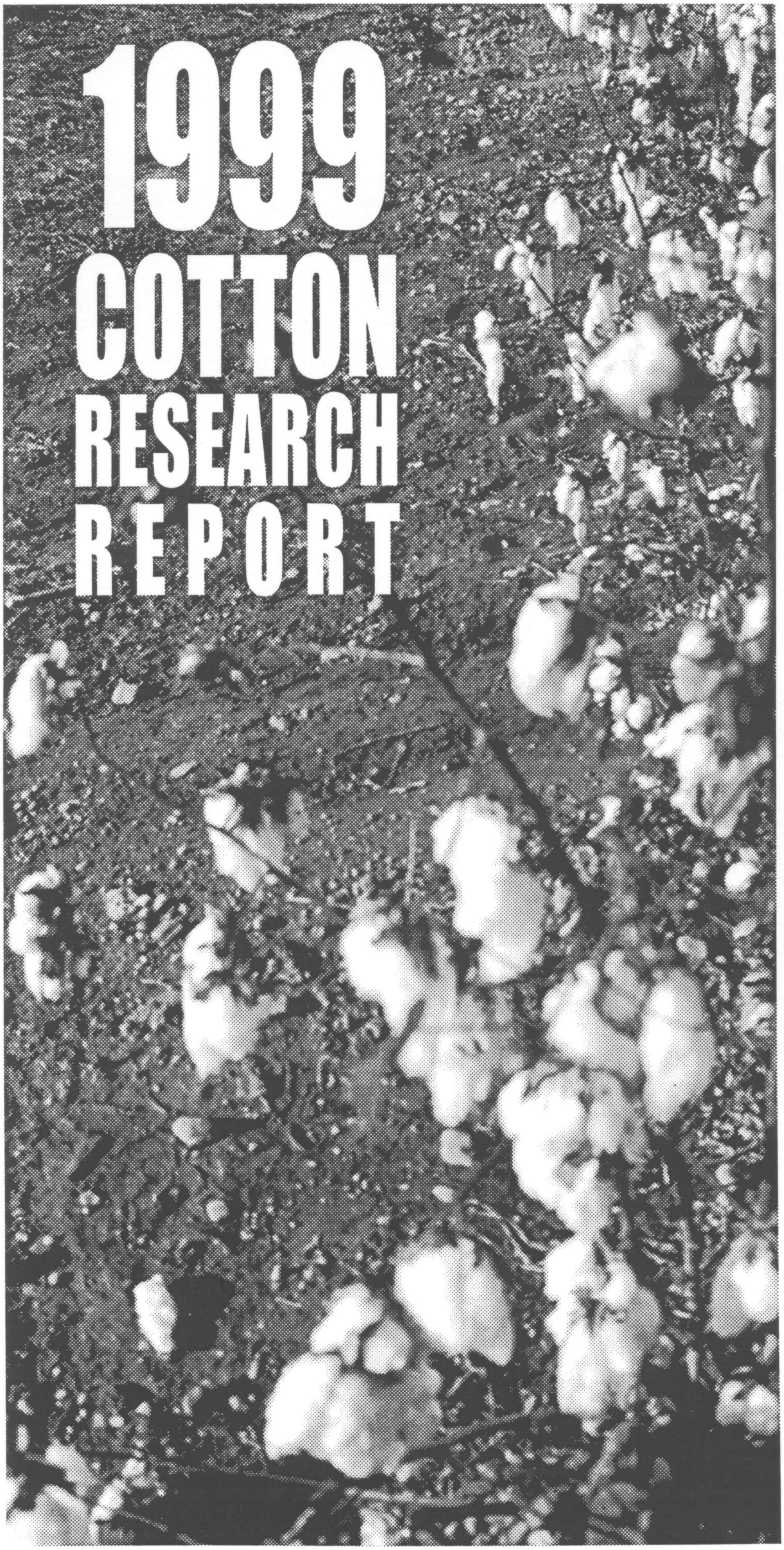
1999
COTTON
RESEARCH
REPORT



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VARIETY TRIALS

CHEROKEE COUNTY COTTON VARIETY TRIAL

Charles Burmester and David Derrick

A cotton variety trial was conducted in the northeastern corner of Alabama in 1999. This area is a large cotton growing area with unique soil types that are not represented in the state cotton variety trials. The trial was conducted in Cherokee Country, Alabama, on the farm of Randall and Nick McMichen. The area had Holston fine sandy loam soils.

Plots were planted on May 5 and consisted of eight rows of each variety planted the length of the field. Each variety plot measured approximately 0.5 acres. The cotton variety Deltapine DP 458BRR was used as a check variety between each plot.

TABLE 1. CHEROKEE COUNTY COTTON YIELD RESULTS[1]

Variety	Seed cotton yield *lbs/ac*	Lint *%*	Lint *lbs/ac*
Paymaster PM1220BG/RR	3366	44	1480
Sure-Grow 125BR	3280	42	1380
Deltapine DP 409BRR	3220	41	1320
Deltapine DP 458BRR	2990	43	1290
Deltapine DP 422BRR	3073	40	1230
Sure-Grow 501BR	2902	42	1220
Deltapine DP 451BRR	3140	38	1190
Sure-Grow 485RR	2711	42	1140
Sure-Grow 125RR	2639	42	1110

[1] Deltapine DP 458BRR was used as a check between each variety. Since yield differences between 458 plots were small, no yield adjustments were needed.

This area received a few timely rains in July and August that benefited the cotton greatly. Insects were not a major problem in 1999. Bollworms were scouted and controlled with pyrethroid applications in the varieties without Bt genetics.

Plots were harvested on September 24. All varieties produced excellent yield (Table 1). All varieties were spindled picked and seed cotton weighed with a boll buggy. A seed cotton sample was collected from each variety for lint percent and quality parameters. Cotton quality results are presented in Table 2.

Results of this nonreplicated strip trial should be used as a guide in conjunction with result from the Alabama Cotton Variety Tests.

TABLE 2. CHEROKEE COUNTY COTTON QUALITY RESULTS

Variety	Micro-naire	Length	Uni-formity	Strength
Deltapine 458BRR	5.1	1.10	84	30.0
Sure-Grow 125BR	4.5	1.07	82	28.5
Sure-Grow 485RR	4.3	1.10	85	32.0
Sure-Grow 501BR	4.5	1.04	81	30.0
PM 1220BG/RR	4.6	1.07	82	30.5
Sure-Grow 125RR	4.4	1.05	83	29.0
Deltapine DP 451BRR	4.2	1.14	81	29.0
Deltapine DP 422BRR	4.2	1.09	83	29.0
Deltapine DP 409BRR	4.0	1.08	79	30.0

EVALUATION OF TRANSGENIC COTTON VARIETIES IN ULTRA-NARROW ROW AND NO-TILL PLANTING SYSTEMS

E. Cebert and U.R. Bishnoi

The objective of this research was to determine the effect of tillage, row spacing, and timing of Roundup application on yield of Bt/RR cotton.

A transgenic cotton cultivar was planted through conventional tillage and ultra-narrow row (UNR) on May 8 and April 22, respectively, to compare application of Roundup after four and six weeks of planting. The cultivar Deltapine DP 425BRR was planted in conventional 40-inch row spacing and UNR spacing of 7.5 inches in a randomized complete block design with four replications. Plots were located on the Tate Farm in Madison County, Alabama.

Roundup was applied on May 21 and June 8 in the conventional plots and on June 6 and June 22 in the UNR plots. Data on plant population, number of opened bolls and seed cotton yield were collected and analyzed to determine potential significant differences between the different systems of production and timing of Roundup application.

Differences between the application of Roundup after four and six weeks were not significant in seed cotton yields and number of bolls opened. The significant difference observed in plant population was a response to row spacing and seeding rate, rather than Roundup application. The increased number of plants per square meter in the UNR system compensated for the low number of bolls per plant (Tables 1 and 2). Plants in conventional row spacing produced on the average five open bolls compared to less than two for UNR cotton.

TABLE 1. RESPONSE OF TRANSGENIC COTTON TO TIME OF ROUNDUP APPLICATION AND TILLAGE SYSTEMS

Roundup application date	Plant *m^{-2}*	Open bolls	Seed cotton yield *lbs/ac*
No-till and UNR			
June 22	44.8 a	55.7 ab	1819 a
June 8	41.5 b	62.0 a	2232 a
Conventional tillage and row spacing			
May 21	11.2 c	60.0 ab	2169 a
June 6	9.2 d	45.5 b	2066 a

Means with the same letter are not significantly different at p=0.05.

TABLE 2. COMPARATIVE PERFORMANCE OF ULTRA-NARROW AND CONVENTIONAL ROW SPACING IN TRANSGENIC COTTON[1]

Row spacing	Plant *m^{-2}*	Open bolls	Seed cotton yield *lbs/ac*
Ultra-narrow	43.1 a	58.9 a	2008 a
Conventional	10.2 d	52.7 a	2117 a

[1] Ultra-narrow row spacing was 7.5 inches; conventional row spacing was 40 inches.
Means with the same letter are not significantly different at p=0.05.

VARIETY EVALUATION IN ULTRA-NARROW ROW COTTON AT E.V. SMITH AND PRATTVILLE

Dennis P. Delaney, C. Dale Monks, Jim Bannon, Don P. Moore, and B. Durbin

The interest in ultra-narrow row (UNR) cotton has lead to many research areas that need to be investigated. Since variety selection is one of the most important decisions for producers to make, trials were established at E.V. Smith Research Center, Tallassee, Alabama, and Prattville Research Field, Prattville, Alabama, in 1999 to evaluate several picker type selections in the UNR system.

UNR plots were planted in early May at the E. V. Smith Research Center and Prattville Research Field into a tilled seedbed using a plot drill. Experimental design was a randomized complete block with four replications. A predetermined number of seeds were planted in each plot. Conventional soil-applied herbicides were used to control weeds. Data collected were seed cotton and/or lint yields. See table for variety evaluations.

YIELDS OF ULTRA-NARROW ROW COTTON VARIETIES

	——Prattville Research Field——		E.V. Smith Research Center
Variety	Seed cotton yield *lbs/ac*	Lint yield *lbs/ac*	Lint yield *lbs/ac*
Sure-Grow 125	3989	1396	1740
Sure-Grow 125BR	4095	1433	1799
Sure-Grow 501BR	4201	1470	1657
Paymaster PM 1220BG/RR	4033	1411	1751
Paymaster PM 1330BG	3983	1394	1593
Paymaster PM 1560BG/RR	4151	1453	1638
Terra 292	3939	1379	1654
Stoneville ST 474	3877	1357	1496
Stoneville BXN 47	3933	1377	1589
PhytoGen PSC 355	3566	1248	1732
PhytoGen PSC 556	3304	1157	1487
FiberMax 989	3883	1359	1689
FiberMax 832	3641	1274	1654
Deltapine DP 20B	3877	1357	1571
Deltapine NuCotn 33B	4008	1403	1573
Deltapine DP 458BRR	3504	1227	1554
Deltapine DP 655BRR	4057	1420	1644
Deltapine Acala 90	3771	1320	1523
AgriPro AP6101	3584	1255	1610
AgriPro HS44	3759	1316	1564
LSD	***346***	***121***	***141.2***

CROP PRODUCTION

Evaluation of Roundup Ready Cotton in Ultra-narrow Row Systems

Charles Burmester

The objective of this test was to evaluate different cotton varieties in an ultra-narrow row system and to determine if these varieties respond differently to Roundup applications applied after the fourth leaf stage.

Plots were planted on May15 with Deltapine DP 458 BRR, Sure-Grow 125BR, and Paymaster PM 1220BG/RR at the Tennessee Valley Research and Extension Center in Belle Mina, Alabama. Plots were 12 feet wide and 30 feet long and were arranged in a randomized complete block design with four replications. Stand counts were determined on June 2 and plant height measured on July 21 and August 6. The number of nodes per plant and nodes above white flower were determined on July 21 and August 6, respectively. Plots were harvested on October 5 and scrapped on October 15.

The cotton stand was a little irregular especially in the Paymaster PM 1220BG/RR plots. However, this should not have affected the results. After the second Roundup application (applied with Bidrin and Pix), leaf burn was noted. This apparently stunted the cotton (see table, height measurements on August 6). During plant mapping, cotton treated with Roundup only at the fourth leaf stage had many more open bolls than cotton treated with Roundup at the fourth and eighth true leaf.

Bolls were pulled in two areas of each plot for a total harvest area of 36 square feet. Cotton was ginned on a small table top gin for lint percent. The plots with Roundup applied at the fourth leaf were harvested on October 5. The plots with Roundup applied at the eighth leaf stage could not be harvested until October 15 due to late maturity. Yields (see table) of all varieties were greatly reduced where Roundup was applied at the eighth leaf stage. It is possible that combining Roundup with Bidrin and Pix in that application also increased the damage.

EFFECT OF ROUNDUP READY COTTON ON COTTON STAND, PLANT HEIGHT, NODES, NODES ABOVE WHITE FLOWER, AND YIELD

Treatment	Rate	Growth stage	Stand[1] June 2	Height (*in*) July 21	Height (*in*) Aug. 6	Nodes July 21	NAWF Aug. 6	Yield *lbs/ac*
Roundup Ultra	0.75 lb/ac	3-4 leaf	19.8 c	21.9 ab	23.8 b	13.1 a	2.5 bc	740 c
Roundup Ultra	0.75 lb/ac	8th leaf						
Paymaster PM 1220BG/RR								
Cotoran	1.0 lb/ac	pre	25.6 bc	21.9 ab	25.7 a	12.5 ab	2.6 abc	1384 a
Caparol	1.5 pts/ac	pre						
Roundup Ultra	0.75 lb/ac	3-4 leaf						
Staple		as needed						
Select		as needed						
Paymaster PM 1220BG/RR								
Roundup Ultra	0.75 lb/ac	3-4 leaf	26.5 bc	20.5 b	19.6 d	12.8 ab	2.3 c	819 c
Roundup Ultra	0.75 lb/ac	8th leaf						
Deltapine DP 458BRR								
Cotoran	1.0 lb/ac	pre	36.4 a	20.9 ab	21.5 c	12.2 b	2.4 bc	117 b
Caparol	1.5 pts/ac	pre						
Roundup Ultra	0.75 lb/ac	3-4 leaf						
Staple		as needed						
Select		as needed						
Deltapine DP 458BRR								
Roundup Ultra	0.75 lb/ac	3-4 leaf	32.4 ab	21.4 ab	22.9 bc	12.1 b	2.8 ab	866 c
Roundup Ultra	0.75 lb/ac	8th leaf						
Sure-Grow 125BR								
Cotoran	1.0 lb/ac	pre	25.5 bc	22.5 a	26.5 a	12.2 b	29.a	1342 a
Caparol	1.5 pts/ac	pre						
Roundup Ultra	0.75 lb/ac	3-4 leaf						
Staple	as needed	as needed						
Select	as needed	as needed						
Sure-Grow 125BR								
LSD (0.10)			***6.60***	***1.63***	***1.84***	***0.76***	***0.35***	***162.1***

[1] Stand per nine square feet. Means with the same letter are not significantly different at the p=0.10 level.

COVER CROPS AND TILLAGE METHODS FOR ULTRA-NARROW ROW AND WIDE ROW COTTON

Dennis P. Delaney, Wayne Reeves, C. Dale Monks, and Brian E. Gamble

Ultra-narrow row (UNR) cotton acreage has been rapidly increasing in Alabama in the last three to four years. Producers have become interested in UNR cotton as a way to save on machinery costs and possibly increase yields on marginal land. Previous research in Alabama has shown increased yields with the use of conservation tillage and lupin/legumes as winter cover crops for UNR cotton. This experiment was initiated in 1998 to investigate the optimum combination of row spacing (wide versus UNR), cover crops (legume versus rye), and tillage (conventional versus no-till).

