has a tendency to be slightly cooler and wetter than a conventional seed bed. This combination may be conducive to a carryover of disease inoculum on the past year's crop debris.
- **Seeding Rate.** Recommended seeding rates have gradually declined in most parts of the Cotton Belt. This increased the importance of getting a high percentage of seeds to germinate, emerge, and become established.
- **Insecticide/Nematicide Use.** Experience shows that the use of a soil fungicide can be a “safening” factor when certain soil-applied insecticides/nematicides are used.
- **Soil Moisture.** When soils are saturated with moisture for prolonged periods, seeds and seedlings are adversely affected. These conditions are ideal for the growth of several soil pathogens.
- **Planting Date.** A field planted prior to normal planting dates for its area will have conditions that **favor greater seedling disease pressure.**

VERTICILLIUM WILT

Verticillium wilt is one of the important diseases affecting cotton in Tennessee. It is the most damaging of the two wilts that occur on cotton. This disease is widespread in the cotton-growing area and is most severe during cool, wet growing seasons.

Verticillium wilt is caused by the soil-borne fungus, *Verticillium dahliae*. This fungus can survive in the soil for many years even in the absence of cotton.

Cotton seedlings infected with *Verticillium* usually turn yellow, dry out, and die. Plants, which become infected later in the season, are stunted and exhibit a yellow condition along the leaf margins and between the major veins. This yellow imparts a mottled appearance to the plant. Severely affected plants will shed their leaves. Sprouts or new shoots may develop near the base of infected plants.

Positive diagnosis of Verticillium wilt in the field can be difficult because of its close similarity to Fusarium wilt. Both wilt diseases cause a brown discoloration of the interior of the stem. The discoloration associated with Verticillium wilt is usually more evenly distributed across the stem than that associated with Fusarium wilt. The browning of the stem tissues is also usually less intense where the wilt is caused by *Verticillium*.

The most tolerant varieties available should be planted in fields that are infested with *Verticillium* (See Table 4). Crop rotations will help reduce losses to Verticillium wilt, but they must be four- to six-year rotations. Any practice, such as bedding, which permits more rapid warming of the soil will also help reduce losses.

LEAF SPOTS AND BLIGHTS

Several leaf spot and blight diseases occur on cotton and under favorable conditions can cause considerable damage. The most important of these diseases are Ascochyta blight (wet weather blight), bacterial blight (blackarm and angular leaf spot), Cercospora leaf spot, and Alternaria leaf spot. These diseases cause various types of leaf-spot and blight symptoms. The following measures will help control these minor disease problems: (1) use a recommended fungicidal seed treatment, (2) destroy crop residue by chopping and plowing it under when not under no-till conditions, (3) use suitable rotations as prescribed for other diseases, (4) plant resistant varieties when they are available and (5) keep the potassium at a high level according to soil tests.

Table 4**REACTION OF COTTON VARIETIES TO VERTICILLIUM WILT
Milan Experiment Station, Milan, TN – 2000-2001**

<i>Variety</i>	<i>2000-Wilt Rating (0-10)</i>	<i>2001-Wilt Rating (0-10)</i>	<i>2000-Total Yield lbs. Lint/A</i>	<i>2001-Total Yield lbs. Lint/A</i>
FiberMax 989 (ck.)	0.8	0.9	782 d ¹	771 hi
FiberMax 958	1.6	2.3	1298 a	900 f-i
FiberMax 966	1.6	1.5	1294 a	1105 b-f
Deltapine DP 436 RR	1.9	2.3	878 cd	941 d-h
Deltapine DP 388	2.1	2.1	911 cd	908 e-i
Deltapine DES 607	2.3	--	890 cd	--
Sure-Grow 747	2.3	3.0	878 cd	1006 d-g
Sure-Grow 501 BR	2.4	2.1	931 cd	1252 abc
Deltapine DP 451 B/RR	2.4	2.4	905 cd	1127 b-e
PhytoGen PCS 355	2.4	2.5	1082 bc	1044 c-g
AgriPro AP 7115	2.5	2.5	928 cd	716 i
Deltapine DP 422 B/RR	2.6	--	812 d	1058 c-g
Stoneville BXN 47	2.6	2.0	900 cd	861 ghi
Stoneville ST 474	2.8	1.8	813 d	1146 bcd
Stoneville ST 4892BR	2.9	1.8	964 cd	1288 ab
Stoneville ST 4691B	2.9	2.5	1088 bc	1237 abc
Sure-Grow 125 BR	3.1	2.1	810 b	1127 b-e
Paymaster PM 1560 BG	4.3	1.8	1071 bc	1285 ab
Paymaster PM 1218 BG/RR	4.6	2.8	1196 ab	1413 a
Paymaster PM 1244 RR (ck.)	5.1	2.8	921 cd	859 ghi
Agri Pro AP 1500 RR	–	2.1	--	772 hi
Deltapine DP 422 B/RR	–	2.1	–	1058 c-g
LDS 5% (2000)	0.5	–	192	--
LSD 5% (2001)	–	1.0	–	195

2000 - Planted May 12; plots rated for wilt injury on September 8 and 21 with a final rating October 10 (rated 0 - no wilt symptoms observed to 10 - all plants dead); harvested October 3 and 12. Ratings made by Albert Y. Chambers.

2001 - Planted May 4; final plot rating made on October 10 (rated 0 = no wilt symptoms to 10 = all plants dead) final harvest October 31. Rating made by Tracy Bush and Albert Chambers.

¹Mean figures followed by the same small letter do not differ significantly (P = 0.50, Duncan's New Multiple Range Test).

BOLL ROTTS

Boll rots have caused heavy losses to cotton producers during wet growing seasons. Damage from boll rots is most severe in fields where rank growth occurs. Rain and high humidity during late summer and fall are optimum conditions for boll-rot development.

A number of fungi and bacteria have been associated with boll rots. Some of these organisms invade the cotton bolls directly, whereas others enter through insect wounds or as secondary invaders. Boll rots cause losses by reducing yields, damaging the cotton fibers, and infecting seed. Infected seed will result in seedling blights the following season. Boll rots usually first appear as water-soaked spots. Later, as the infection spreads, the bolls turn black and may be covered with a moldy fungus growth. Badly infected bolls may drop from the plant.

To prevent boll rots, cotton growers should avoid excessive applications of nitrogen that promote rank growth of cotton. It has been found that skip-row cotton provides better air circulation, resulting in less boll rot. Defoliation will also help reduce boll rots. Bottom defoliation followed by complete defoliation about two weeks later has given good control of boll rot. A good insect control program will prevent injuries, which serve as infection sites for boll-rotting organisms.

Plant growth regulators such as Pix can also be used where rank growth usually occurs and boll rot is likely to be a problem. Pix **should not be** used on cotton under stress, especially drought stress.

NEMATODES

For several years reniform nematodes (*Rotylenchulus reniformis*) have been a severe problem in cotton production in several states south of Tennessee. In the fall of 1997-2000 the reniform nematode was found in several fields in Madison and Crockett counties. This nematode is spread very easily on farm equipment. Producers should sample their cotton land for this nematode in the fall after harvest. High levels of reniform have been found as deep as 36 inches in the soil, making control difficult.

No current cotton varieties are resistant to the reniform nematode. If the reniform nematode is present, producers should rotate with a non-host crop such as corn or grain sorghum. The winter grain crops such as wheat, rye, oats and barley also are non-hosts; however, legume winter cover crops such as vetch and clover are hosts.

Reniform nematodes can infect and reproduce on cocklebur, cowpea, crotalaria, sow thistle, jimson weed, Florida beggar weed, and Florida pusley. Temik 15G at 5 lb./acre applied in-furrow at planting will reduce the reniform nematode population for the early part of the season. An additional side-dress application of Temik 15G at 5 lbs/A can be made for better control at the pinhead stage, or use two applications of Vydate 14 days apart starting at pinhead.