Plots were planted at the Wiregrass Research and Extension Center in Headland, Alabama. Rye was planted as a cover crop during the fall of 1997 and 1998, lupin was planted in 1997, and a lupin/crimson clover mix was planted in 1998 due to winterkill the previous year. Cover crops were killed at least one month before planting cotton and rolled down on no-till plots or incorporated on conventional plots. All plots were paratilled each spring. Paymaster PM 1220BG/RR cotton seed was planted in May of each year, but was replanted in June 1998 due to extremely dry weather. UNR (eight-inch) plots were planted at 182,000 seeds per acre and wide-row (36-inch) plots at 84,000 seeds per acre each year. The experimental design was a split-strip-strip arrangement of treatments with four replications. Data collected included plant populations, leaf area indices, and seed cotton and lint yields.

In 1998 plant population counts showed that UNR had a higher population than wide row with 148,000 versus 38,000 plants per acre, respectively. In 1999 plant populations of 37,000 plants per acre were seen in wide row, 139,000 in conventional UNR, and 98,000 in no-till UNR.

Leaf area index (LAI) measurements showed a significant interaction between row width x cover x tillage. UNR cotton consistently had a higher LAI than wide row at early bloom. In 1999, there was a tillage x row width interaction, again with UNR having a much higher LAI at this growth stage.

Lint yield measurements showed that UNR systems yielded higher (911 versus 596 pounds per acre) than wide row in 1998, with no interactions. In 1999, there was a tillage x cover interaction, but no row width effect. Conventional tilled plots after legumes yielded 949 pounds per acre versus 865 pounds per acre for no-till after legumes. After rye, conventional yielded 923 pounds per acre and no-till 669 pounds per acre. It appeared that early season leaching and slow breakdown of cover crops in late season might have caused nitrogen deficiency in no-till rye plots. Based on two years of data, it appears that UNR cotton took advantage of higher early season intercepted sunlight (LAI) to yield better than wide row cotton in a year with a dry early summer that slowed late season growth. In a year with a wet early spring and dry late summer, wide row cotton continued growth through late bloom and yielded the same as UNR. In that year, no-tilling decreased yields, while cover crops had a variable effect.

GROWTH REGULATOR EFFECTS ON COTTON

Dennis P. Delaney, C. Dale Monks, Jim Bannon, and B. Durbin

Growth regulators have been used for the past several years to promote and/or control vegetative growth in cotton. Each year trials are conducted to compare established products with new products that will be coming to the market. A study was conducted in 1999 to compare Pix Plus, Pix Ultra—an experimental growth regulator with Pix—and an untreated control.

In early May 1999 Deltapine NuCotn 33B cotton was planted conventionally at the E.V. Smith Research Center, Shorter, Alabama, on raised beds. Plots were 30 feet long and four rows wide. Standard fertility and weed control practices were followed. Plots were irrigated throughout the season with a traveling gun system. The experimental design was a randomized complete block with four replications. All treatments were applied at eight fluid ounces of product per acre with a backpack sprayer in 15 gallons per acre solution. Activate Plus was also added to each treatment. Treatments were applied at the pinhead to matchhead square stage and again at the late matchhead square stage at 12 fluid ounces per acre. Data collected were plant height, nodes above white flower, fruit retention, fruiting branches, and retention on the first fruiting position on August 16; open, closed, and total bolls on September 3; plant height and seed yield on September 23; and lint turnout.

Most of the parameters measured did not indicate a difference between treatments including the untreated control. The major differences noted were height and earliness when the treatments were compared to the untreated control and the increased earliness of Pix compared to Pix Ultra and Pix Plus. Final yields did not differ between treatments.

Effects of Boron and Mepiquat Chloride Timing on Irrigated Cotton Growth and Yield

Charles Burmester

Different formulations of a cotton growth regulator, mepiquat chloride, were evaluated for controlling cotton growth and increasing yields on irrigated cotton. The standard mepiquat chloride formulation, Pix Plus, was compared to a new experimental formulation, Pix Ultra. A foliar boron treatment was also added to evaluate possible boron and growth regulator interactions.

The cotton variety Deltapine NuCotn 33B was planted on May 5, at the Tennessee Valley Research and Extension Center, Belle Mina, Alabama. Plots consisted of eight cotton rows 50 feet long arranged in a randomized complete block design with four replications. Early season growth regulator rates (0 to 12 ounces per acre) were applied at early square. The late season applications of Pix Plus and Pix Ultra were applied in two applications of eight ounces per acre.

The effects of the early season growth regulator rates were evaluated by monitoring plant height and node development. Cotton yields were taken by harvesting the four middle rows of each plot with a modified spindle cotton picker.

The higher rates of Pix Plus and Pix Ultra decreased cotton plant height as expected at early square (Table 1). Differences, however, were not as dramatic as seen in 1998. Late season cotton height differences were much smaller than expected. Rates of the growth regulators and boron applications had little effect on cotton node development and growth (Table 2).

Lint yields were very high and averaged almost three bales per acre (Table 1). The early season growth regulator rates, however, had very little effect on yield and no growth regulator and boron interaction was found.

Table 1. Effect of Pix Plus and Pix Ultra on Plant Height

Treatment	Rate	Growth stage	Plant height *(in)*						Lint yield
	oz/ac		June 10	June 21	June 30	July 12	July 21	Aug. 10	*lbs/ac*
Pix Plus	—	matchhead square	13.75 a	22.65 a	32.15 a	41.3 a	45.0 a	48.5 a-d	1419 b
Pix Plus	4	matchhead square	13.43 a	20.13 ab	26.48 def	36.0 cd	39.8 c	45.3 b-e	1458 ab
Pix Plus	8	matchhead square	15.35 a	20.85 ab	26.05 ef	34.8 d	38.8 c	44.0 e	1497 ab
Pix Plus	12	matchhead square	14.08 a	19.20 b	24.63 f	34.0 d	39.2 c	45.0 cde	1425 b
Pix Ultra	—	matchhead square	14.50 a	22.33 a	30.38 abc	40.2 ab	44.1 ab	49.3 ab	1467 ab
Pix Ultra	4	matchhead square	14.68 a	20.75 ab	27.85 cde	37.1 bcd	40.8 bc	49.2 abc	1463 ab
Pix Ultra	8	matchhead square	14.62 a	19.92 ab	25.30 ef	35.7 cd	40.2 c	45.7 b-e	1464 ab
Pix Ultra	12	matchhead square	15.40 a	20.60 ab	26.30 def	34.8 d	38.4 c	44.6 de	1487 ab
Pix Plus + Boron	—	matchhead square	14.52 a	22.43 a	30.73 ab	40.5 a	46.3 a	50.3 a	1542 a
Pix Plus + Boron	4	matchhead square	14.88 a	20.92 ab	28.92 bcd	38.3 abc	44.1 ab	48.7 a-d	1471 ab
Pix Plus + Boron	8	matchhead square	15.68 a	20.65 ab	26.13 ef	35.1 cd	41.1 bc	46.6 a-e	1499 ab
Pix Plus + Boron	12	matchhead square	15.63 a	20.15 ab	24.75 f	33.8 d	38.7 c	44.3 e	1456 ab
LSD (0.10)			***2.064***	***2.495***	***2.496***	***3.05***	***3.10***	***3.65***	***97.9***

Means with the same letter are not significantly different at the p=0.10 level.

Table 2. Effect of Pix Plus and Pix Ultra on Number of Nodes and Nodes above White Flower

Treatment	Rate	Growth stage	—Total nodes—		——Nodes above white flower——		
	oz/ac		June 10	July 12	July 12	July 21	July 29
Pix Plus	—	matchhead square	8.9 a	14.0 ab	7.2 abc	5.4 c	4.6 a
Pix Plus	4	matchhead square	8.6 a	13.5 ab	7.4 abc	5.2 c	5.0 a
Pix Plus	8	matchhead square	9.1 a	13.7 ab	7.1 abc	5.6 abc	4.3 a
Pix Plus	12	matchhead square	8.6 a	13.5 ab	7.1 bc	5.7 abc	5.0 a
Pix Ultra	—	matchhead square	8.9 a	14.3 a	7.7 ab	5.6 abc	4.6 a
Pix Ultra	4	matchhead square	9.0 a	13.1 ab	7.2 abc	5.4 bc	4.9 a
Pix Ultra	8	matchhead square	8.9 a	13.7 ab	7.3 abc	5.5 bc	4.7 a
Pix Ultra	12	matchhead square	9.2 a	13.4 ab	6.9 c	5.3 c	4.7 a
Pix Plus + Boron	—	matchhead square	8.8 a	13.8 ab	7.8 a	6.1 a	4.6 a
Pix Plus + Boron	4	matchhead square	8.9 a	13.5 ab	7.2 abc	5.9 ab	4.5 a
Pix Plus + Boron	8	matchhead square	9.1 a	12.9 b	7.1abc	5.7 abc	4.8 a
Pix Plus + Boron	12	matchhead square	8.7 a	13.2 ab	7.3 abc	5.6 bc	4.5 a
LSD (0.10)			***0.51***	***1.07***	***0.56***	***0.43***	***0.65***

Means with the same letter are not significantly different at the p=0.10 level.

Effects of Dimilin and Boron on Cotton

Dennis P. Delaney, C. Dale Monks, Jim Bannon, and B. Durbin

Dimilin and boron have been used to promote growth and control insects in soybeans for the past several years. There is currently work underway to evaluate the same system for use in cotton. This trial was conducted to evaluate the following treatments: Dimilin at two ounces per acre applied four times beginning at pinhead square, Dimilin at four ounces applied four times beginning at pinhead square, Dimilin at four ounces applied two times beginning at full bloom, Dimilin plus Solubor applied two times starting at full bloom, Solubor applied two times beginning at full bloom, and an untreated control.

Deltapine NuCotn 33B cotton was planted using conventional methods at the E. V. Smith Research Center in Shorter, Alabama, in early May on raised beds in plots 30 feet long and four rows wide. Standard fertility and weed control practices were followed. Plots were irrigated throughout the season with a traveling gun system. All treatments were applied with a backpack sprayer in 15 gallons per acre solution. Experimental design was a randomized complete block with six replications. Data collected were total open and closed bolls on September 10; and total nodes, fruit retention on the first and second positions, fruit retention by node zones 6-10 and 11-15, and seed cotton yield on September 23.

There were few differences noted between treatments for most of the parameters measured. The only differences were in retention on nodes 11-15 between the two- and four-ounce rate of Dimilin and the total node counts between the two ounces of Dimilin and the Dimilin/Solubor combination. No differences in earliness or yield were noted.

COTTON RESPONSE TO PHOSPHORUS IN ALABAMA'S LONG-TERM EXPERIMENTS

Charles C. Mitchell

Alabama's early phosphorus (P) recommendations were based on P-rate experiments maintained by the Alabama Agricultural Experiment Station on research substations in the major land resource areas of the state and on smaller experiment fields in minor soil regions. Six of these experiments, which were started in 1928, are still maintained today and are known as the Two-year Rotation experiments because they have always involved cotton, corn, sorghum, soybean, or peanut rotations. Five of these have included cotton since 1992. In order to maintain a sound research basis for its soil testing services, Auburn University and the Alabama Agricultural Experiment Station established additional soil test calibration experiments in 1954 when the A.U. Soil Testing Laboratory began services. These new soil fertility experiments were known as the Rates of N-P-K experiments and have been continued at seven locations since their establishment. Five of the seven experiments have been planted in cotton every year since 1992.

In spite of a strong research basis for soil testing in Alabama, producers and their consultants often question the validity of soil test interpretations. No doubt part of this is due to a wide range of interpretations available from different public and private soil testing services, opinions of consultants, and competition for fertilizer sales. Emphasis on precision agriculture may have created expectations from soil testing beyond what it is capable of delivering. Nevertheless, as producers adopt new technologies, genetically improved varieties, and new production practices, they expect and deserve periodic verification of soil testing interpretations from their public laboratories. The purpose of this study is to summarize cotton yield response to residual soil P since 1992 in order to validate or update Alabama's current soil test calibration for P using modern varieties with higher yield potentials.

Cotton yields from P variable treatments on the Two-year Rotation and Rates of N-P-K experiments were compared with yields from a standard treatment, which received a full complement of fertilizers (see table), to develop relative yields for each location and year. When Mehlich-1 extractable soil P was calibrated with relative cotton yields for each of the experiments at each of the five locations, several locations and tests failed to demonstrate a response to increasing levels of residual soil P. Treatments on all soils except for the Lucedale sandy clay loam at Prattville Research Field would be rated "low" by the southern public soil testing laboratories.

Failure to get dramatic responses all the time demonstrates the inherent difficulties of trying to make soil testing a definitive and infallible tool. However, when yield and soil data from both tests at all Coastal Plain locations over the entire seven-year period were pooled (see figures), a reasonable critical value for Mehlich-1 extractable P could be estimated. The current critical value used by the Auburn University Soil Testing Laboratory for these soils is 25 milligrams (mg) P per kilogram (kg) (50 pounds P per acre).

The Soil Science Society of America defines *critical soil test concentration* as " . . . that concentration at which 95% of maximum relative yield is achieved. . . usually coincides with the inflection point of a curvilinear yield response curve." Above this value, no fertilizer P is recommended because the probability of a yield response is extremely low. Below this value, P is recommended in increasing increments. Alabama's critical value is within the range used by other public soil testing

MEAN COTTON LINT YIELDS ON THE FERTILIZED CONTROL PLOTS ON THE TWO-YEAR ROTATION AND RATES OF N-P-K EXPERIMENTS, 1992-1998

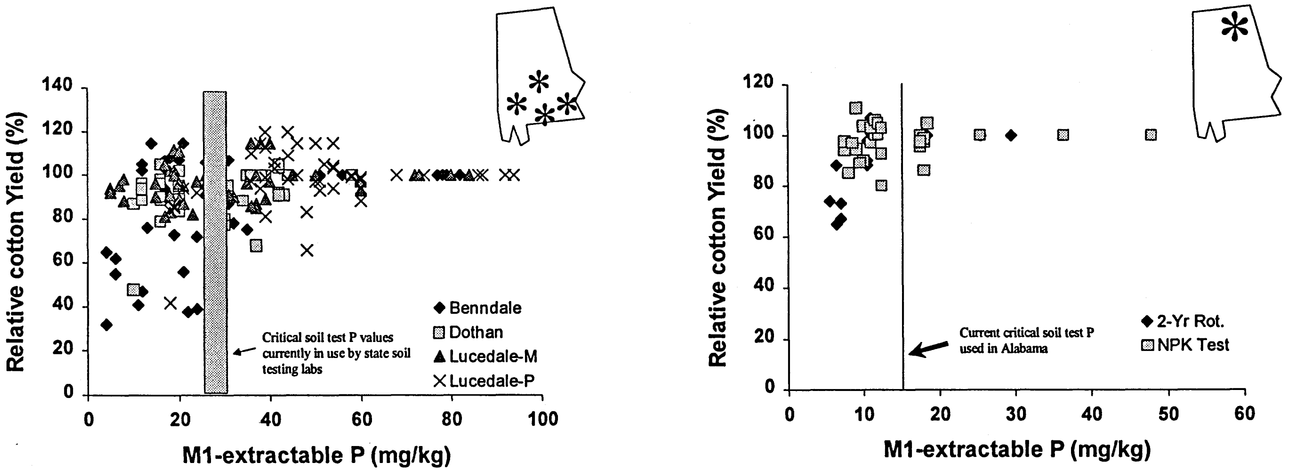
	Location				
Year	Brewton	Wiregrass	Monroeville	Prattville	Tennessee Valley
	lbs lint/ac				
Two-year Rotation (cotton-soybean rotation)					
1992	1080	770	—	1320	1270
1993	1080	550	800	650	1030
1994	540	—	800	1340	1270
1995	1400	730	740	340	590
1996	1040	800	1020	930	930
1997	340	550	620	1360	1070
1998	620	—	890	1080	810
Rates of N-P-K (cotton every year)					
1992	760	950	420	1480	1490
1993	—	670	1250	660	920
1994	500	—	970	1290	1180
1995	—	790	900	140	740
1996	1030	830	1020	1280	1420
1997	930	620	820	1180	1170
1998	780	—	1030	1100	109

laboratories in the region for Mehlich-1 P and cotton on Coastal Plain soil (18 to 30 mg P per kg). The fine-textured soils of the Tennessee Valley have a high P fixation capacity and a lower critical P value as currently used by the Auburn University Soil Testing Laboratory. These data verify the current value of 15 mg P per kg for these soils (see figures).

Based on a comparison between Deltapine NuCotn 35B and Deltapine DP 5690 cultivars at the Prattville Research Field from 1996 to 1998 on the Rates of N-P-K experiment in split plots, there is no difference in responsiveness to residual soil P. However, the new Bollgard® variety, Deltapine NuCotn 35B, averaged 80 pounds lint per acre per year more than the conventional variety.

Soil test calibration for cotton using Mehlich-1 extract on five Alabama soils during 1992-1998 indicated that critical values in use by state soil testing laboratories in the southeastern United States are well within reason for new cultivars and modern cultural practices. There is no need to adjust the critical values currently in use in Alabama. These critical values are 25 milligrams P per kilogram for soils with a cation exchange capacity (CEC) less than nine centimoles per kilogram (cmol/kg) (Coastal Plain soils) and 15 milligrams extractable P per kilogram for soils with a CEC less than nine cmol/kg (limestone valley soils). Based on a comparison between Deltapine NuCotn 35B and Deltapine DP 5690 cultivars, there is no difference in responsiveness to residual soil P.

Mehlich-1 soil test calibration for cotton based on data from Alabama's Two-year Rotation and Rates of N-P-K experiments at five Alabama locations. Shaded area includes the current critical Mehlich-1 extractable P values used by public soil testing laboratories in Alabama, Georgia, Florida, South Carolina, and Tennessee. All Coastal Plain soils in these experiments had CEC < 9.0 cmol/kg.



Coastal Plain Soils

Tennessee Valley Soils

NITROGEN RATES FOR COTTON IN ALABAMA'S LONG-TERM EXPERIMENTS

Charles C. Mitchell

Although nitrogen (N) is the most difficult nutrient to manage in cotton production, it has more impact on yields, earliness, and lint quality than any other primary plant nutrient. It is also the most costly plant nutrient applied per acre. Potential nitrate-N leaching into ground waters is a driving force behind water quality issues and nutrient management planning policies. As higher yields become possible with new, genetically modified varieties, growers legitimately question older research upon which standard N recommendations are made. Some laboratories adjust N recommendations based upon realistic yield goals.

In order to reexamine the effects of N rates on new cotton varieties with higher yield potentials, seven years of cotton yield data from existing, long-term soil fertility experiments (1992 through 1998) were summarized. Since 1996, Bollgard® and Roundup Ready® varieties have been used at most locations. Experiments summarized are known as the Two-year Rotation experiment (circa 1929) and the Rates of N-P-K experiment (circa 1954) at five locations. The Two-year Rotation is a cotton-soybean rotation with N rate variables for the cotton and the Rates of N-P-K experiment is in cotton every year.

Results support the current standard N recommendations used on soil test reports. For most sandy and loamy Alabama soils, the standard recommendation is a total of 90 (plus or minus 30) pounds N per acre during the growing season; 60 (plus or minus 30) pounds N per acre is standard for the deep, red silt and clay loams of the limestone valleys of North Alabama (Figure 1).

The comment with current recommendations recognizes that residue from a good soybean or peanut crop may contribute 20 to 30 pounds N per acre to the following cotton crop. Because as many as six months could elapse between soybean/peanut harvest in the fall and cotton planting the following April or May, much of the residual N may be lost from the soil. Data from N-rate treatments on the Two-year Rotation at five locations verify the variable nature of residual N from legumes (Figure 1). Since 1992, cotton on this experiment has always followed soybean or peanut. Clearly, cotton response to N rates was highly variable following a legume.

Promoters of fertilizer use have often espoused the concept of recommendations based on yield goals. This is a particularly popular and reasonable practice with grain crops such as corn, wheat and sorghum, and forages. These crops remove large quantities of N in the harvested portion of the crop. However, Alabama's long-term N experiments do not support this practice for cotton under the conditions of these experiments. All five sites had similar results, so only three of the sites are presented in Figure 2. In a disaster year when cotton yields are less than a bale per acre, very little if any N fertilizer is needed. No farmer plans on a disaster year and never fertilizes for these situations. But even in outstanding production years when yields far exceed anticipated yield goals (e.g., more than three bales per acre), data from Alabama's research stations support the "standard" recommendation plus or minus about 30 pounds N per acre.

Because of the rapid adoption of the new, genetically modified cotton varieties, there have been few opportunities to evaluate their response to soil fertility variables. In 1996, the first year Bollgard® varieties were available to Alabama producers, the Rates of N-P-K experiment on a Lucedale sandy clay loam at the Prattville Research Field was modified to determine if any differences existed in response to soil fertility variables between two varieties of similar genetic backgrounds. All plots were split and a Bollgard® variety, Deltapine NuCotn 35B, was planted on half of each plot in three, 40-inch rows, 25 feet long, and a conventional variety of similar genetics, Deltapine DP 5690, was planted on the other half of each plot. There were significant differences due to N rate and variety each year. The Deltapine NuCotn 35B yielded an average of 85 pounds more lint per acre per year than the conventional variety over all N rates.

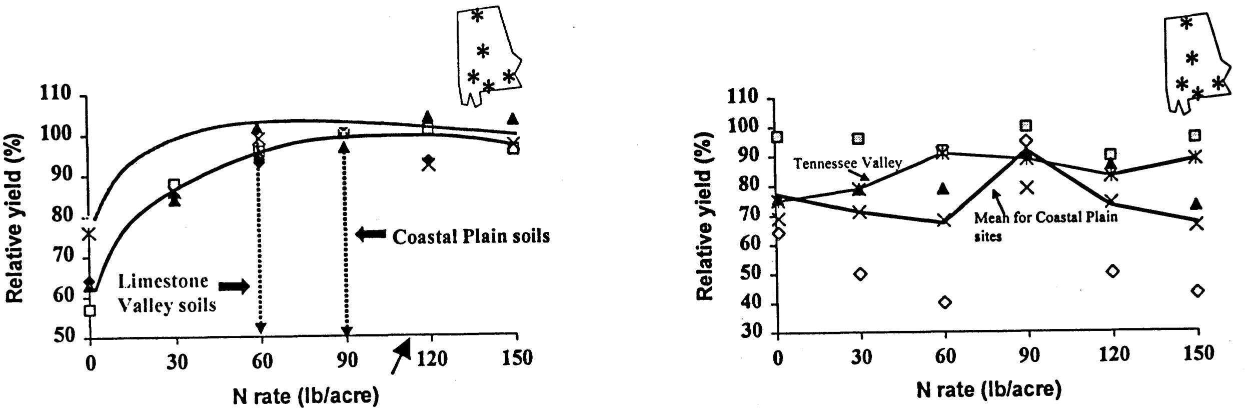
Long-term, N-rate research at several Alabama locations since 1992 supports the current standard N recommendations used on soil test reports. For most sandy and loamy Alabama soils, the standard recommendation is a total of 90 (plus or minus 30) pounds N per acre during the growing season; 60 (plus or minus 30) pounds N per acre is standard for the deep, red silt and clay loams of the limestone valleys of North Alabama. Cotton following a good soybean or peanut crop will benefit from some residual N but predicting this response has been difficult. While N recommendations based on a yield goal may apply for some crops, this clearly is not the case with nonirrigated cotton in Alabama. Producers

SOILS IN ALABAMA'S LONG-TERM SOIL FERTILITY EXPERIMENTS WITH COTTON

Location	Soil type
Brewton Research Field	Benndale loamy sand (*coarse-loamy, siliceous, thermic Typic Paleudults*)
Wiregrass Research and Extension Center	Dothan sandy loam (*fine-loamy, siliceous, thermic Plinthic Kandiudults*)
Monroeville Research Field	Lucedale fine sandy loam (*fine-loamy, siliceous, thermic Rhodic Paleudults*)
Prattville Research Field	Lucedale sandy clay loam (*fine-loamy, siliceous, thermic Rhodic Paleudults*)
Tennessee Valley Research and Extension Center	Decatur silt loam (*clayey, kaolinitic, thermic Rhodic Paleudults*)

should follow the standard N recommendation on new fields and make adjustments as experience and cropping systems dictate. Nitrogen rates do not need to be adjusted for the newer, genetically modified cotton varieties.

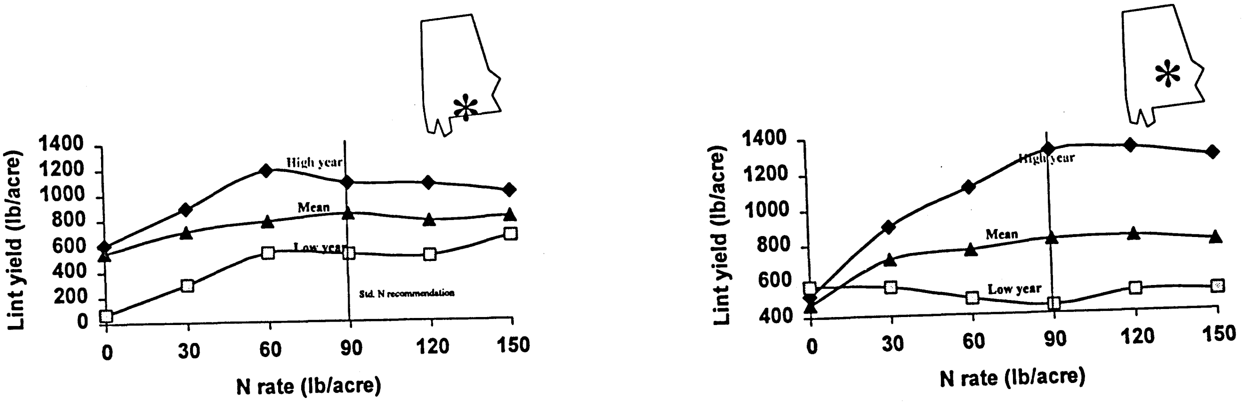
Figure 1. Nitrogen rates where cotton is planted every year (Rates of N-P-K Test) and cotton following soybean (Two-year Rotation experiment) at five Alabama locations, 1992-1998. Relative yield is the lint yield compared to the lint yield of a treatment receiving 90 pounds N per acre. All N is applied in split applications.



All Sites: Continuous cotton on "Rates of N-P-K Test"

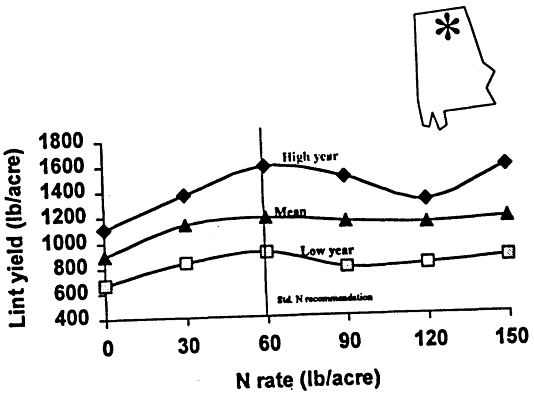
All Sites: Cotton following soybean on "Two-Year Rotation"

Figure 2. Cotton yield response to nitrogen rates on the "Rates of N-P-K Test" (c. 1954), 1992-1998, at five Alabama locations. Lines represent the highest yielding year, the lowest yielding year, and the mean of seven years



Brewton: Benndale loamy sand

Prattville: Lucedale sandy clay loam



Tennessee Valley: Decatur silt loam

POTASSIUM NUTRITION OF COTTON ON LONG-TERM EXPERIMENTS

Charles C. Mitchell and Gary L. Mullen

Potassium (K) nutrition of crops on acid, infertile soils of the southeastern United States (Table 1) has always been a concern, especially for cotton, which is susceptible to K deficiencies. With increasing acreage and yields of cotton on these soils, new varieties, eradication of the boll weevil, and new technologies for insect control, K nutrition is of renewed concern to growers. Alabama's Two-year Rotation experiments at six locations (circa 1929) have provided information for fertilizer recommendations and data for soil test calibration since their beginning. In 1982, these experiments were put into a residual phosphorus (P) and K mode. Cotton has been a principal crop in these experiments for 46 of the 69 years from 1929 to 1997. Therefore, these experiments offer an excellent opportunity to study soil K changes with time and reevaluate K nutrition of cotton. The objective of this summary is to reexamine soil test calibration for K on cotton. In order to accomplish this objective, soil K variable treatments on the Two-year Rotation experiment at five Alabama locations were summarized from 1992 through 1998.

TABLE 1. CALIBRATION OF M1 EXTRACTABLE POTASSIUM FOR COTTON IN SOUTHEASTERN UNITED STATES

State	Low	Medium	High
		mg/kg	
Alabama			
CEC<4.6	<30	31-60	60+
CEC<9	<45	45-90	90+
CEC 9+	<60	61-120	120+
Florida			
All soils	<35	36-60	60+
Georgia			
Coastal plain	<30	31-75	75+
Piedmont	<50	51-100	100+
South Carolina			
All soils	<35	36-78	78+
Virginia			
All soils	<37	38-87	88+

Alabama's Two-year Rotation soil fertility experiments at five locations have been in a cotton-soybean rotation since 1992. Four of the 17 soil fertility treatments were annual K variables which were applied before 1982: (1) 0 K, (2) 28 pounds of K_2O per acre, (3) 60 pounds of K_2O per acre (standard treatment), and (4) 120 pounds of K_2O per acre. No fertilizer K has been applied to K-variable plots since 1982 (i.e., residual K since 1982) except for the standard treatment, which continues to receive 60 pounds of K_2O per acre per two-year rotation. In addition to the K variables, all plots received annual applications of 60 pounds of P_2O_5 per acre before 1982, and all plots tested high in P. Plow layer soil samples were tested every other year (after harvest) for Mehlich-1 extractable K.

The Rates of N-P-K experiment was started in 1954 and has similar K variables as the Two-year Rotation. It has been in cotton every year since 1992 at five locations. At the Prattville Research Field, plots were split in 1996 through 1998. Half of each plot was planted in Deltapine NuCotn 35B, a genetically modified variety containing the Bollgard® gene, which makes it resistant to certain bollworms. The other half of each plot was planted in Deltapine DP 5690, a conventional variety similar to the Deltapine NuCotn 35B. The purpose of this was to see if there was any difference in response to K fertility.

In 1982 when annual K applications ceased on all treatments except the 60-pounds-of-K_2O-per-acre treatment, the two highest K treatments were at or above what was considered to be a "high" soil test K level for cotton at all sites. A "high" soil test is above an established critical value and is defined as an adequate supply of that nutrient; no additional application of that nutrient is recommended.