MAJOR COTTON DISEASE IDENTIFICATION & CONTROL CHART

DISEASE	CAUSE	SYMPTOMS	CONTROL
SEEDLING DISEASES (seed-rot, root-rot, and damping off)	<u>Rhizoctonia</u> , <u>Pythium</u> , <u>Thielaviopsis</u> spp., and several other fungi and bacteria	Seed-rot, root-rot, preemergence and post emergence damping-off.	Fungicide seed treatments help control seed rots and some preemergence damping-off. However, an <u>additional soil treatment</u> of fungicide must be used to control root-rots and most damping-off. In addition, producers must follow all other recommended cotton production practices decreasing seedling diseases. Some of these practices include use of correct planting equipment and date of planting, good seed bed preparation, correct use of herbicides and insecticides and use of high germinating seed.
FUSARIUM WILT	<u>Fusarium oxysporum</u> F. <u>vasinfectum</u>	Plants become stunted, yellowed, followed by defoliation. Yellowing first occurs around leaf edges and advances inward. Cross sections of infected stems usually reveal a brown discoloration that is more intense in outer layers of tissue. Infected plants fruit earlier and produce smaller bolls.	Reduce nematode population. Crop rotations. Use resistant varieties.
BOLL ROTS	Several fungi and bacteria	Boll rots usually first appear as water-soaked spots. Later, as infection spreads, bolls turn black and may be covered with a moldy fungus growth. Badly infected bolls may drop from plant.	Avoid excessive rates of nitrogen. Practice skip-row planting. Timely defoliation will reduce boll rots. Reduce insects that injure bolls. Growth regulators such as Pix can be used effectively to reduce boll rots.
LEAF SPOTS	<u>Ascochyta</u> , <u>Cercospora</u> , <u>Alternaria</u> , spp. and some bacteria	Various types of leaf spots and blights. Many spots occur on leaves toward maturity, but these are not usually damaging to the plant at this stage of growth.	Use fungicide seed treatments. Destroy crop residues. Use crop rotations and plant resistant varieties when available (esp. when Bacterial Blight is severe). Keep potash levels at least medium to high.
VERTICILLIUM WILT	<u>Verticillium dahliae</u>	Seedlings may become infected and turn yellow, dry out and die. Plants that become infected later in the season are stunted and exhibit a yellow condition along leaf margins and between the major veins. Severely affected plants will shed their leaves. A brown discoloration of the interior of the stem can usually be found later in the season. This discoloration is distributed evenly across the inside of the stem.	Plant resistant varieties when Verticillium Wilt is severe. A variety that matures very early may in some years escape injury from Verticillium Wilt. (See wilt resistance chart)
RENIFORM NEMATODE	<u>Rotylenchulus reniformis</u>	Above ground: Infested plants are usually slightly stunted. Plants under stress may be severely stunted and show potassium deficiencies. Under ideal growing conditions plants may not show any detectable symptoms. Reniform nematodes may cause increased incidence and severity of seedling disease.	Yield losses can range from 10-50 percent depending on stress and nematode population. Crop rotation with corn or grain sorghum will help reduce the population of reniform. The longer the rotation, the better the result. But the population may rebound when cotton is planted back. Soil samples for reniform nematode should be taken each year. Nematicides can be profitable under stressful conditions.

COTTON DISEASE CONTROL GUIDE

1. **PLANT HIGH-QUALITY** seed with >80% plus germination.
2. **TREAT SEED** with a fungicide to avoid early losses.
3. **SOIL TEMPERATURE** should be 65-70°F before planting.
4. **IN-FURROW SOIL** fungicides should be used in addition to not in place of seed treatments.
5. **ROTATE** to avoid the build-up of disease organisms.
6. **DISEASE-RESISTANT VARIETIES** should be planted.
7. **CULTURAL PRACTICES**, such as planting on a bed, also help prevent disease.
8. **SOIL SAMPLE** for nematodes.

COTTON SEEDLING DISEASE CONTROL WITH IN-FURROW FUNGICIDES AND SEED TREATMENTS

Melvin A. Newman, Wyveta Percell, Wesley Crowder and Chris Street
Department of Entomology and Plant Pathology
University of Tennessee
Jackson, TN

Abstract

Several in-furrow fungicides were tested for efficacy at the Lower Brownsville Road (LBR) location near Jackson, Tennessee, in 2003. These in-furrow (IF) tests were planted on April 22-23, 2003, with SG 215 BR seed that had been commercially treated with fungicides and Cruiser (thiamethoxam). Some hopper-box (HB) seed treatment materials were included in the tests, but most treatments were IF fungicides. Two seed treatment tests were planted with DP451BR. Six tests were planted no-till with a seeding rate of four seeds/row-ft. and 36" row spacing. Plots were four rows wide and 30' long with two rows inoculated and two rows not inoculated. Four replications of each treatment were planted in a randomized complete block design with a four-row Case IH 900 planter equipped for soil in-furrow applications of either liquid or granular fungicides. **ONLY THE INOCULATED DATA IS DISCUSSED SINCE THERE WERE NO TREATMENTS IN THE UNINOCULATED PLOTS THAT WERE SIGNIFICANTLY DIFFERENT FROM THE UNTREATED CHECK.** The inoculum was composed of a 1:1 mixture of *Rhizoctonia* and *Pythium* grown on millet seed. It was added at planting IF at the rate of 10 ml/row-ft with a granular hopper-box applicator. Final stand counts were made on May 29, and plots were harvested with a plot picker on September 30. Yields were adjusted for gin turn-out and reported in pounds of lint per acre (lbs. lint/A) for each test. Standard weed control chemicals for no-till were applied, and there was no insect pressure at any time during the season. The weather was very wet and cold shortly after planting, but all plots were able to continue growing with excellent weather returning in the summer and fall to render some surprisingly high yields.

In the first test, an untreated check was compared with five IF fungicide treatments and one HB treatment. For this test, inoculum containing only the *Rhizoctonia* pathogen was used. The IF treatments included: Rovral 4F (iprodione) at 7 oz./A, Demosan 3F (chloroneb) at 3 pts./A, Quadris 2.08 SC (azoxystrobin) at 5.5 oz./A, Terraclor 2EC (quintozene) at 6 pts./A, and Terraclor 15 G at 10 lbs./A. The hopper-box treatment was System³ (quintozene/metalaxyl/*Bacillus subtilis*) applied at 12 oz./Cwt of seed. All treatments, including the HB treatment, yielded significantly more lint/A than the untreated check. Numerically, the IF treatments all had higher yields than the HB treatment. Except for the treatments with Rovral and Demosan, stand counts were significantly higher than for System³. System³ had the lowest stand count of all the treatments but was still significantly higher than the untreated check.

In a second test, four IF fungicide treatments and one IF biological treatment were compared with one HB fungicide treatment of Delta-Coat AD 3.24 FS (metalaxyl/chloroneb) at 11.75 fl. oz./Cwt of seed and one biological seed treatment. The IF treatments were: Ridomil Gold PC 10.5 GR (quintozene/mefenoxam) at 10 lbs./A, Terraclor Super-X 2.5 EC (quintozene/etridiazole) at 6 pts./A, Terraclor Super-X 18.8 granules at 10 lbs./A, Quadris 2.08 SC at 5.5 oz./A, and a biological material (BioYield Concentrate: *Bacillus amyloliquefaciens* GB 99/*Bacillus subtilis* GB 122 diluted 1:100) at 5 fl. oz./A. The seed treatment was the same concentration of BioYield applied to the seed at 0.5 fl. oz./Cwt. All IF fungicide treatments as well as the HB treatment had significantly higher stand counts when compared with the biological treatments and the untreated check. All other treatments had a significantly higher yield than the BioYield seed treatment. The yields were only numerically higher for the IF and HB fungicides when compared to the untreated check and the biological materials.

In a third test, Demosan 3F (chloroneb) was tested at 1, 2 and 3 pts./A, with and without Ridomil Gold 4EC (mefenoxam) at 1 oz./A. These treatments were compared with a treated check (Quadris 2.08 SC at 6 oz./A plus Ridomil Gold 4EC at 1 oz./A) and an untreated check. There was no significant difference in yields or stand counts among the three Demosan rates as long as Ridomil Gold was added to the treatment. Demosan alone at the 3 pts./A

Abstract - continued

rate did not require the addition of Ridomil to be significantly better in yield than the untreated check. Stand counts for Demosan alone at the lowest rate of 1 pt./A was not significantly different from the untreated check. Demosan alone at the 2 pts./A rate produced stand counts significantly higher than the untreated check but yields remained statistically the same. Quadris at 6 oz./A plus 1 oz./A Ridomil Gold was significantly better in yield and stand count when compared to the untreated check but was no better than any of the Demosan treatments except for the 1 pt./A rate of Demosan alone.

The fourth test was to compare the efficacy of tank-mix and pre-mix Quadris/Ridomil Gold on cotton seedling damping off. Syngenta's pre-mix A13836 (Quadris/Ridomil Gold) was applied at two rates. There was one rate of Ridomil Gold PC 10.5 GR (quintozene/mefenoxam), two rates of Ridomil Gold 4 EC (mefenoxam), two rates of Quadris 2.08 SC (azoxystrobin), and a combination of Ridomil Gold 4 EC with Quadris 2.08 SC applied at two rates. Yields were significantly higher for Ridomil Gold PC, Ridomil Gold plus Quadris at the higher rate, and for both rates of the pre-mix. All the treatments produced numerically higher yields than the check. Ridomil Gold alone at the 1.75 oz/A rate had the lowest stand count and the lowest yield of all the treatments. All the treatments, except for Ridomil Gold at the higher rate, had significantly higher stand counts than the check. Ridomil Gold plus Quadris at the higher rate and the two rates of the tank-mix had the highest significant stand counts.