Mean cotton lint yield from each residual K treatment was compared with mean yield for the standard fertilization treatment that received 60 pounds of K_2O per acre to calculate a relative yield (Table 2). Relative yield is expressed as a percentage of the standard treatment yield. Relative yield by location and year was then compared to the mean soil test K value for each treatment at that location to develop a soil test calibration for cotton for the period 1992 through 1998 (Figure 1).

TABLE 2. MEAN COTTON LINT YIELDS FROM THE STANDARD FERTILIZED TREATMENT IN THE TWO-YEAR ROTATION EXPERIMENTS, 1992-1998

	Location[1]				
Year	Brewton	Wiregrass	Monroeville	Prattville	Tennessee Valley
			lbs lint/acre		
1992	1080	770	—	1320	1270
1993	1080	550	800	650	1030
1994	540	—	800	1340	1270
1995	1400	730	740	340	590
1996	1040	800	1020	930	930
1997	340	550	620	1360	1070
1998	620	—	890	1080	810

[1] Soil type by location: Brewton (Bennedale loamy sand), Wiregrass (Dothan sandy loam), Monroeville (Lucedale fine sandy loam), Prattville (Lucedale sandy clay loam), Tennessee Valley (Decatur silt loam).

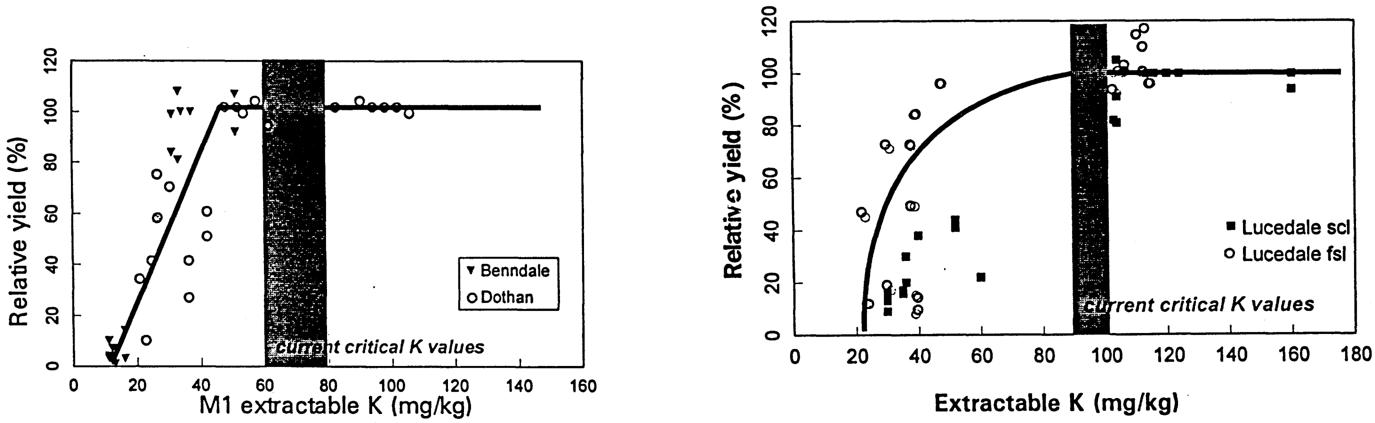
Growers have been concerned that with higher yielding, earlier maturing, modern varieties, soil test calibration for K on cotton needs adjusting. However, these data indicate that the sufficiency level approach to critical K values as used by the Auburn University Soil Testing program in Alabama and other southern states is still very reliable and accurate. The weakly buffered soils with a cation exchange capacity (CEC) less than or equal to 4.6 centimoles per kilogram (cmol kg^{-1}) (the Dothan and Benndale series) are included in one graph and the two Lucedale soils (CEC equals 4.6 to 9.0 cmol kg^{-1}) are included in another graph according to current Alabama soil test calibration. The Decatur soil, which is representative of cotton producing soils of the Tennessee Valley region, has the highest CEC (10.0 cmol kg^{-1}) and the highest critical soil test K level. The fine textured, highly buffered, smectitic and often calcareous soils of the Alabama Black Belt prairie region are tested with another extractant and have a different calibration not included in this study. Potassium recommendations for cotton are made using a linear regression for each of the three groups of soils designated by CEC. Recommendations decrease from 120 pounds K_2O per acre per year at the lowest soil test values to none at the critical soil test value.

In a separate but related study, researchers found that cotton yields on the two Lucedale soils and on the Benndale soil were highly significantly related to soil test K in the 0 to 20 cm depth, in the 20 to 40 cm depth, and in the 40 to 60 cm depth. However, using soil test K from different depths did not improve soil test calibration.

There were no significant differences in yield between Deltapine Nucotn 35B and Deltapine DP5690 nor was there any interaction between variety and K fertility at the Prattville Research Field in 1996 and 1997. Both varieties responded to residual soil K similarly. However, in 1998, Deltapine Nucotn 35B produced higher cotton yields (mean lint yield = 1,050 pounds per acre) over all K treatment than did Deltapine DP5690 (mean lint yield = 920 pounds per acre), probably a result of less insect damage.

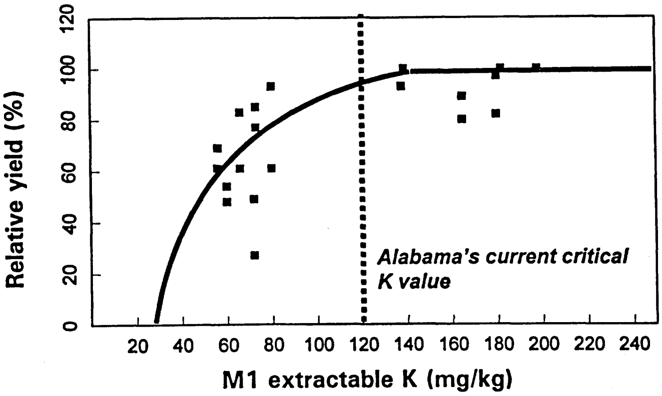
Current soil test calibration critical extractable K values for Alabama soils are still accurate for modern varieties and yields. Plow-layer, soil test K is still a very reliable tool for predicting the need for K fertilization on Alabama soils when other factors are not limiting. There is no apparent need to adjust K fertilization for the new Bollgard® varieties.

Potassium calibration for cotton based on current values in use by public soil testing laboratories using the Mehlich-1 extract and Alabama data from K variables on the Two-year Rotation experiment, 1992-1998. Shaded areas are the ranges in critical soil test K values in the southeastern United States.



Potassium calibration on soils with CEC <4.6 cmol/kg (Dothan sandy loam and Benndale loamy sand)

Potassium calibration on soils with CEC 4.6-9.0 cmol/kg (Lucedale soils)



Potassium calibration on soils with CEC>9.0 cmol/kg (Decatur silt loam)

SUMMARY OF 1999 ROUNDUP READY COTTON PRODUCED UNDER IRRIGATED AND NONIRRIGATED CONDITIONS IN NORTH ALABAMA

C. Dale Monks, Rob Woods, Dennis P. Delaney, Bobby Norris, Charles Burmester, and Glenn Wehtje

Roundup Ready cotton has been increasing in acreage since its introduction two years ago. Approximately 80% of the crop in Alabama in 2000 will be glyphosate tolerant. Studies were initiated at the Tennessee Valley Research and Extension Center, Belle Mina, Alabama, to evaluate the effects of glyphosate on irrigated and dryland (nonirrigated) cotton.

Deltapine DP 458BRR cotton was planted and tillage was conducted with conventional procedures. Experimental design was a 2 x 4 factorial arrangement of treatments in a completely randomized design. This arrangement meant that both irrigated and nonirrigated plots were treated with four factors, which were three levels of glyphosate treatments and a control.

The fertility program included 100 pounds per acre of 0-0-60 fertilizer applied on March 4, one ton per acre of lime on March 18, 75 pounds per acre of nitrogen (34-0-0) on March 24, and 30 pounds per acre of liquid nitrogen applied to irrigated plots on May 27. A field cultivator was used on March 26 and April 13. Treflan (one pint per acre) was applied and a vertical action tiller with rolling baskets was used for final seedbed preparation on April 19. Cotton was planted on April 19 with Temik (five pounds per acre) plus Terraclor SuperX (six pounds per acre) applied in the seed furrow. Weed control measures included Cotoran (1.8 pounds per acre) plus Caparol (1.5 pints per acre) applied preemergence after planting. Roundup Ultra treatments (one quart per acre) were applied on May 25 (four-leaf) and/or June 18 (directed). Cotton was defoliated on September 17 with Finish (one quart per acre) plus Ginstar (three ounces per acre) and harvested on October 4. A total of 16 ounces per acre of Pix was applied to dryland plots and 24 ounces per acre were applied to irrigated plots. Data were collected from 30 plants and included visual injury observations, plant mapping, seed cotton and lint yield, and boll characteristics by node.

No crop injury was observed on any treatment compared to the untreated control. Boll counts and seed cotton yield indicated no difference in boll opening caused by the herbicide treatments. Nonirrigated plots were 66% open in September compared to 20% open for irrigated plots. Nonirrigated plots yielded 1,610 pounds per acre seed cotton compared to 3,420 pounds per acre in irrigated plots. Micronaire (mic), length, and strength readings were lower in nonirrigated plots with 3.2 versus 4.1 mic, 1.06 versus 1.11 inches staple length, and 25 versus 29 grams per tex for the nonirrigated compared to irrigated treatments, respectively. Yield was distributed in the lower fruiting nodes in the nonirrigated plots but was more evenly distributed in the mid- to upper-nodes in the irrigated plots.

INSECTICIDE APPLICATIONS

Comparison of Selected In-furrow Treatments for Thrips Control in Cotton

Barry L. Freeman

The objective of this research was to compare at-plant applications of two in-furrow liquid treatments to an in-furrow granular treatment and an untreated control.

Plots were planted April 21 with Deltapine NuCotn 33B cotton at the Tennessee Valley Research and Extension Center, Belle Mina, Alabama. Plots consisted of four rows 25 feet long with a 40-inch wide row spacing and were arranged in a randomized complete block with four replications. Plots were harvested September 28.

Admire was applied at rates below those recommended for experimental purposes only. Plots were maintained according to Alabama Cooperative Extension System recommendations for weed control, fertility, and insect control following at-planting insecticide treatments.

Five random plants from each plot were sampled by being rinsed in 70% ethyl alcohol. Specimens were subsequently filtered and counted under a stereoscope. Adult and larval thrips were tallied separately. Adult thrips specimens were mounted on microscope slides in CMC-10 medium and sent to Texas A&M University for determination of species.

Each plot was rated for damage on a system from 0 - 5 (0 = no damage and 5 = extreme damage). Evaluations were made on May 7, May 14, May 21, May 27, and June 7. Damage was rated on May 21 and May 27. Plant population was determined on June 9. All living plants in the center two rows of each plot were counted. All white blooms were counted from the center two rows of each plot on July 6 through July 9 as an indication of earliness.

All insecticide-treated plots produced more plants than the control treatment. The Admire and Temik treatments had higher plant populations than the Admire + Orthene treatment. The control treatment revealed severe thrips damage on both evaluation dates. Temik and Admire treatments showed moderate damage on May 21, but plants had outgrown some of this damage by June 16. The Admire + Orthene treatment revealed heavy thrips injury on May 21, but by June 16 these plots had recovered substantially.

Larval and total numbers of thrips were much higher from the control treatment than from all insecticide treatments on each sample date. Insecticide treatments contained moderate thrips reproduction throughout the sample period with the Admire +

Table 1. Effect of Insecticides on Number of Adult Thrips by Species[1]

Treatment	Sample date	Tobacco thrips	Western flower thrips	Flower thrips	Soybean thrips	Others	Aphids
Admire	May 7	4 (57)[2]	3 (43)	0	0	0	0
	May 14	21 (95)	0	0	1 (5)	0	0.25
	May 21	0	3 (100)	0	0	0	0.25
	May 27	8 (53)	7 (47)	0	0	0	0.25
	June 7	0	1 (9)	2 (18)	8 (73)	0	1.25
	Totals	33 (57)	14 (24)	2 (3)	9 (16)	0	0.50
Admire + Orthene	May 7	11 (85)	1 (8)	0	1 (8)	0	0
	May 14	32 (80)	4 (10)	3 (8)	1 (3)	0	0
	May 21	4 (44)	4 (44)	0	1 (11)	0	1.5
	May 27	7 (29)	11 (46)	3 (13)	0	3 (13)	0.5
	June 7	8 (47)	0	2 (12)	5 (29)	2 (12)	1.0
	Totals	62 (60)	20 (19)	8 (8)	8 (8)	5 (5)	0.60
Temik	May 7	2 (33)	4 (67)	0	0	0	0.25
	May 14	15 (75)	3 (15)	1 (5)	0	1 (5)	0.25
	May 21	7 (47)	6 (40)	2 (13)	0	0	0
	May 27	20 (61)	11 (33)	2 (6)	0	0	2.75
	June 7	2 (25)	0	4 (50)	1 (13)	1 (13)	1.0
	Totals	46 (56)	24 (29)	9 (11)	1 (1)	2 (2)	0.85
Control	May 7	30 (91)	2 (6)	0	0	1 (3)	0.25
	May 14	32 (89)	2 (6)	2 (6)	0	0	0.50
	May 21	19 (90)	1 (5)	1 (5)	0	0	10.5
	May 27	20 (56)	10 (28)	4 (11)	1 (3)	1 (3)	6.25
	June 7	0	3 (38)	2 (25)	2 (25)	1 (13)	0.5
	Totals	101 (75)	18 (13)	9 (7)	3 (2)	3 (2)	3.60

[1] Tobacco thrips *(Frankliniella fusca)*, Western flower thrips *(Frankliniella occidentalis)*, Flower thrips *(Frankliniella la tritici)*, Soybean thrips (*Neohydatothrips variabilis)*. [2] Percent of totals in parentheses.

Orthene treatment averaging somewhat more thrips than the other two insecticide treatments.

The tobacco thrips, *Frankliniella fusca*, was the predominant adult thrips in all treatments, but it occurred in large numbers and at a higher percent in the control treatment than in other treatments (Table 1). This was likely due to early colonization, which provided a competitive advantage. The second most numerous species in all treatments was the Western flower thrips, *F. occidentalis*, although large numbers never occurred as has sometimes happened when hot, dry conditions prevail in May and early June. Little difference was noted among treatments concerning the abundance of Western flower thrips although the Temik treatment contained the highest numbers and Admire the fewest. Flower thrips, *F. tritici*, and soybean thrips, *Neohydatothrips variabilis*, occurred in numbers too low to detect any particular treatment effects. A very few of the following adult thrips species were also present: *F. exiqua, F. williamsi,* and *Thrips vulgatisima.*

All insecticide treatments contained fewer cotton aphids, on average, than did the control treatment. However, the control treatment contained fewer aphids at the end of the sample period than did other treatments.

As indicated by bloom counts, all insecticide-treated plots bloomed earlier than the control treatment and the Admire and Temik treatments bloomed earlier than the Admire + Orthene treatment (Table 2). All insecticide treatments out-yielded the control, with the Temik and Admire treatments yielding the most.

Overall, the Temik treatment outperformed other treatments, but considering the low rate, the Admire treatment was a close second. The Admire + Orthene treatment was less effective, but considerably better than the control. Some researchers have observed that imidacloprid treatments do not control Western flower thrips very well and that they control larval thrips better than they control adult thrips. Neither of these observations were confirmed in this study.