Test number five consisted of treatments applied by Gustafson on DP 451 BR cottonseed. There were five treatments plus a treated and an untreated check. The check treatment was RTU Baytan-Thiram (triadimenol/thiram) at 3 oz/cwt plus Allegiance (metalaxyl) at 0.75 oz/cwt. Other fungicides included in the test were: Protégé XT (azoxystrobin/triadimenol/metalaxyl), Kodiak Concentrate (Bacillus subtilis GBO3), Cotguard (carboxin/TCMTB/metalaxyl), Kodiak FL (Bacillus subtilis GBO3), RTU Vitavax-Thiram (carboxin/thiram), Delta Coat (metalaxyl/chloroneb), Protégé FL (azoxystrobin) and Baytan 30 (triadimenol). There were no significant yield differences between the treatments and the checks. However, the lowest yield numerically was the treated check. The check treatment plus Delta Coat produced a significantly higher stand count. The rest of the treatments had numerically higher stand counts than either the treated or the untreated check.

The sixth test was a fungicide seed treatment applied by Syngenta to test Dynasty (mefenoxam/fludioxonil/azoxystrobin) and Dynasty + Systhane WSP (myclobutanil) against other seed company applied standards and against commonly used over treatments. DP 451 BR cottonseed was treated with Cruiser 5FS (heterorhabditis bacteriophora) and the following fungicides: Dynasty alone at two rates, Dynasty + Systhane WSP at two rates, and six other combinations of commonly used fungicide seed treatments. There were no significant yield differences among the treatments, but all of them were higher than the untreated check. The highest yield numerically was the Allegiance FL(metalaxyl)/Baytan 30(triadimenol)/Thiram 42-S(thiram)/Protégé FL(azoxystrobin)/Allegiance FL combination. All of the treatments had significantly higher stand counts than the untreated check. Treatment 6 had a significantly lower stand count than six of the other treatments. Treatment 11 had the highest numerical stand count as well as the highest numerical yield.

SEEDLING DISEASE CONTROL PLOT DATA

Plot Description (Lower Brownsville Road)

Planted:	April 22-23, 2003
Varieties:	SG 215 B/RR and DP 451 BR with Cruiser seed treatment
Plot Design:	Randomized complete block; plots four rows wide, 30' long; four replications
Pesticides:	Roundup UltraMax (1.2 pt/A) on March 14 Cotoran (1 qt/A), Prowl (1 qt/A), Gramoxone (1 qt/A), Karate (2 oz/A) broadcast preemergence Roundup (22 oz/A) + Caparol (1 qt/A) post-directed on June 25
Soil Temp:	70 ⁰ F @ planting
Seeding Rate:	3.5 seeds/ft. on 36" row-spacing
Equipment:	Case IH 900 four-row planter; 9930 John Deere 2-row picker
Inoculation:	Rhizoctonia and Pythium (with and without in each treatment)
Tillage:	No-till; cotton for many years
Soil:	Falays silt loam; pH 6.0; no reniform nematodes
Fertilizer:	60-60-90 on April 16
PGR:	Mepex (12 oz/A) on July 21 just before a rain and again July 25
Insecticide:	Decis 1.5 EC (2 oz/A) on July 25
Harvest:	Sept. 30, 2003

TEST 1

Jan-20-04 (03COTTRC)

AOV Means Table

University of Tennessee

Terraclor vs Other Treatments for Seedling Disease Control 2003					
Trial ID: 03COTTRC		Investigator:			
Location: Madison Co.		Study Dir.: Dr. Melvin Newman			
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Rating Data Type		COUPLA	COUPLA	YIELD	YIELD
Rating Unit		pl/60'	pl/60'	# lint/A	# lint/A
Rating Date		May-29-03	May-29-03	Sep-30-03	Sep-30-03
Pest Stage at Eval		Inoc.	Uninoc.	Inoc.	Uninoc.
Pest Stage Scale				rep 2-4	rep 2-4
PRM Data Type				T2	T4
# Subsamples, Dec.				1	1
Trt Treatment	Rate				
No. Name	Rate Unit	2	4	11	12
1 UTC		43 c	81 a	999.3 b	1327.4 a
2 Terraclor	10 lb/a	87 a	90 a	1401.9 a	1428.3 a
3 Terraclor	6 pt/a	87 a	97 a	1379.4 a	1445.9 a
4 Quadris	5.5 oz/a	85 a	92 a	1300.9 a	1418.7 a
5 Rovral	7 oz/a	65 b	99 a	1255.9 a	1415.5 a
6 System 3	12 oz wt/cwt	63 b	87 a	1211.0 a	1447.5 a
7 Demosan	3 pt/a	76 ab	88 a	1270.4 a	1397.8 a
LSD (P=.05)		11.7	15.6	147.53	185.98
Grand Mean		72.04	90.36	1259.83	1411.57

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T2 = [9]*.397688
Column 4: T4 = [10]*.396992

TEST 2

Jan-20-04 (03COTTSX)

AOV Means Table

University of Tennessee

Efficacy of TSX for Cotton Seedling Disease Control 2003					
Trial ID: 03COTTSX		Investigator:			
Location: Madison Co.		Study Dir.: Dr. Melvin Newman			
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Rating Data Type		COUPLA	COUPLA	YIELD	YIELD
Rating Unit		pl/60'	pl/60'	# lint/A	# lint/A
Rating Date		May-29-03	May-29-03	Sep-30-03	Sep-30-03
Pest Stage at Eval		Inoc.	Uninoc.	Inoc.	Uninoc.
PRM Data Type				T3	T4
# Subsamples, Dec.				1	1
Trt Treatment	Rate				
No. Name	Rate Unit	2	4	9	10
1 UTC		53 bc	71 b	1120.2 a	1293.1 a
2 TSX	10 lb/a	92 a	98 a	1308.9 a	1325.8 a
3 TSX	6 pt/a	87 a	88 a	1288.8 a	1303.6 a
4 Ridomil Gold PC	10 lb/a	76 a	94 a	1280.6 a	1363.2 a
5 Quadris	5.5 fl oz/a	87 a	95 a	1323.0 a	1366.7 a
6 Delta-Coat AD	11.75 fl oz/cwt	72 a	80 ab	1303.0 a	1279.0 a
7 BioYield	0.5 fl oz/cwt	39 c	67 b	949.2 b	1266.2 a
8 BioYield	5 fl oz/a	57 b	94 a	1172.1 a	1404.1 a
LSD (P=.05)		14.6	13.8	151.27	123.29
Grand Mean		70.22	85.81	1218.22	1325.23

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T3 = [7]*.389805
Column 4: T4 = [8]*.386494

TEST 3

Jan-20-04 (03COTDEM)

AOV Means Table

University of Tennessee

Demosan In-Furrow Spray 2003					
Trial ID: 03COTDEM		Investigator:			
Location: Madison Co.		Study Dir.: Dr. Melvin Newman			
Crop Code	GOSHI		GOSHI		GOSHI
Rating Data Type	COUPLA		COUPLA		YIELD
Rating Unit	pl/60'		pl/60'		# lint/A
Rating Date	May-29-03		May-29-03		Sep-30-03
Pest Stage at Eval	Inoc.		Uninoc.		Uninoc.
Pest Stage Scale					rep 2-4
PRM Data Type					T3
# Subsamples, Dec.					T4
Trt Treatment	Rate				
No. Name	Rate Unit	2	4	11	12
1 UTC		51 c	81 a	1022 b	1441 a
2 Demosan	1 pt/a	62 bc	85 a	1147 ab	1411 a
3 Demosan	1 pt/a	70 abc	86 a	1320 a	1553 a
Ridomil Gold	1 oz/a				
4 Demosan	2 pt/a	75 ab	101 a	1230 ab	1491 a
5 Demosan	2 pt/a	88 a	94 a	1346 a	1483 a
Ridomil Gold	1 oz/a				
6 Demosan	3 pt/a	89 a	95 a	1376 a	1585 a
7 Demosan	3 pt/a	86 a	85 a	1347 a	1411 a
Ridomil Gold	1 oz/a				
8 Quadris	6 oz/a	93 a	102 a	1357 a	1460 a
Ridomil Gold	1 oz/a				
LSD (P=.05)		16.4	13.1	174.0	142.0
Grand Mean		76.63	91.13	1268.08	1479.15