TABLE 2. EFFECT OF INSECTICIDES ON BLOOM COUNT AND SEED COTTON YIELD

Treatment	July 6	July 7	July 8	July 9	Seasonal avg.	Yield	% Change
	——	*number of blooms/100 row feet*			——	*lbs/ac*	from control
Admire	86	89	101	105	95	3254	28.9
Temik	61	78	91	89	80	3270	29.5
Admire + Orthene	39	53	65	80	59	3156	25
Control	20	24	38	37	29	2525	—

EVALUATION OF SELECTED SEED TREATMENTS AND IN-FURROW AND FOLIAR-APPLIED INSECTICIDES FOR THRIPS CONTROL IN COTTON

Ron H. Smith

The objective of this research was to evaluate selected seed treatments and in-furrow and foliar-applied insecticides for thrips control in cotton.

TABLE 1. NUMBER OF THRIPS PER ROW FOOT AND THRIP DAMAGE

Treatment	Rate	May 27		June 2		June 9
		Thrips/foot	Damage	Thrips/foot	Damage	Damage
Temik 15G	4.5 lbs/ac	0.50 c	1.50 d	0.33 a	1.17 b	1.33 b
Temik 15G	8 lbs/ac	1.17 c	2.00 cd	0.33 a	1.33 b	1.17 b
Adage 5 FS	300g ai/100 kg	1.83 bc	2.17 cd	0.67 a	1.33 b	1.33 b
Untreated	—	1.83 bc	3.50 abc	1.33 a	3.00 ab	3.67 a
Adage 5 FS	250g ai/100 kg	4.33 ab	3.50 abc	1.00 a	3.00 ab	2.33 ab
Bidrin Overspray	0.25 lb ai/ac	4.33 ab	5.00 a	1.33 a	5.00 a	4.17 a
Adage 5 FS	200g ai/100 kg	4.67 bc	3.83 ab	1.00 a	3.17 ab	3.33 ab
Gaucho 480 FS	250g ai/100 kg	4.83 a	3.17 bc	1.33 a	3.00 ab	2.67 ab

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

Plots were planted on April 23 with Deltapine DP 5415RR at the Prattville Research Field. Plots consisted of four rows 37 feet long with a 40-inch wide row spacing and were arranged in a completely randomized design with three replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Thrips were sampled when plants on one foot of row were beaten into a plastic pail. The sample site was selected at random from center two rows of four row plots. Thrips were counted on May 27 at the two true leaf stage, on June 9 at the eight true leaf stage, and on June 29 at the 12 to 14 leaf stage. A six- by 37-foot area of each plot was harvested on October 6.

Table 2. Plant Height and Number of Plants per Row Foot

Treatment	Rate	May 27 Height *(in)*	June 2 Height *(in)*	June 9 Height *(in)*	June 9 *plants/ft*
Temik 15G	4.5 lbs/ac	3.50 a	5.50 ab	9.33 a	3.33 ab
Temik 15G	8 lbs/ac	3.33 ab	5.33 ab	9.00 a	3.00 b
Adage 5 FS	300g ai/100 kg	3.50 a	5.83 a	9.33 a	3.45 ab
Untreated	—	2.83 b	4.67 bc	5.67 b	4.11 a
Adage 5 FS	250g ai/100 kg	3.33 ab	4.83 b	8.33 a	3.89 a
Bidrin Overspray	0.25 lb ai/ac	2.17 c	4.00 c	5.50 b	3.89 a
Adage 5 FS	200g ai/100 kg	2.83 b	4.67 bc	5.67 b	4.00 a
Gaucho 480 FS	250g ai/100 kg	3.17 ab	5.33 ab	8.00 ab	3.33 ab

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

Tobacco thrips was the primary species identified with a population of approximately 50% adults on June 2. Adage at 300 grams per 100 kilograms of seed gave statistically the same thrips control as Temik at 4.5 and 8.0 pounds active ingredients per acre based on damage ratings at three dates (Table 1). This level of control was also supported by plant height counts made on the same dates (Table 2). Adage at the 200 and 250 gram rate was less effective than Temik. A Bidrin overspray was the least effective treatment, showing more damage and reduced plant height over the untreated. The node of first fruiting branch node and yields (Table 3) followed these same trends.

Table 3. Seed Cotton per Acre

Treatment	Rate	Seed cotton yield *lbs/ac*
Temik 15G	4.5 lbs/ac	2452.7 ab
Temik 15G	8 lbs/ac	2557.4 ab
Adage 5 FS	300g ai/100 kg	2662.0 a
Untreated	—	2315.4 ab
Adage 5 FS	250g ai/100 kg	2400.4 ab
Bidrin Overspray	0.25 lb ai/ac	1818.3 b
Adage 5 FS	200g ai/100 kg	2178.0 ab
Gaucho 480 FS	250g ai/100 kg	2335.0 ab

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

Evaluation of Orthene, Temik, and Admire for Thrips Control in Cotton

Ron H. Smith

The objective of this research was to evaluate selected seed treatments and insecticide applications of Orthene, Temik, and Admire for thrips control in cotton.

Plots were planted on April 20 with Deltapine NuCotn 35B at the Prattville Research Field. Plots consisted of four rows 30 feet long with a 40-inch wide row spacing and were arranged in a randomized complete block design with three replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Insecticides were applied at-planting and as foliar sprays on May 12 and May 20.

The sample site was selected at random from the center two rows of four-row plots. Thrips were sampled when plants on one foot of row were beaten into a plastic pail. Thrips were also measured by visually observing and counting the number of thrips. Thrips were counted on May 11 (estimated 98% adult stage), June 9 (estimated 85% adult stage), and June 29 (estimated 70% adult stage). A six- by 37-foot area of each plot was harvested on October 6. Damage ratings were made by observing the entire center two rows of each plot and assigning a number between 1 (extreme damage) and 5 (no visible thrips damage to foliage).

No significant differences were present between treatments based on the number of thrips present per foot at the sample dates. However, on May 18 (Table 1) treatments consisting of Admire plus Orthene, Orthene plus CGA-215944, and the untreated control had numerically much higher thrips numbers. Admire had the lowest damage rating on May 11 while Temik and Orthene ST + FS treatments showed less damage on May 18. On the last three sample dates—May 27, June 2, and June 9—all treatments had less damage than the untreated check. Plant height was inversely related to the level of thrips damage on all sample dates (Table 2). There were numerical, but no statistical differences in yields between treatments (Table 3).

TABLE 1. NUMBER OF THRIPS PER ROW FOOT AND DAMAGE RATINGS[1]

Treatment	Rate	——May 11——		——May 18——		——May 27—		June 2	June 9
		Thrips/foot	Damage	Thrips/foot	Damage	Thrips/foot	Damage	Damage	Damage
Temik 15 G	3.5 lbs/ac	0.67 a	4.33 ab	3.33 a	3 b	1.67 a	1.83 c	1.17 b	1 b
Orthene (S.T) + (F.S.) 97 PE	(S.T.) = 3.2 oz/ac	0.33 a	3.67 b	5.67 a	3.17 b	1 a	2.33 bc	1.33 b	1 b
Orthene (S.T.) + Regent 2.5 EC	(S.T.) = 3.2 oz/ac	1 a	4.17 ab	4.67 a	4.33 ab	2.5 a	3.5 abc	2 b	1 b
Admire 2 F (IF)	6.4 oz/ac	1 a	3.67 b	4.67 a	3.33 ab	2.83 a	3.5 abc	2.17 ab	1.83
Orthene (S.T.) + (F.S.) 90 SP	(S.T.) = 3.2 oz/ac	1 a	4.17 ab	7 a	3.67 ab	1.5 a	2.83 bc	1.67 b	1 b
Untreated	—	1.33 a	4.67 a	12 a	4.67 a	4 a	4.83 a	4 a	2.83 a
Admire 2 F(IF) +) Orthene 90 S (IF	2.4 oz/ac + 0.55 lbs/ac	1.67 a	4.33 ab	13.67 a	4 ab	2.67 a	3.83 ab	3 ab	1.33 b
Orthene (S.T.) + CGA-215944 50 WP	(S.T.) = 3.2 oz/ac	1.33 a	4.0 ab	19 a	3.83 ab	2.33 a	2.83 bc	1.33 b	1 b

[1] Damage ratings on a scale of 1 - 5: 1 = no thrip damage on true leaves; 5 = heavy trip damage on true leaves.
Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

TABLE 2. PLANT HEIGHT

Treatment	Rate	May 18	May 27	June 2	June 9
		———	———in	———	———
Temik 15 G	3.5 lbs/ac	4.3 a	6.83 a	9.33 a	15 a
Orthene (S.T) + (F.S.) 97 PE	(S.T.) = 3.2 oz/ac	3.83 abc	6 a	6 a	14.33 ab
Orthene (S.T.) + Regent 2.5 EC	(S.T.) = 3.2 oz/ac	3.73 abc	6.33 a	8.33 a	13.67 ab
Admire 2 F (IF)	6.4 oz/ac	3.47 bc	6 a	8.5 a	12.67 ab
Orthene (S.T.) + (F.S.) 90 SP	(S.T.) = 3.2 oz/ac	4.13 ab	5.5 a	8.33 a	13.00 ab
Untreated	—	3.33 c	5.5 a	7.33 a	10.67 b
Admire 2 F(IF) + Orthene 90 S (IF)	2.4 oz/ac + 0.55 lb/ac	3.70 abc	6.17 a	8.67 a	13.00 ab
Orthene (S.T.) + CGA-215944 50 WP	(S.T.) = 3.2 oz/ac	3.93 abc	6.5a	8.67 a	13.67 ab

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

TABLE 3. STAND DENSITY, BLOOMS, AND YIELD

Treatment	Rate	Plants	Blooms	Seed cotton yield
		no/ft	*no/30 ft*	*lbs/ac*
Temik 15 G	3.5 lbs/ac	3.67 ab	14.00 a	3097.6 a
Orthene (S.T) + (F.S.) 97 PE	(S.T.) = 3.2 oz/ac	3.33 ab	9.00 ab	3057.3 a
Orthene (S.T.) + Regent 2.5 EC	(S.T.) = 3.2 oz/ac	3.11 b	7.00 b	3146.0 a
Admire 2 F (IF)	6.4 oz/ac	3.33 ab	6.67 b	3041.1 a
Orthene (S.T.) + (F.S.) 90 SP	(S.T.) = 3.2 oz/ac	3.11 b	7.00 b	3000.8 a
Untreated	—	3.56 ab	5.00 b	2694.3 a
Admire 2 F(IF) + Orthene 90 S (IF)	2.4 oz/A + 0.55 lb/ac	3.78 a	5.67 b	2815.3 a
Orthene (S.T.) + CGA-215944 50 WP	(S.T.) = 3.2 oz/ac	3.45 ab	7.33 b	3025.0 a

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

THE EFFECT OF SELECTED INSECTICIDES ON THE TARNISHED PLANT BUG AND BENEFICIAL ARTHROPODS IN DP 20B COTTON IN NORTH ALABAMA

Barry L. Freeman

The objective of this research was to evaluate several insecticide treatments for their effect on tarnished plant bug and common beneficial arthropods.

Plots were established on April 12 with Deltapine DP 20B at the Tennessee Valley Research and Extension Center in Belle Mina, Alabama. Plots consisted of eight rows, 300 feet long with a 40-inch wide row spacing. Plots were maintained according to Alabama Cooperative Extension System recommendations for weed control and fertility. Insecticide applications were made on June 16 and July 14.

Ten, six-foot drop cloth samples were taken and 100 pinhead squares were inspected for plant bug damage in whole-field, pretreatment samples. Posttreatment samples consisted of four, three-foot drop cloth samples at first evaluation and four, six-foot drop cloth samples thereafter.

Forty pinhead squares per plot were sampled to determine the level of plant bug damage on June 21, June 25, July 1, and July 20. Forty white blooms per plot were inspected for plant bug damage on July 20 and 28 while 40 young bolls per plot were inspected for plant bug damage on July 28.

The trial began just as beneficial arthropods and plant bugs were becoming established in cotton. Numbers of both were moderate and some reproduction had begun (Table 1).The fairly high plant bug damage level reported in Table 1 appears to indicate that the number of adult plant bugs was higher than indicated by the sample taken. This discrepancy could be caused by the fact that the drop cloth is a poor technique for sampling adult plant bugs.

The following arthropods were sampled: big-eyed bugs, insidious flower bugs, damsel bugs, lady beetles, lace wings, spiders, ants, and tarnished plant bugs. Adults and immatures were noted except in the case of spiders and ants (Table 2).

Tracer had little impact on the overall beneficial complex and consistently had more big-eyed bugs than did the control plot . Steward had a very mild impact on most beneficial species, especially on flower and damsel bugs. Although there tended to

TABLE 1. NUMBER OF PLANT BUGS AND PERCENT PINHEAD SQUARE RETENTION, BLOOM DAMAGE, AND BOLL DAMAGE PER 100 ROW FEET

	June 21			June 25			July 1		
Treatment	Adult	Nymph	Square retention	Adult	Nymph	Square retention	Adult	Nymph	Square retention
Karate	0	8.3	85	4.2	20.7	83	0	33.3	83
Orthene	8.3	41.6	70	0	62.3	73	0	120.4	83
Steward 0.065	8.3	66.0	80	8.3	16.2	55	8.3	120.4	70
Steward 0.11	8.3	100.0	78	0	103.8	70	4.2	137.0	50
Steward 0.05	0	117.0	58	0	137.0	58	0	120.4	55
Steward 0.055	0	58.2	60	8.3	154.0	55	16.6	187.0	43
Tracer 0.063	8.3	150.0	60	4.2	170.2	53	4.2	186.8	45
Control	16.7	266.4	58	0	95.5	63	8.3	174.3	48

TABLE 1, CONTINUED. NUMBER OF PLANT BUGS PERCENT PINHEAD SQUARE RETENTION, BLOOM DAMAGE, AND BOLL DAMAGE PER 100 ROW FEET

	July 20				July 28				Seasonal Average				
Treatment	Adult	Nymph	Square retention	BLB[1]	Adult	Nymph	BD[2]	BLD	Adult	Nymph	Total	Change[3] %	Square retention
Karate	0	12.5	57.5	42.5	8.3	0	0	25.0	2.5	15.0	17.5	-88.2	77.1
Orthene	0	45.8	25.0	25.0	0	45.8	5.0	32.5	1.7	63.2	64.9	-56.4	68.4
Steward 0.065	0	75.0	25.0	25.0	0	70.8	2.5	37.5	5.0	89.7	94.7	-36.4	63.1
Steward 0.11	4.2	50.0	12.5	12.5	4.2	62.5	2.5	37.5	4.2	90.7	94.9	-36.3	59.5
Steward 0.05	8.3	108.3	22.5	22.5	4.2	66.7	2.5	55.0	2.5	109.9	112.4	-24.5	54.0
Steward 0.055	12.5	104.2	30.0	30.0	4.2	70.8	10.0	45.0	8.3	114.8	123.1	-17.3	50.1
Tracer 0.063	8.3	87.5	30.0	30.0	12.5	62.5	12.5	45.0	7.5	131.4	138.9	-6.7	47.6
Control	8.3	108.3	37.5	37.5	4.2	62.5	15.0	47.5	7.5	141.4	148.9	—	52.9

[1]BLD = Bloom damage; [2] BD = Boll damage. [3]Percent change in total plant bug numbers from control.

be a positive rate response between the two lower and two higher rates of Steward, an overall strong rate response was not evident. Orthene and Karate significantly reduced overall predator complex with Karate being generally a little harsher than Orthene. Orthene and Karate provided the best plant bug control with Karate being superior to Orthene. Steward did reduce plant bug numbers and damage as compared to a control plot, but the reduction was modest. Tracer had no measurable impact on plant bugs.

The selectivity by Steward for predaceous arthropods measured in this study should prove very useful in cotton pest management programs. It is questionable as to what use can be made of the plant bug suppression demonstrated by Steward in areas with substantial populations. As expected, Tracer's selectivity toward beneficials was once again confirmed, and Tracer's lack of plant bug control was also expected.

TABLE 2. SEASONAL AVERAGE OF ALL PREDATORS PER 100 FEET OF ROW

Treatment	Total number of predators	% Change from control
Tracer 0.063	453.0	0
Control	451.0	—
Steward 0.065	417.0	- 7.5
Steward 0.055	401.9	- 11.0
Steward 0.11	389.2	- 14.0
Steward 0.09	367.0	- 19.0
Orthene	215.0	- 52.0
Karate	177.1	- 61.0

THE EFFECT OF SELECTED INSECTICIDES ON THE TARNISHED PLANT BUG AND BENEFICIAL ARTHROPODS IN SURE-GROW 125BR COTTON IN NORTH ALABAMA

Barry L. Freeman

The tarnished plant bug has been a significant problem for cotton producers in North Alabama for many years. Since the boll weevil has been largely removed and Bt cotton has been widely adopted, foliar sprays for cotton insect control have been dramatically reduced. The removal of this incidental control of the tarnished plant bug has further increased this insect's status as a pest of cotton. Many people now regard the tarnished plant bug as the leading insect threat to cotton production in North Alabama and other areas.

This reduction in foliar sprays has also fostered beneficial organisms. The ability to utilize parasites and predators in a cotton insect management program is greater than it has ever been, but tarnished plant bug control can severely retard the use of this desirable management tool. As a result, it is important to evaluate an insecticide's effect on beneficial organisms as well as the target insects.

This trial was designed to evaluate 13 treatments for their effect on tarnished plant bug and beneficial arthropod populations. Seven treatments involved unregistered compounds.

Plots were established on April 12 with Sure-Grow 125BR cotton at the Tennessee Valley Research and Extension Center in Bell Mina, Alabama. Plots consisted of eight rows 200 feet long

TABLE 1. NUMBERS OF TARNISHED PLANT BUGS PER 100 FEET OF ROW

Treatment	June 21		June 23		June 29		July 19		July 27		Seasonal average			Change[4]
	A[1]	N[2]	A	N	A	N	A	N	A	N	A	N	T[3]	%
Orthene	0	16.6	0	29.0	0	21.0	0	8.3	4.2	0	0.8	15.0	15.8	- 89
Regent (.05)	0	8.3	0	4.2	4.2	4.2	0	4.2	12.5	58.3	3.3	15.8	19.1	- 87
Bidrin	0	0	4.2	49.8	12.5	41.4	0	0	0	41.7	3.3	26.6	29.9	- 80
Actara (.062)	8.3	16.6	0	29.1	0	77.5	0	20.8	4.2	33.3	2.5	35.5	38.0	- 74
Karate	0	8.3	4.2	4.2	0	0	0	54.2	8.3	141.7	2.5	41.7	44.2	- 70
Vydate	8.3	41.3	0	16.6	4.2	33.0	12.5	62.5	8.3	54.2	6.7	41.5	48.2	- 67
Regent (.038)	8.3	16.6	12.5	29.1	0	83.0	1	16.7	4.2	87.5	5.8	46.6	51.6	- 65
Steward (.11)	0	49.5	0	49.5	8.3	87.2	4.2	20.8	4.2	58.3	3.3	53.1	56.4	- 62
Actara (.05)	8.3	24.8	0	45.7	4.2	45.7	0	70.8	4.2	87.5	3.3	54.9	58.2	- 60
Provado	8.3	8.3	16.5	16.6	4.2	87.3	4.2	45.7	4.2	129.2	7.59	57.4	64.9	- 56
Steward + Vydate	0	33.0	8.3	74.7	0	83.1	0	12.5	0	41.7	1.7	71.5	73.2	- 50
Steward (.09)	8.3	57.8	4.2	83.0	8.3	190.8	0	16.7	4.2	45.7	5.0	78.8	83.8	- 43
Control	8.3	239.3	0	153.8	8.3	199.3	8.3	75.0	0	41.7	5.0	141.8	146.8	- 14

[1] A=adult. [2] N=nymph. [3] T=total. [4] Percent change in total plant bug numbers from control.

and were not replicated. Insecticides were applied on June 16 and July 14.

Forty-eight hour pretreatment samples revealed 78 plant bugs and 173 total predators per 100 feet of row. All treatments reduced plant bug numbers considerably. The best treatments overall were Orthene, the high rate of Regent, and the Bidrin treatment, all of which provided 80% control or better (Table 1). Karate was as good or better than any treatment after the first application, but significant numbers of nymphs were present on the two sample dates after the second application (Table 1). Karate and most other pyrethroids have been very effective plant bug control agents during the past several seasons and this has been particularly true in dealing with imbedded July populations. These data could indicate a pyrethroid resistance problem in the tarnished plant bug though no on-farm problems were encountered during 1999 or in previous years.

Of the predaceous arthropods sampled in this study, the hemipteran predators are the most important. Big-eyed bugs, flower bugs, and damsel bugs all prey upon important caterpillar pests of cotton and are critical to insect management programs. Lady beetles and lacewings tend to key upon aphid populations and are only secondarily important as enemies of caterpillars. Spiders are catholic in their taste and their status as an important predator in cotton is dubious.

The treatment impact on big-eyed bugs was varied (Table 2). Steward, Vydate, and combinations thereof had an overall positive impact on these bugs and the low rate of Actara had a very modest negative impact (Table 2). With the exception of Provado the other treatments had a relatively serious negative impact on this predator (Table 2). Provado's impact was in between the first and second group of treatments (Table 2). Regent had a particularly negative impact on big-eyed bugs. The impact on flower bugs by most treatments was fairly severe. Regent was a notable exception, possessing populations considerably higher than in the control treatment. The impact on flower bugs by the Bidrin treatment and one of the Steward treatments was not as great as other treatments. Regent's apparent selectivity for insidious flower bugs has been observed with consistency in previous trials. However, the overall data from this trial may indicate a competitive advantage of big-eyed bugs over flower bugs, and the seemingly positive impact of Regent on flower bug populations may be a simple reflection of the compounds efficacy against big-eyed bugs.

Damsel bug populations were affected the least by the Steward, Vydate, and low rate of Actara treatments. Even though good numbers of damsel bugs occurred during this trial, the relative scarcity of this predator makes it difficult to draw firm conclusions from one test. Lady beetle populations were reduced by 20

TABLE 2. NUMBER OF BIG-EYED BUGS PER 100 FEET OF ROW

Treatment	June 21		June 23		June 29		July 19		July 27		Seasonal average			Change
	A[1]	N[2]	A	N	A	N	A	N	A	N	A	N	T[3]	%[4]
Vydate	8.3	8.3	6.6	29.0	20.7	116.2	54.2	358.3	91.7	341.7	36.3	170.7	207.0	22.5
Steward (.09)	49.5	8.3	33.2	54.1	8.3	137.0	20.8	250.0	83.3	337.5	39.0	157.4	196.4	16.2
Steward + Vydate	0	0	4.2	62.3	8.3	87.3	37.5	179.2	87.5	470.1	27.5	159.8	187.3	10.8
Steward (.11)	8.3	0	16.6	37.2	29.2	124.6	29.2	258.3	54.2	375.0	27.5	159.0	186.5	10.4
Control	16.5	0	24.9	45.6	12.4	120.4	25.0	329.2	29.2	241.7	21.6	147.4	169.0	—
Actara (0.05)	8.3	0	12.5	20.7	20.7	83.2	20.8	166.7	50.0	362.5	22.5	126.6	149.1	- 11.8
Provado	24.8	0	33.2	4.2	12.4	125.0	29.2	141.7	58.3	204.2	31.6	95.0	126.6	- 25.1
Actara (.062)	24.8	0	16.6	8.3	4.2	108.3	12.5	75.0	29.2	225.0	17.5	83.3	100.8	- 40.4
Bidrin	0	0	24.8	24.8	16.6	53.9	33.3	91.7	25.0	204.2	19.9	74.9	94.8	- 43.9
Orthene	0	0	4.2	4.2	8.3	62.0	8.3	104.2	75.0	120.8	19.2	58.2	77.4	- 54.2
Karate	8.3	0	4.2	4.2	12.4	29.2	0	33.3	16.7	175.0	8.3	48.3	56.6	- 66.5
Regent (0.38)	0	8.3	4.2	0	0	53.9	4.2	0	4.2	4.2	2.5	13.3	15.8	- 90.7
Regent (0.05)	0	0	20.7	0	0	41.6	0	0	8.3	4.2	5.8	9.2	15.0	- 91.1

[1] A=adult. [2] N=nymph. [3]T=total. [4]Percent change in total big-eyed bug numbers from control.

to 73%, as compared to the control treatment, by all treatments except for the Karate and Orthene treatments. Aphid populations were observed to be higher in the Karate, Orthene, and Vydate plots, which is likely more responsible for the increase in lady beetles than is efficacy. Overall lacewing populations were significantly reduced by all treatments. Spider populations were reduced by all treatments, but Actara, the low rate of Regent, Vydate, and one of the Steward treatments had the least effect. In general the Steward and Vydate treatments had the least impact on the important hemipteran predators while Orthene and Karate had the greatest impact (Table 3).

In conclusion, the performance of Karate on plant bugs after the second application is of concern, but concluding problems with pyrethroid resistance in the tarnished plant bug in north Alabama would be premature. In addition, a greater rate response was noted with Regent than in most previous trials. Finally, products which provide good plant bug control tend to have the greatest negative impact against predaceous arthropod populations.

Table 3. Seasonal Average of all Hemipteran Predators

Treatment	—Seasonal average— Adult	Nymph	Total	Change[1] %
Vydate	57.2	196.5	253.7	2.3
Steward (0.11)	59.0	193.4	252.4	1.8
Control	63.0	184.9	247.9	—
Steward (0.09)	66.4	177.4	243.8	- 1.7
Steward + Vydate	46.6	188.1	234.7	- 5.3
Actara (0.05)	46.6	137.4	184.0	- 25.8
Bidrin	66.4	103.2	169.6	- 31.6
Provado	48.9	110.8	159.7	- 35.6
Regent (0.38)	60.5	95.8	156.3	- 37.0
Actara (0.062)	30.0	89.1	119.1	- 52.0
Regent (0.05)	43.2	73.3	116.5	- 53.0
Karate	25.0	68.3	93.3	- 62.4
Orthene	30.1	59.0	89.1	- 64.1

[1] Percent change in total plant bug numbers from control.

The Effect of Selected Insecticides on the Tarnished Plant Bug and Beneficial Species in Sure-Grow 180 Cotton in Central Alabama

Ron H. Smith and Richard L. Davis

The objective of this research was to evaluate selected foliar-applied insecticides for tarnished plant bug control and selectivity on beneficial insects in cotton.

Plots were planted on April 13 with Sure-Grow 180 at the Prattville Research Field. Plots consisted of eight-rows 120 feet long with a 40-inch wide row spacing and were arranged as adjacent strips with one replicate (screening trial with sub-samples taken within each treatment). All plots were maintained throughout the season with standard herbicide and fertility production practices as recommended by the Alabama Cooperative Extension System.

Treatments were applied on June 22 (treatment number one) and July 7 (treatment number two). Plant size at initial treatment was approximately 26 to 28 inches (second week of bloom). Sampling methods varied depending on growth stage of the plant. Evaluation on June 24 was made with a sweep net held horizontally. Plants were beaten into a net at 10 row feet per sample. On June 29 and July 8, a drop cloth was used to sample an area of four row feet. Square retention was validated by examining the top two fruiting sites on 20 plants per treatment for a total of 40 fruiting sites.

Evaluations were made on June 24 (two days after treatment number one), June 29 (seven days after treatment number one) and July 8 (two days after treatment number two). The majority of plant bug population on June 22 (treatment number one) were adults while the population had shifted to immatures on July 7 (treatment number two). A six- by 37-foot area of each plot was harvested on October 6.

The number of adult tarnished plant bugs was well above threshold and the square retention was severely depressed (55%) when this test was initiated on June 24 (Table 1). All treatments gave significant control of adult plant bugs at one-day post treatment. However, there was a wide range of improvement in percent square set from a low of 54% with Acetamiprid 0.075 to a high of 83% with Bidrin 41WP at 0.25. Acetamiprid at 0.025 and 0.038 showed the most selectivity toward big-eyed bugs (Table 2), but less selectivity toward minute pirate bugs (Table 3). Pirate at 0.35 showed the most selectivity toward minute pirate bugs followed by Lorsban at 0.2.

At seven days posttreatment (June 29) the majority of the plant bug population was immatures. This evaluation likely was the best measure of residual control by the various treatments.

Bidrin 41WP gave the greatest residual control with the three rates of Acetamiprid giving moderate control. The least residual control was obtained from Orthene, Decis, and Leverage. At seven days posttreatment, the greatest selectivity toward big-eyed bugs was found in the Acetamiprid 0.025 treatment. However, again this was not the case with minute pirate bugs since all treatments reduced this species below the untreated after seven days. Most treatments had resulted in improved square retention (over 80%) after seven days.

Treatment number two was targeted to a predominant nymphal population of plant bugs on July 6. At two days posttreatment, all treatments significantly reduced plant bugs below the untreated check. In general, the pyrethroid treatments and Bidrin 8EC gave the greatest reduction. Steward, Acetamiprid, and Bidrin 41WP followed with moderate to good suppression. Again, Acetamiprid and Provado showed the greatest selectivity toward big-eyed bugs but not minute pirate bugs. All treatments raised square retention to well above 80% after application number two.

When all three sample dates were combined, Bidrin 41WP, Capture, and Karate gave the best plant bug suppression. The least suppression was found behind Orthene, Decis, Leverage, Pirate, and Provado. Steward, Lorsban, Bidrin 4EC, and the three rates of Acetamiprid were in the middle group as far as tarnished plant bug suppression was concerned. There were no rate responses toward tarnished plant bugs with the three rates of Acetamiprid. However, Acetamiprid showed the most selectivity of all treatments to big-eyed bugs and there was a rate relationship with this species. Pirate, Provado, and Steward showed the most selectivity toward minute priate bugs species.

TABLE 1. NUMBER OF TARNISHED PLANT BUGS PER 100 ROW FEET

Treatment	Rate	——June 24——			——June 29——			——July 8——			——Season——		
	lbs ai/ac	N[1]	A[2]	T[3]	N	A	T	N	A	T	N	A	T
Bidrin 41WP	0.25	0	0	0	37.5	0	37.5	25	6.25	31.25	20.83	2.08	22.92
Capture 2 EC	0.04	0	0	0	81.25	0	81.25	12.5	0	12.5	1.25	0.00	31.25
Karate 2 EC	0.025	0	0	0	75	6.25	81.25	18.75	0	18.75	31.25	2.08	33.33
Bidrin 8 EC	0.25	0	3.33	3.33	112.5	18.75	131.25	12.5	0	12.5	41.67	7.36	49.03
Lorsban 4 EC	0.2	6.67	10	16.67	93.75	0	93.75	25	12.5	37.5	41.81	7.50	49.31
Acetamiprid 70 WP	0.038	3.33	6.67	10	106.25	12.5	118.75	25	0	25	44.86	6.39	51.25
Acetamiprid 70 WP	0.025	0	0	0	125	6.25	131.25	25	6.25	31.25	50.00	4.17	54.17
Acetamiprid 70 WP	0.075	0	0	0	100	0	100	62.5	0	62.5	54.17	0.00	54.17
Steward 1.25 SC	0.11	3.33	0	3.33	143.75	0	143.75	18.75	6.25	25	55.28	2.08	57.36
Provado 1.6 F	0.047	3.33	6.67	10	137.5	0	137.5	56.25	0	56.25	65.69	2.22	67.92
Pirate 3 SC	0.35	6.67	0	6.67	14.75	0	143.75	87.5	0	87.5	79.31	0.00	79.31
Leverage 2.7	3 oz/ac	0	3.33	3.33	193.75	6.25	200	43.75	0	43.75	79.17	3.19	82.36
Decis 1.5 EC	0.019	6.67	0	6.67	275	0	275	31.25	0	31.25	104.31	0.00	104.31
Orthene 90 SP	0.225	0	6.67	6.67	281.25	0	281.25	43.75	12.5	56.25	108.33	6.39	114.72
Untreated	——	3.33	23.33	26.66	243.75	6.25	250	175	0	175	140.69	9.86	150.55

[1] N=nymphs. [2] A= adults. [3] T = total.