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T3 = [9]*.392082
Column 4: T4 = [10]*.395664

TEST 4

Jan-20-04 (03COTIFF)

AOV Means Table

University of Tennessee

Cotton In-furrow Fungicide 2003					
Trial ID: 03COTIFF		Investigator: Walt Bachman			
Location: Madison Co.		Study Dir.: Dr. Melvin Newman			
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Part Rated				6'x30'	6'x30'
Rating Data Type		COUPLA	COUPLA	YIELD	YIELD
Rating Unit		pl/60'	pl/60'	# lint/A	# lint/A
Rating Date		May-29-03	May-29-03	Sep-30-03	Sep-30-03
Pest Stage at Eval		Inoc.	Uninoc.	Inoc.	Uninoc.
Pest Stage Scale				rep 2-4	rep 2-4
PRM Data Type				T3	T4
# Subsamples, Dec.					
Trt Treatment	Rate				
No. Name	Rate Unit				
1 UTC		3	6	13	14
3 Ridomil Gold PC	8.95 lb/a	43 c	81 a	943 c	1492 a
4 Ridomil Gold	1.2 oz/a	95 ab	109 a	1439 a	1615 a
5 Ridomil Gold	1.75 oz/a	71 b	101 a	1374 ab	1492 a
6 Quadris	6 oz/a	51 c	82 a	1085 bc	1489 a
7 Quadris	8.7 oz/a	86 ab	94 a	1312 ab	1594 a
8 Ridomil Gold	1.2 oz/a	84 ab	98 a	1331 ab	1604 a
Quadris	6 oz/a	89 ab	96 a	1379 ab	1539 a
9 Ridomil Gold	1.75 oz/a	99 a	105 a	1444 a	1582 a
Quadris	8.7 oz/a				
10 A 13836	4.6 oz/a	104 a	106 a	1417 a	1652 a
11 A 13836	6.9 oz/a	105 a	103 a	1414 a	1566 a
LSD (P=.05)		16.4	16.6	211.6	242.4
Grand Mean		79.11	96.25	1283.85	1550.32

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T3 = [10]*.375286

Column 4: T4 = [12]*.395709

TEST 5

Jan-20-04 (03COTSTG)

AOV Means Table

University of Tennessee

Fungicide Seed Treatment 2003					
Trial ID: 03COTSTG		Investigator:			
Location: Madison Co.		Study Dir.: Dr. Melvin Newman			
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Rating Data Type		COUPLA	COUPLA	YIELD	YIELD
Rating Unit		pl/60'	pl/60'	# lint/A	# lint/A
Rating Date		May-29-03	May-29-03	Sep-30-03	Sep-30-03
Pest Stage at Eval		Inoc.	Uninoc.	Inoc.	Uninoc.
PRM Data Type				T3	T4
# Subsamples, Dec.				1	1
Trt Treatment	Rate				
No. Name	Rate Unit	2	4	9	10
1 UTC		90 b	151 a	1254.7 a	1404.2 a
2 RTU Baytan-Thiram	3.0 fl oz/cwt	94 b	148 a	1212.8 a	1368.2 a
Allegiance	0.75 fl oz/cwt				
3 RTU Baytan-Thiram	3.0 fl oz/cwt	121 ab	149 a	1288.9 a	1414.6 a
Allegiance	0.75 fl oz/cwt				
Protege XT	0.6 oz wt/cwt				
Kodiak Conc.	0.25 oz wt/cwt				
4 RTU Baytan-Thiram	3.0 fl oz/cwt	119 ab	147 a	1250.3 a	1396.0 a
Allegiance	0.75 fl oz/cwt				
Cotguard	9.1 fl oz/cwt				
Kodiak FL	0.5 fl oz/cwt				
5 RTU Baytan-Thiram	3.0 fl oz/cwt	109 ab	146 a	1286.7 a	1487.8 a
Allegiance	0.75 fl oz/cwt				
RTU Vitavax-Thiram	12 fl oz/cwt				
Allegiance	0.75 fl oz/cwt				
Kodiak FL	0.5 fl oz/cwt				
6 RTU Baytan-Thiram	3.0 fl oz/cwt	127 a	157 a	1285.6 a	1412.3 a
Allegiance	0.75 fl oz/cwt				
Delta Coat	12.8 fl oz/cwt				
7 RTU Baytan-Thiram	3.0 fl oz/cwt	121 ab	153 a	1247.0 a	1478.5 a
Allegiance	0.75 fl oz/cwt				
Protege FL	0.4 fl oz/cwt				
Baytan 30	0.25 fl oz/cwt				
Allegiance	0.75 fl oz/cwt				
Kodiak FL	0.5 fl oz/cwt				
LSD (P=.05)		21.3	17.4	115.84	124.98
Grand Mean		111.39	150.04	1260.86	1423.08

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T3 = [7]*.364802

Column 4: T4 = [8]*.383942

TEST 6

Jan-20-04 (03COTSTS)

AOV Means Table

University of Tennessee

Cotton Seed Treatment Fungicide 2003				
Trial ID: 03COTSTS		Investigator:		
Location: Madison Co.		Study Dir.: Dr. Melvin Newman		
Crop Code		GOSHI	GOSHI	GOSHI
Part Rated				
Rating Data Type		COUPLA	COUPLA	GOSHI 6'x30'
Rating Unit		pl/60'	pl/60'	YIELD
Rating Date		May-29-03	May-29-03	# lint/A
Pest Stage at Eval		Inoc.	Uninoc.	# lint/A
PRM Data Type				Inoc.
# Subsamples, Dec.				T3
				T4
				1
				1
Trt Treatment	Rate			
No. Name	Rate Unit	3	6	11
1 UTC		38 c	75 b	1004.7 b
2 Dynasty	11.34 g ai/cwt	121 a	141 a	1445.2 a
3 Dynasty	11.34 g ai/cwt	114 a	154 a	1480.4 a
Systhane WSP	9.52 g ai/cwt			1633.9 a
4 Dynasty	14.51 g ai/cwt	115 a	148 a	1414.5 a
5 Dynasty	14.51 g ai/cwt	115 a	148 a	1432.7 a
Systhane WSP	9.52 g ai/cwt			1550.1 a
6 Apron XL	3.4 g ai/cwt	80 b	143 a	1442.9 a
Maxim	1.13 g ai/cwt			1574.1 a
Systhane WSP	9.52 g ai/cwt			
7 RTU-Baytan-Thiram	18.59 g ai/cwt	96 ab	132 a	1383.9 a
Allegiance LS	6.8 g ai/cwt			1569.3 a
8 Allegiance FL	6.8 g ai/cwt	100 ab	142 a	1357.7 a
Baytan 30	4.54 g ai/cwt			1508.2 a
Ascend 30	8.62 g ai/cwt			
9 Allegiance FL	6.8 g ai/cwt	117 a	155 a	1469.0 a
RTU-Baytan-Thiram	18.59 g ai/cwt			1576.5 a
Delta-Coat AD	136 g ai/cwt			
10 Allegiance FL	6.8 g ai/cwt	103 ab	154 a	1433.8 a
RTU-Baytan-Thiram	18.59 g ai/cwt			1623.2 a
Protege XT	10.43 g ai/cwt			
11 Allegiance FL	6.8 g ai/cwt	124 a	146 a	1530.3 a
Baytan 30	4.54 g ai/cwt			1568.1 a
Thiram 42-S	14.1 g ai/cwt			
Protege FL	3.63 g ai/cwt			
Allegiance FL	6.8 g ai/cwt			
LSD (P=.05)		22.4	17.7	176.32
Grand Mean		102.11	139.59	1399.55
				191.98
				1566.68

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 3: T3 = [8]*.375286
Column 4: T4 = [10]*.395709

SEED SPECIFIC IN-FURROW FUNGICIDE TEST

The purpose of the seed specific in-furrow spray (intermittent) test was to compare a continuous in-furrow spray with that of a seed specific spray. Terraclor Super-X 2.5EC (quintozene/ etridiazole) was used at 48 and 64 fl. oz/A for the continuous application and 24 and 32 fl. oz/A for the intermittent. To increase the incidence of seedling disease, each treatment was tested with and without seedling disease organisms (inoculum). Where inoculum was added to the furrow, all TSX rates, whether continuous or intermittent, were significantly better than the untreated in both yield and stand count. This means that the lower TSX rates, using the intermittent spray, were just as effective as the higher rates. This would save at least 50 percent of the amount of fungicide needed for seedling disease control.

Although yields were not significantly different from the untreated where inoculum was not used, the stand counts were higher for all rates of TSX. This also indicates that the intermittent applications were just as good as the continuous spray.

SEED TREATMENT AND SEED SPECIFIC IN-FURROW SPRAYER PLOT DATA AND NATIONAL COTTON SEED TREATMENT TEST

Plot Description (WTES)

Planted:	SSF: April 28, 2003 NST: April 15, 2003
Varieties:	SSF: SG 215 B/RR with Cruiser seed treatment NST: DP 451 BR with Cruiser seed treatment
Plot Design:	SSF: Randomized complete block; plots 6.33' x 30'; five replications NST: Randomized complete block; plots 3' x 20'; ten replications
Pesticides:	NST: Temik (3.5 lb/A) in-furrow; Cotoran (1 qt/A), Prowl (1 qt/A) broadcast preemergence
Soil Temp:	SSF: 82 ⁰ F @ planting NST: 71 ⁰ F @ planting
Seeding Rate:	SSF: 3 seeds/ft on 38" row-spacing NST: 5 seeds/ft. on 36" row-spacing
Equipment:	SSF: 2-row planter + picker NST: Case IH 900 four-row planter
Inoculation:	SSF: Rhizoctonia and Pythium (15 ml/row)
Tillage:	Conventional
Crop History:	SSF: soybean/wheat for many years NST: cotton for many years
Defoliant:	Finish 6 Pro (24 oz/A) + Def 6 (5 oz/A) on Sept. 11
Harvest:	SSF: Sept. 29 NST: Sept. 22

SEED SPECIFIC IN-FURROW FUNGICIDE TEST

Jan-20-04 (03COTSSF)

AOV Means Table

University of Tennessee

Seed Specific In-Furrow Fungicide 2003			
Trial ID: 03COTSSF		Investigator: Newman	
Location: WTES		Study Dir.: Dr. Melvin Newman	
Crop Code		GOSHI COUPLA	GOSHI Yield
Rating Data Type			# lint/A
Rating Unit			
Rating Date		Jun-20-03	Sep-30-03
PRM Data Type			T2
# Subsamples, Dec.			1
Trt Treatment	Rate		
No. Name	Rate Unit	2	5
1 UTC		113 b	1041.7 a
2 UTC (w/inoculum)		30 c	629.7 b
3 TSX (continuous)	48 fl oz/a	137 ab	1090.6 a
4 TSX (continuous w/inoc.)	48 fl oz/a	144 a	1082.9 a
5 TSX (intermittent)	24 fl oz/a	142 a	1074.9 a
6 TSX (intermittent w/inoc)	24 fl oz/a	124 ab	1026.5 a
7 TSX (continuous)	64 fl oz/a	139 a	1005.9 a
8 TSX (continuous w/inoc.)	64 fl oz/a	135 ab	1066.8 a
9 TSX (intermittent)	32 fl oz/a	135 ab	1077.5 a
10 TSX (intermittent w/inoc)	32 fl oz/a	130 ab	989.0 a
LSD (P=.05)		16.8	135.94
Grand Mean		122.95	1008.55

Means followed by same letter do not significantly differ
(P=.05, Student-Newman-Keuls)

Column 2: T2 = [4]*.390488

REPORT OF THE COTTONSEED TREATMENT COMMITTEE FOR 2003

Compiled by C. S. Rothrock and S. A. Winters

University of Arkansas, Fayetteville AR

Introduction

The 2003 National Cottonseed Treatment Program evaluated cotton seedling survival for a number of fungicide seed treatment combinations over diverse environmental conditions and levels and types of cotton seedling pathogens. Fourteen fungicide seed treatments were nominated by chemical industry representatives for evaluation in the 2003 National Cottonseed Treatment Program. A standard fungicide treatment, Vitavax-PCNB + Allegiance, and a nontreated control were included to assess efficacy of the nominations and seedling disease pressure. In addition, the fungicide treatments Allegiance or PCNB were included to aid in determining the importance of *Pythium* species or *Rhizoctonia solani*, respectively. Disease ratings and pathogen isolations for seedlings and soil populations of selected soilborne pathogens were conducted by collecting seedlings and soil from the nontreated control plots at each location. Soil temperature and water and plant development data also were collected for sites for the 2003 National Cottonseed Treatment Program.

Materials and Methods

Fungicide treatment

Acid-delinted neutralized seed of *Gossypium hirsutum* L., 'DP 451 B/RR' or 'PM 2326 RR', were provided by Delta and Pine Land Company, Scott, MS. DP 451 B/RR was planted at all locations, with the exception of locations in Oklahoma and Texas, where the cultivar PM 2326 RR was planted. Fungicide treatments and dye (Color Coat Red, Syngenta Inc.) were mixed with water and applied to seed at a rate of 2.5%, RTU-PCNB 2.6%, (v/w). Water and dye also were applied to the nontreated seed treatment at the same rate. Treatments were applied to the cottonseed while the seed tumbled in a Hege 11 Liquid Seed Treater. When two or more fungicides were applied, the fungicides were mixed and applied in a single application. The technical information for the fungicides is given in Table 1. Seed germination of all treatments for DP 451 B/RR was evaluated by the Mississippi State Seed Testing Laboratory (Mississippi State, MS). Seed germination of treatments for PM 2326 RR was evaluated by rolling seed in moistened germination paper and incubating at 30°C.

Field experiments

Nineteen field experiments were conducted by 15 cooperators across the U.S. Cotton Belt (Table 2). Each location utilized a randomized complete block experimental design, with the number of replications ranging from 4 to 10. The stand counts used in the analyses were taken from 24 to 45 days after planting, average 30 days, depending on the location. A soil sample and seedlings from plots containing nontreated seed were taken from 25 to 45 days after planting, average 31 days, depending on the location. Soil and seedlings were placed in insulated packages with refrigerated cool packs and mailed overnight to the University of Arkansas for processing. A subsample of soil was sent to T. L. Kirkpatrick, Southeast Research and Extension Center, Hope, Arkansas, for determination of populations of plant parasitic nematodes. Soil temperature and moisture was monitored by burying a temperature sensor and a Watermark soil moisture sensor connected to a data logger (Spectrum Technologies, Inc., Plainfield, IL) 4" deep at planting.

Seedlings were evaluated for growth by recording the number of nodes from five arbitrarily selected seedlings and then the aboveground portions of all seedlings were removed and discarded. An average of 48 seedlings per location were then rinsed for 20 minutes in running tap water and rated for disease symptoms. The hypocotyl disease severity index was 1=no symptoms, 2=few pinpoint lesions or diffuse discolored areas, 3=distinct necrotic lesion, 4=girdling lesion, and 5=seedling dead. The root disease index was 1=no symptoms, 2=1-10% of the root system discolored, 3=11-25% of the root system discolored, 4=26-50% of the root system discolored, and 5>50% of the root system discolored. Seedlings were surface disinfested by immersion for 1.5 min in 0.5% NaClO, blotted dry in a paper towel, and plated on water agar (1.3%) amended with 10 mg and 250 mg of the antibiotics rifampicin and ampicillin, respectively, and 0.5 Fl of the miticide Danitol (Valent Chemical Co.) per liter. Resulting colonies were transferred to PDA and identified to genus. Seedlings were subsequently transferred to the Thielaviopsis selective

medium TB-CEN (Specht and Griffin, 1985), which was modified by adding Penicillin G (60 mg/L), to determine isolation frequency for *Thielaviopsis basicola*. An additional set of seedlings for 15 sites, average 47 seedlings (range 7 to 50), was plated on the selective medium P₅ARP (Jeffers and Martin, 1986) following a 20 minute water rinse as another method to examine the isolation frequency for *Pythium* species.

Soil samples were assayed for populations of *Rhizoctonia* species by using the multiple-pellet soil method (Henis et al., 1978), and *Rhizoctonia* populations were quantified on a modified Ko and Hora medium (Ko and Hora, 1971). Soil populations of *Pythium* spp. and *T. basicola* were detected by diluting 25 g of soil in 0.2% water agar to a total volume of 250 ml and placing on a wrist action shaker for 20 minutes. *Pythium* spp. were quantified by the spread-plate method on the selective medium P₅ARP, and *T. basicola* populations were quantified using the pour-plate method with the selective medium TB-CEN.

Statistics

Data were analyzed by the GLM procedure using SAS (SAS Institute Inc., Cary NC). Percent stand was analyzed over locations and by location. Treatment means were separated by using a protected LSD at $P=0.05$. The Pearson-product correlation method was used to examine the relationship among percent stand, plant development, disease, pathogen isolation frequency, and soil populations over locations.

Results and Discussion

After the seed were treated, seed germination for the cultivar DP 451 B/RR over all treatments averaged 90%, with an average cool test germination of 86%. Seed germination for the cultivar PM 2326 RR averaged 88% and did not differ significantly among treatments.