Pretreatment populations on June 21 averaged 15 nymphs and 22.5 adults.

TABLE 2. NUMBER OF BIG-EYED BUGS PER 100 ROW FEET

Treatment	Rate	June 24			June 29			July 8			Season		
	lbs ai/ac	N[1]	A[2]	T[3]	N	A	T	N	A	T	N	A	T
Acetamiprid 70 WP	0.025	6.67	20	26.67	81.25	31.25	112.5	18.75	37.5	56.25	35.56	29.58	65.14
Acetamiprid 70 WP	0.038	6.67	33.33	40	62.5	0	62.5	25	31.25	56.25	31.39	25.53	52.92
Steward 1.25 SC	0.11	0	13.33	13.33	37.5	37.5	75.0	12.5	0	12.5	16.67	16.94	33.61
Acetamiprid 70 WP	0.075	0	9	9	12.5	12.5	25	18.75	43.75	62.5	10.42	21.75	32.17
Untreated	—	6.67	20	26.67	37.5	12.5	50	18.75	0	18.75	20.97	10.83	31.81
Provado 1.6 F	0.047	0	6.67	6.67	25	0	25	12.5	43.75	56.25	12.50	16.81	29.31
Lorsban 4 EC	0.2	0	20	20	12.5	0	12.5	0	50	50	4.17	23.33	27.50
Pirate 3 SC	0.35	3.33	10	13.33	0	37.5	37.5	0	6.25	6.25	1.11	17.92	19.03
Orthene 90 SP	0.225	3.33	3.33	6.66	6.25	6.25	12.5	6.25	18.75	25	5.28	9.44	14.72
Leverage 2.7	3 oz/ac	0	0	0	12.5	6.25	18.75	0	18.75	18.75	4.17	8.33	12.50
Decis 1.5 EC	0.019	0	0	0	18.75	6.25	25	6.25	0	6.25	8.33	2.08	10.42
Bidrin 8 EC	0.25	0	0	0	6.25	6.25	12.5	0	12.5	12.5	2.08	6.25	8.33
Capture 2 EC	0.04	0	0	0	0	0	0	12.5	0	12.5	4.17	0.00	4.17
Karate Z 2.08	0.025	0	0	0	0	6.25	6.25	0	6.25	6.25	0.00	4.17	4.17
Bidrin 41 WP	0.25	0	0	0	0	0	0	6.25	0	6.25	2.08	0.00	2.08

[1] N = nymphs. [2] A = adults. [3] T = total.

Pretreatment populations on June 21 averaged 0 nymphs and 20 adults.

TABLE 3. NUMBER OF MINUTE PIRATE BUGS PER 100 ROW FEET

Treatment	Rate	June 24			June 29			July 8			Season		
	lbs ai/ac	N[1]	A[2]	T[3]	N	A	T	N	A	T	N	A	T
Untreated	—	0	46.67	46.67	6.25	50	56.25	12.5	37.5	50	6.25	44.72	50.97
Pirate 3 SC	0.35	0	40	40	0	25	25	0	12.5	12.5	0.00	25.83	25.83
Provado 1.6 F	0.047	6.67	6.67	13.34	12.5	31.25	43.75	0	6.25	6.25	6.39	14.72	21.11
Steward 1.25 SC	0.10	0	16.67	16.67	0	31.25	31.25	0	12.5	12.5	0.00	20.14	20.14
Orthene 90 SP	0.225	0	16.67	16.67	0	37.5	37.5	0	0	0	0.00	18.06	18.06
Capture 2 EC	0.04	0	3.33	3.33	0	43.75	43.75	0	0	0	0.00	15.69	15.69
Leverage 2.7	3 oz/ac	0	3.33	3.33	0	31.25	31.25	0	12.5	12.5	0.00	15.69	15.69
Bidrin 8 EC	0.25	0	6.67	6.67	0	37.5	37.5	0	0	0	0.00	14.72	14.72
Acetamiprid 70 WP	0.025	0	6.67	6.67	0	25	25	6.25	0	6.25	2.086	10.56	12.64
Lorsban 4 EC	0.2	0	23.33	23.33	0	12.5	12.5	0	0	0	0.00	11.94	11.94
Decis 1.5 EC	0.019	0	0	0	0	18.75	18.75	0	6.25	6.25	0.00	8.33	8.33
Karate Z 2.08	0.025	0	0	0	0	18.75	18.75	0	6.25	6.25	0.00	8.33	8.33
Acetamiprid 70 WP	0.075	0	3.33	3.33	0	12.5	12.5	0	6.25	6.25	0.00	7.36	7.36
Acetamiprid 70 WP	0.038	0	0	0	0	18.75	18.75	0	0	0	0.00	6.25	6.25
Bidrin 41 WP	0.25	0	0	0	6.25	0	6.25	0	6.25	6.25	2.08	2.08	4.17

[1] N = nymphs. [2] A = adults. [3] T = total.

Pretreatment populations on June 21 averaged 0 nymphs and 97.5 adults.

EFFICACY OF SELECTED INSECTICIDES FOR BOLLWORM/BUDWORM CONTROL IN COTTON

Ron H. Smith and Richard L. Davis

The objective of this research was to evaluate selected foliar-applied insecticides for bollworm/budworm control in cotton.

Plots were planted on April 12 with Sure-Grow 180 cotton on the Prattville Research Field. Plots consisted of four rows 60 feet long with a 40-inch row spacing and were arranged in a randomized complete block with four replications. All plots were maintained throughout the season with standard herbicide and fertility production practices as recommended by the Alabama Cooperative Extension System.

Insecticides were applied on June 18, July 16, July 19, August 3, and August 13. The insecticides applied on July 16 were washed off by rain. Plots were evaluated on June 21, July 26, August 6, and August 17. Whole plant surveys were taken on seven plants selected at random from the center two rows of each plot. Subsampling consisted of examining 20 additional squares per plot for bollworm/budworm damage.

Species identified were tobacco budworms (nearly 100%) on June 18, cotton bollworm (more than 90%) on July 16 and 19, and tobacco budworms (estimated at 70%) on August 3 and 13. The center two rows of each 60-foot plot were harvested on September 23.

All treatments reduced the number of bollworm/budworm larvae below the untreated check (Table 1). Intrepid plus Karate was the most effective treatment while Dimilin and Denim were the least effective. Damaged fruit ratings were closely related to the level of worm control. In general, the treatments with pyrethroid chemistry were as effective or more so than the newer chemistry. This indicates that the bollworm species made up the majority of the worm population in 1999. Yields ranged from a high of 2,395 pounds per acre to a low of 2,072 pounds per acre (Table 2).

TABLE 1. NUMBER OF LARVAE LARGER THAN 0.25 INCH PER 100 PLANTS AND PERCENT SQUARE DAMAGE

Treatment[1]	Rate	June 21		July 26		August 6		August 17		Season	
	lbs ai/ac	Larvae	Damage	Larvae	Damage	Larvae	Damage	Larvae	Damage	Larvae	Damage
Intrepid 80 WP + Karate Z	0.15 + 0.033	0 a	3.33 a	8 b	1.25 d	0 a	0 c	0 b	5 a	0 c	2.4 c
Karate Z	0.033	0 a	0 a	3.5 b	2.5 cd	0 a	3.75 bc	0 b	2.5 a	0.88 bc	2.19 c
Orthene 90 Sp + Decis 1.5 EC	0.5 + 0.025	0 a	8.33 a	3.5 b	5 cd	0 a	0 c	3.5 b	8.75 a	1.75 bc	5.42 c
Steward 1.25 SC	0.11	0 a	5 a	0 b	3.75 cd	0 a	3.75 bc	7 b	5 a	1.75 bc	4.17 c
Tracer 4 SC	0.062	0 a	5 a	3.5 b	7.5 cd	3.5 a	7.5 ab	0 b	2.5 a	1.75 bc	5.52 c
Decis 1.5 EC	0.025	0 a	3.33 a	3.5 b	3.75 cd	3.5 a	3.75 bc	3.5 b	5 a	2.63 bc	4.27 c
Fury 1.5 EC + Lepinox	0.0375 + 0.3	0 a	6.67 a	7 b	5 cd	3.5 a	2.5 bc	0 b	2.5 a	2.63 bc	3.85 c
Steward 1.25 SC	0.09	0 a	0 a	3.5 b	6.25 cd	0 a	0 c	7 b	11.25 a	2.63 bc	4.79 c
Dimilin 2L	6.0 oz	0 a	10 a	10.5 b	15 b	7 a	11.25 a	3.5 b	6.25 a	5.25 bc	10.52 ab
Denim 0.16 EC	0.01	2.5 a	6.67 a	6.67 b	10 bc	7 a	2.5 bc	7 b	10 a	5.88 b	7.08 bc
Untreated	—	0 a	10 a	10 a	23.75 a	7 a	7.5 ab	17.5 a	8.75 a	14.13 a	12.4 a

[1] Treatments made June 18, July 19, August 3, and August 13. Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

TABLE 2. SEED COTTON YIELD PER ACRE

Treatment	Rate *lbs ai/ac*	Seed cotton yield *lbs/ac*
Intrepid 80 WP + Karate Z	0.15 + 0.033	2395.8 a
Karate Z	0.033	2329.3 ab
Orthene 90 Sp + Decis 1.5 EC	0.5 + 0.025	2492.6 a
Steward 1.25 SC	0.11	2283.9 ab
Tracer 4 SC	0.062	2072.1 b
Decis 1.5 EC	0.025	2329.3 ab
Fury 1.5 EC + Lepinox	0.0375 + 0.3	2323.2 ab
Steward 1.25 SC	0.09	2320.2 ab
Dimilin 2L	6.0 oz	2084.2 b
Denim 0.16 EC	0.01	2259.7 ab
Untreated	—	2072.1 b

Means within columns followed by a common letter are not significantly different at the p=0.05 level according to Duncan's Multiple Range Test.

RESISTANCE MONITORING OF TOBACCO BUDWORM/COTTON BOLLWORM IN BT COTTON

William J. Moar and Ron H. Smith

Since the introduction of Bt cotton in the United States in 1996, Alabama growers have consistently used Bt cotton in about 65% of the statewide cotton acreage. This is the highest percentage use of Bt cotton in the United States. Furthermore, several areas of the state such as southwestern Alabama, have used the 96/4 strategywith Bt cotton on most farms for the last four years. Although concerns have always been raised regarding the increased threat of Bt resistance developing in insects exposed to Bt transgenic crops, this "concentrated" use of Bt cotton should raise these concerns even higher.

To help address some of the concerns regarding Bt resistance developing in tobacco budworm and cotton bollworm, the U.S. Department of Agriculture's Agricultural Research Service (USDA/ARS) facility in Stoneville, Mississippi, started providing insect larval bioassay services in 1997 for anyone willing to send them tobacco budworm or cotton bollworm from Bt cotton areas. In 1997, growers, consultants, and extension and university faculty from Alabama sent in a total of 23 samples of insects for resistance assessment. These samples were collected from throughout Alabama and represented about 40% of all insect samples received and tested by USDA/ARS. This project has continued annually since 1997. This summary reports the results from the 1999 growing season.

About 70 Bt Resistance Management Kits were sent out to interested parties (consultants, extension specialists, private industry), primarily in the southern half Alabama and northwestern Florida. Most of these kits were not used because of the relatively low numbers of tobacco budworms and cotton bollworms found in Bt and nonBt cotton. However, at least 10 tobacco budworm/cotton bollworm samples from Alabama were sent to USDA/ARS in Stoneville. These samples came primarily from Autauga, Escambia, Henry, and Mobile counties and accounted for about 20% of all samples analyzed by USDA/ARS in 1999. These samples were tested for Bt resistance, which is indicated by the insects' susceptibility to *Heliothis virescens* and *Helicoverpa zea.*

Results from these tests showed no detectable changes in susceptibility for *H. virescens*. After four years of sometimes intense use of Bt cotton, the level of susceptibility in *H. virescens* has not changed. Results with *H. zea* from 1999, however, showed a significant decrease in susceptibility in one population from Mobile County, Alabama, and one population in Escambia County, Florida. However, this change in susceptibility was not a reduction in mortality; it was just an increase in the number of larvae that required several more days to die than normal. These results show a trend in decreased susceptibility for *H. zea*. As such, the monitoring program needs to be maintained or perhaps even increased in order to further document the current observations and to determine if these trends will, in fact, continue. However, our results by do not appear to be substantial or conclusive enough to suggest that an increase in refugia (areas where Bt cotton is not planted) is warranted.

EVALUATION OF SELECTED INSECTICIDES FOR EFFICACY ON SOYBEAN LOOPERS

Ron H. Smith and Richard L. Davis

The objective of this research was to evaluate foliar-applied insecticides for soybean looper control in cotton.

Plots were planted on May 20 with Deltapine DP 458BRR cotton on the Little Farm in Baldwin County, Alabama. Plots consisted of four rows 500 feet long and 36 inches wide and were arranged as adjacent strips with one replication (screening trial). All plots were maintained throughout the season with standard herbicide and fertility production practices as recommended by the Alabama Cooperative Extension System. Treatments were applied on August 28.

Plots were evaluated for soybean loopers on September 1 and September 23. Four sample sites were selected at random from the center two rows within each strip. At each site, six row feet were sampled by the shake cloth method. Foliage loss was estimated after the entire treated area was surveyed (Table 1).

TABLE 1. PERCENT DEFOLIATION ON SEPTEMBER 23

Treatment	Rate	——Percent defoliation——	
	lbs ai/ac	Lower canopy	Upper canopy
RH-2485 (Intrepid) 80 WP	0.15	20	< 5
Steward 1.25 SC	0.09	20	< 5
Steward 1.25 SC	0.065	25	< 5
RH-2485 (Intrepid) 80 WP	0.01	30	< 5
Pirate 3 SC	0.2	35	4
Denim 0.16	0.01	40	10
Tracer 3 SC	0.045	40	15
Larvin 3.2 F	0.6	50	15
Untreated	—	60	20
Lepinox	1.0	60	25

Intrepid at 0.1 and 0.15 pound active ingredient per acre gave the highest level of control of soybean loopers (Table 2). Other insecticides that significantly reduced looper numbers were Steward, Pirate, Tracer, and Denim. Larvin gave some suppression, but not at the level of the newer insecticides.

At four days posttreatment, Lepinox (Bt) had more loopers than the untreated control. About 30 hours after treatment, 1.5 inches of rain fell and this likely had an impact on all treatments. However, frequent thunderstorms are a normal occurrence in this part of Alabama and these results may be quite typical of those that a grower might expect under on-farm conditions when rainfall occurs following treatment with these newer insecticides.