For the 2003 National Cottonseed Treatment Program, 17 of 19 sites had data reported. For these 17 locations, there was a significant location, treatment, and location x treatment effect (Table 3), indicating that the treatment response was dependent on the environmental or pathogen pressures for a particular location. A significant difference among treatments was found for 8 of the 17 locations (Table 4). In all of these experiments, at least one of the fungicide treatments performed better than the nontreated control. The Allegiance treatment increased stands compared to the nontreated control in 2 of the 8 experiments having a significant response compared to the nontreated control (TN and TX4), indicating the importance of *Pythium* spp. in stand establishment at these sites. In 2 of these 8 experiments (LA1 and LA2), the PCNB treatment increased stands over the nontreated control, indicating the importance of *R. solani* in stand establishment at these sites. The Vitavax-PCNB + Allegiance standard fungicide treatment increased stands compared to the nontreated control in 6 of these 8 experiments (AR1, CA, LA1, LA2, TN and TX2). Nominated treatments increased stands over the nontreated control for 25% of the sites (2 of 8 sites) to 88% of the sites (7 of 8 sites) depending on the treatment. Treatments giving increases in stand compared to the nontreated control at 7 of the 8 sites where a stand response was found were Apron XL + Nu-Flow M + Nu-Flow ND, Dynasty + Systhane 40 WP, Apron XL + WECO 0257 + Nu-Flow ND, Baytan 30 + Argent 30 + Allegiance LS, RTU Baytan-Thiram + Allegiance FL, Apron XL + Nu-Flow M + Nusan 30 + WECO 0257, L0020 + L0288 + L0189, and L1194 + L0030 + Allegiance LS. At 2 of the 8 sites where a response was found (TN and TX4), some of the nominated fungicide treatments performed significantly better than the historical standard fungicide treatment, Vitavax-PCNB + Allegiance. The number of fungicide treatments significantly increasing stands over the nontreated control ranged from 1 of the 14 nominated treatments for the GA site to all of the nominated treatments tested for the LA1 site. The mean stand for a location was not related to locations where stands were increased by fungicide treatments.

Plant development at the time seedlings were sampled ranged from 2.0 to 4.6 nodes, average 3.5 nodes. Hypocotyl disease indices ranged from 1.7 at the TX5 site to 3.2 at the AR3 site, average 2.3 (Table 5). Root disease indices ranged from 1.6 at MS2 to 4.2 at TX2, average 2.8. *R. solani* was isolated from seedlings from the nontreated plots at 14 of 16 locations (Table 5). *R. solani* was isolated from 20% or greater of the seedlings at 6 locations (AL, AR2, AR3, CA, MS1, and MS2). *Pythium* spp. were isolated from seedlings at 14 of 16 locations (Table 5). Isolation frequencies for *Pythium* spp. were 20% or greater for 2 sites (OK1 and TX3). Isolation frequencies of *Pythium* spp. were increased dramatically by plating roots without surface disinfection on the selective medium P₅ARP, with all

sites with seedlings plated on P₅ARP having 20% or greater recovery of *Pythium* spp. (Table 5). *T. basicola* was isolated from seedlings at 6 of the 16 locations on the modified TB-CEN medium (Table 5). *T. basicola* was isolated from over 30% of the seedlings for the AL, AR3, CA, and TX2 sites. *Fusarium* spp. were isolated from seedlings at all locations (Table 5). Isolation frequencies for *Fusarium* spp. ranged from 62% to 100%.

Soil populations of *R. solani* were detected at 10 of the 17 sites, range 2.4 to 24.0 CFU/100 g of soil (Table 6). *Pythium* spp. were detected in soils at 15 of the 17 sites, range 3 to 740 CFU/g of soil. *T. basicola* was detected in 6 of the 17 soils assayed, range 4 to 117 CFU/g soil. Nematode counts were conducted for 12 of the 17 sites. The root-knot nematode was detected for the VA site. The reniform nematode was detected for the MS1 and MS2 sites.

The percent stand for the nontreated seed treatment for the locations was negatively correlated with *Pythium* population, -0.71 ($P=0.001$). The hypocotyl disease index and the root disease index were positively correlated with isolation of *T. basicola* on TB-CEN, 0.73 ($P=0.001$) and 0.54 ($P=0.03$), respectively. Isolation frequency of *Pythium* spp. on water agar and P₅ARP were positively correlated, 0.72 ($P=0.009$)

Conclusions

The results from the 17 locations where data was collected for the 2003 National Cottonseed Treatment Program found that seed treatment fungicides improved stands of cotton compared to the nontreated control for 47% of the sites. All of the nominated fungicide combinations improved stands over nontreated seed at some of the sites where a response was found, with 8 of the 14 nominations increasing stands at 7 of the 8 sites where a response was observed. The percent stand for the nontreated seed treatment for the locations was negatively correlated with *Pythium* population and Allegiance improved stand for 2 of the locations. PCNB increased stands at 2 of the locations, indicating the importance of *R. solani* for these sites. The hypocotyl disease index and the root disease index were positively correlated with isolation of *T. basicola* on TB-CEN.

Disclaimer

This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation by the University of Arkansas, Department of Plant Pathology, nor does it imply registration under FIFRA.

References

- Henis, Y., A. Ghaffar, R. Baker, and S. L. Gillespie. 1978. A new pellet soil-sampler and its use for the study of populations dynamics of *Rhizoctonia solani* in soil. *Phytopathology* 68:371-376.
- Jeffers, S. N., and S. B. Martin. 1986. Comparison of two media selective for *Phytophthora* and *Pythium* species. *Plant Dis.* 70:1038-1040.
- Ko, W., and F. K. Hora. 1971. A selective medium for the quantitative determination of *Rhizoctonia solani* in soil. *Phytopathology* 61:707-710.
- Specht, L. P., and G. J. Griffin. 1985. A selective medium for enumerating low populations of *Thielaviopsis basicola*. *Can. J. Plant Pathol.* 7:438-441.

Table 1. Fungicides, formulations and the active ingredients included in the 2003 National Cottonseed Treatment Program.

Common or registered name ¹	Formulation	Active ingredient (%)
ALLEGIANCE FL (Metalaxyl)	Flowable	28.35% <i>N</i> -(2,6-dimethylphenyl)- <i>N</i> -(methoxyacetyl) alanine methyl ester
ALLEGIANCE LS (Metalaxyl)	Liquid	17.7% <i>N</i> -(2,6-dimethylphenyl)- <i>N</i> -(methoxyacetyl) alanine methyl ester
APRON XL TL (Mefenoxam)	Liquid	33.3% (R)-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester
ARGENT 30 FL (TCMTB)	Liquid	30% 2-(Thiocyanomethylthio) benzothiazole
BAYTAN 30 (Triadimenol)	Flowable	30% Beta-(4-Chlorophenoxy)-alpha-(1,1-dimethylethyl)-1 <i>H</i> -1,2,4-triazole-1-ethanol
DYNASTY (Azoxystrobin, Fludioxonil, Mefenoxam)	Flowable	6.64% Methyl (E)-2-{2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]phenyl}-3-methoxyacrylate, 1.11% 1 <i>H</i> -Pyrrole-3-carbonitrile, 4-(2,2-difluoro-1,3-benzodioxol-4-yl) 3.32% (R)-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester
HM 0233		Helena Chemical Company
HM 0301		Helena Chemical Company
L0020		Gustafson LLC
L0030		Gustafson LLC
L0189		Gustafson LLC
L0288		Gustafson LLC
L1194		Gustafson LLC
L1226		Gustafson LLC
NU-FLOW M HF (Myclobutanil)	Liquid	25% A-butyl-a-(4-chlorophenyl)-1 <i>H</i> -1,2,4-triazole-1-propanenitrile
NU-FLOW ND (Chloroneb, TCMTB)	Flowable	23.5% 1,4-Dichloro-2, 5-dimethoxy-benzene, 9% 2-(Thiocyanomethylthio) benzothiazole
NUSAN 30 EC (TCMTB)	Liquid	30% 2-(Thiocyanomethylthio) benzothiazole
RTU BAYTAN-Thiram	Flowable	5% Beta-(4-Chlorophenoxy)-alpha-(1,1-dimethylethyl)-1 <i>H</i> -1,2,4-triazole-1-ethanol, 15.3% Tetramethylthiuram disulfide
RTU PCNB	Flowable	24% Pentachloronitrobenzene
SYSTANE 40WP (Myclobutanil)	Wettable powder	40% A-butyl-a-(4-chlorophenyl)-1 <i>H</i> -1,2,4-triazole-1-propanenitrile
VITAVAX (Carboxin) - PCNB	Flowable	17% 5,6-dihydro-2-methyl-N-phenyl-1,4-oxathiin-3-carboxamide, 17% Pentachloronitrobenzene
WECO 0257		Wilbur-Ellis Company

¹ Registered chemical name, all capital letters.

Table 2. List of cooperators and procedures used in the 2003 National Cottonseed Treatment Program.

Cooperator	Location		Date			Reps.	Row length	Seed	Soil
			Planted	Sampled	Counted		counted		
K. McLean	Auburn, AL	(AL)	4/14	5/29	5/29	5	25	125	21(17)
T. L. Kirkpatrick	Hope, AR	(AR1)	4/29	5/28	5/28	5	42	189	24(21)
F. Bourland	Keiser, AR	(AR2)	4/15	5/15	5/15	6	25	100	19(17)
C. S. Rothrock	Clarkedale, AR	(AR3)	4/30	5/28	5/28	8	50	250	21(19)
R. Hutmacher	Shafer, CA	(CA)	4/7	5/13	5/13	8	25	150	20(14)
K. W. Seebold Jr.	Tifton, GA	(GA)	4/14	5/15	5/13	5	25	100	22(17)
P. D. Colyer	Bossier City, LA	(LA1)	4/11	5/12	5/9	5	25	100	19(13)
B. Padgett	Winnsboro, LA	(LA2)	4/14	5/14	5/12	4	25	100	20(15)
W. E. Batson Jr.	Mississippi State, MS	(MS1)	4/14	5/19	5/14	4	83	240	22(16)
G. L. Sciumbato	Stoneville, MS	(MS2)	4/28	5/23	5/22	4	40	224	24(20)
L. Verhalen	Tipton, OK	(OK1)	5/1	6/4	6/4	4	20	100	22(19)
M.A. Newman	Jackson, TN	(TN)	4/15	5/15	5/15	10	20	100	18(14)
H. W. Kaufman	Lubbock, TX	(TX2)	5/2	5/30	5/30	4	35.5	178	22(18)
T. S. Isakeit	Victoria, TX	(TX3)	3/31	4/28	4/28	4	17	100	19(13)
	Beaumont, TX	(TX4)	4/2	4/29	4/29	4	20	100	20(15)
	College Station, TX	(TX5)	4/3	5/1	5/1	4	20	100	21(19)
P. M. Phipps	Suffolk, VA	(VA)	4/15	5/14	5/14	4	60	180	16(12)

¹Mean (Minimum) soil temperature; 3-day average following planting.

Table 3. Mean squares for combined analysis of variance across locations, 2003 National Cottonseed Treatment Program.

Source	Degrees of freedom	Mean squares
Location	16	34668 ^{**1}
Replication(Location)	71	1369 ^{**}
Treatment	17	1113 ^{**}
Location*treatment	272	185 ^{**}
Error	1204	88

¹** = significant *F*-test, *P*=0.0001.

Table 4. Cotton seedling stands for locations of the 2003 National Cottonseed Treatment Program.

Treatment	Rate (oz/cwt)	Plant stand (%)																		
		AL	AR1	AR2	AR3	CA	GA	LA1	LA2	MS1	MS2	OK1	TN	TX2	TX3	TX4	TX5	VA	Mean	
Apron XL + Nu-Flow M + Nu-Flow ND	1.0 + 2.5 + 14.5	71	84	74	74	84	87	60	81	31	64	70	77	85	75	37	15	42	65	
Dynasty + Systhane 40 WP	3.1 + 0.84	65	76	74	67	78	87	65	82	32	58	80	72	81	80	41	15	41	64	
Apron XL + WECO 0257 + Nu-Flow ND	1.0 + 0.63 + 7.5	62	79	74	79	86	89	46	86	36	60	69	78	80	75	34	10	41	64	
Baytan 30 + Argent 30 + Allegiance LS	0.5 + 1.5 + 1.2	75	79	73	70	80	84	50	83	36	57	71	82	83	63	39	7	39	63	
Dynasty	3.1	64	72	73	70	75	86	64	80	30	55	75	74	87	67	41	16	40	63	
Apron XL + Nu-Flow M + Nusan 30	1.0 + 2.5 + 2.0	68	73 ¹	74	74	82	86	67	85	33	62	72	71	79	69	25	10	40	63	
RTU Baytan-Thiram + Allegiance FL	3.0 + 0.75	62	79	70	73	80	85	56	80	32	59	76	76	85	72	33	8	41	63	
Apron XL + Nu-Flow M + Nusan 30 + WECO 0257	1.0 + 2.5 + 2.0 + 0.63	73	78	75	71	80	85	52	82	26	61	69	74	82	69	39	6	42	63	
Dynasty	3.9	70	79	67	73	80	85	49	74	34	67	68	75	79	75	40	8	38	62	
L0020 + L0288 + L0189	0.75 + 0.2 + 3.0	57	79	69	71	79	83	68	78	37	66	68	80	81	66	34	9	38	62	
Vitavax-PCNB + Allegiance FL	6.0 + 0.75	61	80	70	73	82	86	60	80	34	70	66	73	82	74	20	6	41	62	
L1194 + L0030 + Allegiance LS	6.1 + 1.5 + 1.2	61	84	72	73	84	85	59	82	23	51	72	77	81	62	42	11	38	62	
L1226 + L0030 + Allegiance LS	0.64 + 1.5 + 1.2	59	75	73	74	77 ¹	82	53	73	37	46	74	77	83	69	29	15	40	61	
RTU PCNB	14.5	63	66	67	67	69	88	66	77	30	61	61	53	79	77	12	23	40	59	
HM 0233 + HM 0301	1.5+12	60	66	77	69	71	87	55	79	34	52	74	47	80	74	7	15	43	58	
HM 0233	1.5	68	67	78	67	73	72	51	77	31	59	55	44	79	69	3	10	44	56	
Allegiance FL	1.5	56	66	64	66	67	75	36	74	25	53	65	68	78	62	26	4	35	54	
Nontreated	---	65	63	65	68	66	82	23	67	31	40	62	55	74	66	7	12	37	52	
Location average		64	75	72	71	77	84	54	79	32	58	69	70	81	70	28	11	40	63	
Coefficient of Variation (%)		19	11	11	12	15	7	23	8	22	25	15	13	6	16	33	80	10	15	
LSD (P=0.05)		NS-10.0		NS	NS	11.1	7.0	15.7		9.0	NS	NS	NS	7.8	6.4	NS-		13.2	NS	NS

¹Treatment mean is significantly different from the nontreated control, even though the mean does not appear to be different as a result of rounding.

Table 5. Disease ratings and isolation frequency of seedling pathogen groups for the 2003 National Cottonseed Treatment Program locations.

Location	Disease Index			Isolation frequency (%) ¹			
	Nodes ²	Hyp. ³	Root ⁴	<i>Rhizoctonia solani</i>	<i>Pythium</i> spp.	<i>Thielaviopsis basicola</i>	<i>Fusarium</i> spp.
	AL	4.6	2.3	3.8	20	0 (43 ⁶)	32
AR1	- ⁵	2.0	2.3	14	8 (67)	0	90
AR2	4.0	2.1	2.0	54	8 (70)	2	75
AR3	3.8	3.2	3.9	20	18 (98)	100	86
CA	2.0	2.4	2.5	20	12 (70)	78	92
GA	4.6	2.2	3.7	14	10 (40)	0	84
LA1	4.6	2.0	2.7	2	4 (62)	0	98
LA2	4.2	2.1	2.9	6	6 (66)	0	80
MS1	4.6	2.5	2.3	24	10	2	62
MS2	4.0	2.1	1.6	56	12	0	92
OK1	-	2.4	2.3	0	34 (92)	0	78
TN	2.8	2.6	2.9	6	19 (57)	0	91
TX2	2.0	2.7	4.2	2	2 (28)	58	86
TX3	3.0	2.0	2.1	0	48 (94)	0	84
TX4	2.0	2.1	2.6	16	0	0	92
TX5	2.4	1.7	2.9	6	6	0	88
VA	-		2.4	2.9	-	-	-

¹ Isolation frequency is based on approximately 50 seedlings per location.

² Nodes based on five seedlings per location.

³ Hypocotyl index; 1=no symptoms, 2=few pinpoint lesions or diffuse discolored areas, 3=distinct necrotic lesion, 4=girdling lesion, and 5=seedling dead.

⁴ Root index; 1=no symptoms, 2=1-10% of the root system discolored, 3=11-25% of the root system discolored, 4=26-50% of the root system discolored, and 5>50% of the root system discolored.

⁵ Information not available.

⁶ Isolation frequency from P₅ARP.

Table 6. Soil populations of selected soilborne fungi from sites in the 2003 National Cottonseed Treatment Program.

Location	<i>Rhizoctonia solani</i> CFU ¹ /100g	<i>Pythium</i> spp. CFU/g	<i>Thielaviopsis basicola</i> CFU/g
AL	ND1 ²	ND2	112
AR1	4.8	130	0
AR2	ND1	15	0
AR3	2.8	99	25
CA	24.0	21	36
GA	ND1	17	0
LA1	2.7	342	0
LA2	8.1	78	0
MS1	10.6	49	0
MS2	4.7	90	4
OK1	ND1	62	0
TN	2.4	152	117
TX2	4.2	ND3	21
TX3	ND1	109	0
TX4	ND1	740	0
TX5	7.0	210	0
VA	ND1	3	0

¹ Colony forming units.

² Populations not detected in soil sample; less than approximately 1 (ND1) CFU/100 g of soil for *Rhizoctonia solani*, and 8 (ND2) or 2 (ND3) CFU/g of soil for *Pythium* spp.

BELTWIDE NEMATODE CONTROL TESTS

On May 28, 2003, near Gadsden, TN, two identical no-till tests were planted for reniform nematode control. Plots were 4 rows wide by 50 ft. long and replicated three times. One test was planted where cotton was grown the previous year, and the other test was planted in the same field where corn was the previous crop. Company-treated Fibermax 989 RR seeds were planted at a rate of five seeds/ft. with 36" row spacing. All plots received 10 lb/A Ridomil Gold PC GR. Soil samples for nematode analysis were collected April 30 (first plant date), May 28 (replant date), and October 28 (harvest date). The untreated check plots received Bidrin at the label rate on June 19. All plots were treated with Mepex on August 7 and Pix Plus @ 8 oz/A on August 14, 2003. They also were treated with DEF 8 oz/A and Finish (1 qt/A) on October 8, 2003 and again on October 16, 2003.

In these two tests, Temik 15G was applied at 5 lb/A in-furrow (IF) and side-dressed at pinhead stage (PH) at 5 lb/A. Temik was also used with two applications of Vydate at 7.5 fl. oz/A at PH and again 14 days later. Gaucho was used as a seed treatment at 8 fl. oz/cwt to control early season insects.

The first test was planted in a reniform nematode-infested field that has been in continuous cotton for many years. The second test was identical to the first except for one year of corn rotation. Although there were some numerical increases with Temik, there was no significant increase in yield for any of the treatments in either test. However, there was a 262 lb. lint/A increase in the grand mean for all treatments in favor of the test that followed one year of corn. The reniform nematode count went down for all treatments in two sampling dates from a grand average of 7,441 in the continuous cotton to 429 nematodes/pt. of soil in the test behind corn. However, by harvest, the nematode count was 6,903 nematodes/pt. of soil following corn and 6,365 nematodes/pt. of soil following cotton.

NEMATODE CONTROL PLOT DATA

Plot Description (Reniform Tests)

Planted: May 28, 2003

Varieties: **REN-1** and **REN-2:** FM 989 RR company-treated

Plot Design: **REN-1** and **REN-2:** RCB; plots 12' x 50'; three replications

Pesticides: **ALL:** Cotoran (1 qt/A), Prowl (1 qt/A), Gramoxone (1 qt/A), Karate (2 oz/A) broadcast preemergence
REN-1 and **REN-2:** Mepex (12 oz/A) on Aug. 7
ALL: Pix Plus (8 oz/A) on Aug. 14; Def 6 (8 oz/A) + Finish 6 (1 qt/A) on Oct. 8 and again on Oct. 16

Seedling Rate: 5 seeds/ft. on 36" row-spacing

Equipment: Case IH 900 four-row planter + picker

Tillage: No-till

Crop History: **REN-1** is planted after continuous cotton
REN-2 is planted after 1 year of corn

Harvest: October 28, 2003

CONTINUOUS COTTON

Jan-20-04 (03COTREN)

AOV Means Table

University of Tennessee

Beltwide Nematode Control Test 2003					
Trial ID: 03COTREN		Investigator:			
Location: Madison Co.?		Study Dir.: Dr. Melvin Newman			
Insect Code		REN 1	REN 1	REN 1	REN 1
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Part Rated		Yield			
Rating Data Type			Reniform	Reniform	Reniform
Rating Unit		# lint/A	larv/pt	larv/pt	larv/pt
Rating Date		Oct-28-03	Apr-30-03	May-28-03	Oct-28-03
Footnote Number		1			
PRM Data Type		T3			
# Subsamples, Dec.		1			
Trt Treatment	Rate				
No. Name	Rate Unit	3	4	5	6
1 Control (Bidrin)		570.8 a	7625 a	9750 a	8825 a
2 Gaucho	8 fl oz/cwt	772.0 a	6475 a	9075 a	5825 a
3 Gaucho	8 fl oz/cwt	557.7 a	7225 a	8475 a	6200 a
Temik	5 lb/a				
4 Gaucho	8 fl oz/cwt	617.1 a	6975 a	7675 a	7675 a
Temik	5 lb/a				
Temik	5 lb/a				
5 Gaucho	8 fl oz/cwt	656.9 a	7400 a	6175 a	6575 a
Temik	5 lb/a				
6 Temik	5 lb/a	648.0 a	9625 a	6275 a	6050 a
7 Temik	5 lb/a	647.5 a	6675 a	5325 a	6500 a
Temik	5 lb/a				
8 Temik	5 lb/a	599.3 a	8300 a	6000 a	3275 a
Vydate	7.5 fl oz/a				
Vydate	7.5 fl oz/a				
LSD (P=.05)		244.38	5203.7	2851.1	4499.9
Grand Mean		633.67	7537.5	7343.75	6365.63

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 1: T3 = [C2]*.386667

Footnote: REN-1 (cotton planted after cotton) REN-2 (cotton planted after corn)

COTTON AFTER ONE YEAR OF CORN ROTATION

Jan-20-04 (03COTREN)

AOV Means Table

University of Tennessee

Beltwide Nematode Control Test 2003					
Trial ID: 03COTREN		Investigator:			
Location: Madison Co.?		Study Dir.: Dr. Melvin Newman			
Insect Code		REN 2	REN 2	REN 2	REN 2
Crop Code		GOSHI	GOSHI	GOSHI	GOSHI
Part Rated		Yield			
Rating Data Type			Reniform	Reniform	Reniform
Rating Unit		# lint/A	larv/pt	larv/pt	larv/pt
Rating Date		Oct-28-03	Apr-30-03	May-28-03	Oct-28-03
Footnote Number		1			
PRM Data Type		T4			
# Subsamples, Dec.		1			
Trt Treatment	Rate				
No. Name	Rate Unit	9	10	11	12
1 Control (Bidrin)		814.0 a	550 a	400 a	7000 a
2 Gaucho	8 fl oz/cwt	822.6 a	425 a	425 a	8650 a
3 Gaucho	8 fl oz/cwt	967.0 a	525 a	225 a	10100 a
Temik	5 lb/a				
4 Gaucho	8 fl oz/cwt	884.0 a	625 a	350 a	5550 a
Temik	5 lb/a				
Temik	5 lb/a				
5 Gaucho	8 fl oz/cwt	840.3 a	600 a	500 a	6975 a
Temik	5 lb/a				
6 Temik	5 lb/a	896.1 a	650 a	275 a	5800 a
7 Temik	5 lb/a	946.2 a	300 a	450 a	4000 a
Temik	5 lb/a				
8 Temik	5 lb/a	996.8 a	275 a	300 a	7150 a
Vydate	7.5 fl oz/a				
Vydate	7.5 fl oz/a				
LSD (P=.05)		307.56	616.4	391.1	5694.0
Grand Mean		895.88	493.75	365.63	6903.13

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Column 1: T4 = [8]*.35725

Footnote: REN-1 (cotton planted after cotton) REN-2 (cotton planted after corn)

Acknowledgments

A special thanks to Chris Street, Wesley Crowder, and Wyveta Percell for their hard work in planting, caring, and harvesting the chemical control plots.

In addition, this publication would not be possible without the expertise of my secretary, Marsha Camp. Her diligence and patience are greatly appreciated.

PRECAUTIONARY STATEMENT

In order to protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user's. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

DISCLAIMER

Mention of a pesticide in this publication does not constitute a recommendation by the University of Tennessee, Department of Entomology and Plant Pathology, nor does it imply registration by EPA.

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The University of Tennessee Institute of Agriculture, U. S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service
Charles L. Norman, Dean