TABLE 2. NUMBER OF LOOPERS PER SIX ROW FEET[1]

Treatment	Rate	Loopers/6 row ft				
	lbs ai/ac	Count 1	Count 2	Count 3	Count 4	Avg.
RH-2485 (Intrepid) 80 WP	0.15	5	6	7	10	7
RH-2485 (Intrepid) 80 WP	0.01	14	5	5	12	9
Steward 1.25 SC	0.09	14	16	4	12	11.5
Pirate 3 SC	0.2	19	25	2	15	15.25
Steward 1.25 SC	0.065	19	12	19	15	16.25
Tracer 3 SC	0.045	13	25	16	17	17.75
Denim 0.16	0.01	17	13	19	27	19.0
Larvin 3.2 F	0.6	29	32	25	21	26.75
Untreated	—	31	30	35	42	34.5
Lepinox	1.0	40	49	31	45	41.25

[1] Evaluations made four days post treatment.
Pretreatment count on August 27: 37.8 loopers per six row feet.

HERBICIDE APPLICATIONS

ON-FARM COMPARISON OF COTTON WEED CONTROL IN ROUNDUP READY COTTON

Charles Burmester

The objective of this on-farm study was to compare two cotton weed control systems using a Roundup Ready cotton variety. One weed control system used a total postemergence program of Roundup Ultra while the other system used preemergence applications of Cotoran (one pound) and Caparol (0.75 pound) in combination with postemergence application of Roundup Ultra.

The test was located in Limestone County, Alabama. The cotton variety Deltapine DP 458BRR was planted on April 20. Plots were eight rows wide and ran the length of the field (1,600 feet). Plots were replicated three times across the field.

Early season rainfall was excellent and produced rapid cotton and weed growth. The Roundup-only system had Roundup Ultra sprayed at the two and four leaf stage of cotton growth. Early season weed competition in this system was intense and cotton often could not be seen until the plots were sprayed. The preemergence application did an excellent job of early season weed control and Roundup Ultra was applied only at the four-leaf stage. Both systems controlled weeds, and cotton was essentially weed free as cotton approached the fifth and sixth leaf stage.

In late season, pigweed became a problem in plots where no preemergence herbicides were used. Pigweeds between rows were controlled with Roundup Ultra using a hooded sprayer, but pigweeds emerging in the row could not be controlled.

EFFECT OF HERBICIDE SYSTEM ON ROUNDUP READY COTTON YIELDS

Treatment	Rate	Growth stage	Seed cotton yields	
	ai/ac		*lbs/plot*	*lbs/ac*
Cotoran Caparol	I lb 1.5 pt	preemergence	1103.3 a	1187 a
Roundup Ultra	1 qt	postemerence	1029.7 a	1105 a
LSD (0.10)			***217.59***	***233.7***

Means with the same letter are not significantly different at the p=0.10 level.

Plots were harvested on September 13 and weighed in a boll buggy before being moduled. Yields (see table) were very low due to a late season drought, but yields were slightly higher in plots where a preemergence herbicide treatment was used. Under these conditions of intense early season weed pressure, use of low rates of preemergence herbicides with Roundup Ultra appears to be very beneficial. No herbicide damage to cotton was noted in any treatment.

HARVEST AID EVALUATION FOR COTTON REGROWTH CONTROL

Michael G. Patterson

The objective of this research was to evaluate several cotton harvest aides for control of new growth in cotton that had been defoliated but had put out new leaves due to a delay in harvesting.

A field of cotton was defoliated using Def 6 at one pint per acre approximately three weeks before treatment with several harvest aides on October 13. Treatments were applied in 10 gallons of solution per acre using 8002 flat fan nozzles spaced 20 inches apart on the boom. Cotton was approximately 40 inches tall at application and air temperature was 78° F with 80% relative humidity.

Plots were planted with Paymaster PM 1220BG/RR on May 22 at the Monroeville Research Field. Plots consisted of four rows, 30 feet long with 38-inch row spacing and were arranged in a randomized complete block design with four replications.

Visual estimates of leaf removal were made at five and 12 days after treatment on a scale of 0 to 100 where 0 = no leaves removed and 100 = all leaves removed.

GREEN LEAF REMOVAL FROM COTTON BY VARIOUS COTTON HARVEST AIDES

Treatment	Rate *ai/ac*	5 DAT *%*	12 DAT *%*
Untreated	—	0	0
Def 6	1.5 pt	87	89
Def 6 Dropp 50 W	0.5 pt 0.1 lb	50	71
Harvade 5F Ginstar 1.5E Crop oil concentrate	6 oz 2 oz 1 pt	52	76
Prep 6 Def 6 Crop oil concentrate	12 oz 6 oz 1 pt	55	64

continued

Visual estimates of green leaf removal varied from 87 % (Def at 1.5 pints) to 0 % (untreated) at five days after treatment (see table). Sodium chlorate at three quarts alone provided 66% removal followed by CottonQuik at two pints, Ginstar at two ounces plus Finish at one pint, and Quickpick at one pint plus sodium chlorate at two quarts, each providing 60% leaf removal. At 12 days after treatment, Def provided 89% removal, followed by Ginstar at four fluid ounces, Ginstar plus Finish, and Harvade plus Ginstar plus crop oil concentrate. Lower than labeled rates of several newer products such as Ginstar (minimum six fluid ounces per acre) and Finish (minimum rate two pints) were used to evaluate their potential as low cost alternatives.

If cotton will be harvested less than one week after application, then Def or Folex (phosphoro-trithioate) would be a good choice. Based on this one trial, if cotton will not be harvested within two weeks, then Def or Folex or Ginstar alone or in mixture with Finish or Harvade would work well. Harvest aid activity is dependent on several factors such as the spray coverage obtained and the temperature and humidity at time of application and for several days afterward.

GREEN LEAF REMOVAL FROM COTTON BY VARIOUS COTTON HARVEST AIDES, CONTINUED

Treatment	Rate *ai/ac*	5 DAT %	12 DAT %
CottonQuik	2 pts	60	70
Finish 4	1 pt	34	41
Quickpick 3.1	1 pt	16	25
Na Chlorate 6	3 qts	66	69
Ginstar 1.5E Finish 4	2 oz 1 pt	60	76
Quickpick 3.1 Na Chlorate 6	1 pt 2 qts	60	66
Starfire surfactant	2 oz 0.25%	59	72
Prep 6	1.33 pt	36	4

VALOR 50 WDG FOR LAYBY WEED CONTROL IN COTTON

Michael G. Patterson

The objective of this research was to evaluate Valor herbicide as a potential replacement for cyanazine (Bladex) in cotton production for use in layby applications. Valor was used alone or in tank mix with MSMA and evaluated for late-season control of emerged weeds. Crop injury was also evaluated.

Plots were planted May 25 with Deltapine DP 5415 cotton at the E. V. Smith Research Center, Tallassee, Alabama. Plots were four rows wide and 30 feet long, with a 36-inch row spacing. Applications were made using a 15003 flat fan nozzle running between cotton rows and calibrated to deliver 15 gallons of solution per acre. Weed species and size at application were as follows: annual grass (50% goosegrass, 50% large crabgrass), eight inches; pigweed (50% hybrid, 50% spiney), 10 inches; yellow nutsedge, eight inches; entireleaf morningglory, 18 inches; and sicklepod, nine inches. Visual weed control and crop injury ratings were made 14 days after treating where 0 = no control or injury and 100 = complete control or death.

Valor at 0.063 pound active ingredient per acre with crop oil concentrate (COC) directed to the base of 14-inch tall cotton controlled annual grasses (46%), pigweed (91%), yellow nutsedge (39%), morningglory (93%), and sicklepod (89%) at 14 days after treatment (see table). Crop injury was minimal. Valor at 0.063 pound active ingredient per acre plus MSMA at two pounds with COC controlled annual grasses (71%), pigweed (93%), yellow nutsedge (70%), morningglory (94%), and sicklepod (94%). For comparison,CY-PRO (cyanazine) at 0.75 pound active ingredient per acre plus MSMA at two pounds with COC controlled annual grasses (80%), pigweed (75%), yellow nutsedge (65%), morningglory (94%), and sicklepod (89%).

In conclusion, Valor plus MSMA provided weed control equal to or better than cyanazine plus MSMA and would provide an acceptable alternative to this standard layby treatment.

EFFECTS OF VALOR 50 WDG HERBICIDE ON COTTON AND SELECTED WEEDS

Treatment	Rate	CI[1]	GRS	PW	NSZ	MG	SP
	lbs ai/ac	(%)					
Untreated	—	0	0	0	0	0	0
Valor COC[2]	0.063 2 pts	3	46	91	39	93	89
Valor MSMA COC	0.063 2.0 2 pts	6	71	93	70	94	94
CY-PRO MSMA COC	0.75 2.0 2 pts	5	80	75	65	94	89

[1] CI= crop injury, GRS= grass, PW= pigweed, NSZ= nutsedge, MG= morningglory, SP= sicklepod.

[2] COC = crop oil concentrate.

NEMATICIDE APPLICATIONS

IMPACT OF VARIOUS CROP ROTATIONS AND WINTER COVER CROPS ON RENIFORM NEMATODE IN COTTON

William S. Gazaway, James R. Akridge, and Kathy McLean

The purpose of this test was to reaffirm the ability of nonhost crops to reduce reniform nematode populations and to determine if certain winter cover crops or fallow will reduce reniform nematode populations to safe levels.

A field near Huxford, Alabama, was selected for the test. This sandy loam field has had a high infestation of Reniform nematode for more than 12 years and, as a result, has suffered substantial cotton yield losses during that period. Corn (DeKalb 683), soybean (Centennial), peanut (Southern Runner), cotton (Deltapine DP 458BRR), and cotton treated with a nematicide (Temik 15G®) were planted on May 25, 1998 in assigned plots. Cotton, which did not receive Temik 15G (aldicarb), was treated with the insecticide Di-Syston 15G® at seven pounds per acre for early season insect control. Vetch (Cahaba White), rye (Wren's Abruzzi), and fallow followed the summer crop harvest in the fall of 1998.

The experimental design was a split plot, randomized design with five replications. Main plots were the winter cover crops and fallow. On May 11, the cotton variety Deltapine DP 655BRR or cotton treated with Temik 15G at seven pounds per acre was planted in all plots. Plots consisted of four 36-inch rows 25 feet long. Soil samples were pulled for nematode analyses from the two inner rows of each plot on May 22, 1998; July 7, 1998; August 19, 1998; November 10, 1998; May 11, 1999; July 22, 1999; and October 7, 1999. Cotton was harvested from the two inner rows of each plot on October 21, 1999. All other cultural practices, weed control, and insect control were implemented according to Auburn University recommendations.

Cotton production varied significantly following rye, vetch, and winter fallow (Table 1). Cotton following vetch had higher yields than cotton following fallow or rye. The better-than-expected cotton yields in the plots following vetch could be attributed to the additional nitrogen produced by this legume.

Plots with winter rye produced the lowest cotton yields in 1999. Considering that rye is not a host to Reniform nematode, these results were surprising. The low cotton yield following rye is believed to be attributed to a nitrogen deficiency, induced by a "green manure" effect. The rye was fairly large when turned under in the late spring. Cotton planted in the rye plots showed signs of nitrogen deficiency throughout the 1999 season. The winter cover crops or fallow did not appear to impact Reniform nematode reproduction since there were no significant differences in nematode populations in the spring of 1999.

Rotation with nonhost crops in 1998 significantly affected both Reniform nematode populations and subsequent cotton yields in 1999. The 1998 peanut and corn crops were the most effective in reducing nematode populations in the spring of 1999. Reniform populations were surprisingly high in plots following the 1998 soybean crop and high, as expected, in plots following cotton and cotton treated with a nematicide (Figure 1). By the end of the 1999 cotton season in October, Reniform nematode populations had rebounded to lethal levels in all treatments. While nonhost crops, including corn, peanut, and soybean, failed to keep Reniform populations at low levels throughout the growing season, these crops did significantly outproduce the continuous cotton

TABLE 1. EFFECT OF 1998/1999 WINTER COVER CROPS AND FALLOW ON 1999 COTTON PRODUCTION

Winter cover crop	Seed cotton yield *lbs/ac*
Vetch	2849 a
Fallow	2615 b
Rye	2085 c
LSD (0.05)	***233***

Means with the same letter are not significantly different at the p=0.05 level.

TABLE 2. IMPACT OF CROP ROTATION WITH NONHOST 1998 SUMMER CROPS ON COTTON PRODUCTION IN 1999

1998 crop	Seed cotton yield *lbs/ac*
Corn	2808 a
Peanut	2739 a
Soybean	2720 a
Cotton	2175 b
Cotton + Temik	2139 b
LSD (0.05)	***21***

Means with the same letter are not significantly different at the p=0.05 level.

nematicide-treated and untreated plots (Table 2). In this particular field, Temik 15 G (aldicarb) at seven pounds per acre failed to increase cotton yields in 1998 and in 1999 (Table 3).

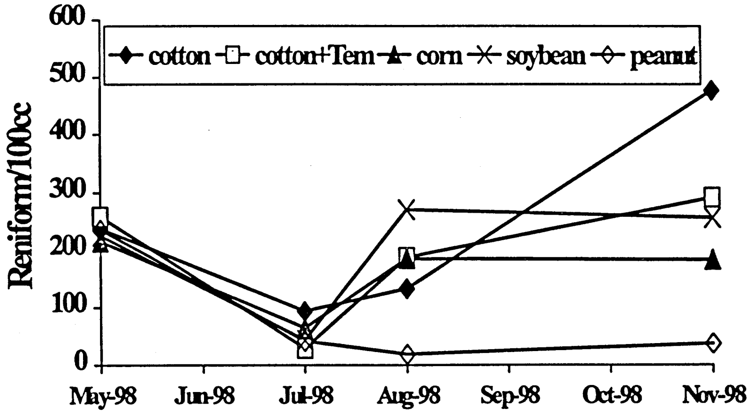
TABLE 3. COTTON PRODUCTION RESPONSE TO TEMIK 15G IN CONTINUOUS COTTON

Treatment	Seed cotton yield 1998 *lbs/ac*	Seed cotton yield 1999 *lb/sac*	Average yield *lbs/ac*
Temik 15G	1995 a	2139 a	2067
DiSyston 15G	1786 a	2175 a	1981
LSD (0.05)	***360***	***218***	

Means with the same letter are not significantly different at the p=0.05 level.

Alternating nonhost crops such as corn, peanut, and certain soybean cultivars (i.e., Centennial) every other year with cotton appears to increase cotton production in Reniform nematode-infested fields. Temik's failure to improve cotton yields in this heavily infested Reniform nematode field for two consecutive years is surprising since this nematicide has performed effectively in other similar cotton fields. Its failure to get positive yield response could be due to the following: (1) The environmental conditions at the time of application could be unfavorable. (2) Temik could be inable to effectively control high reniform populations. (3) Reniform populations could be developing resistance to Temik. (4) Soil microbes in this field could be breaking down Temik (aldicarb) into compounds harmless to the nematode. More studies must be conducted to determine which might be the cause.

Effect of summer on reniform nematode populations in 1998.



EFFECT OF FALL AND SPRING TELONE FUMIGATION ON THE MANAGEMENT OF RENIFORM NEMATODES IN COTTON

William S. Gazaway, James R. Akridge, and Kathy McLean

Telone II, 1,3-dichloropene, is an effective fumigant for managing Reniform nematodes (*Rotylenchulus reniformis)* in cotton when applied under the proper soil conditions. During fall and spring, cotton producers are more likely to encounter cold, wet soils that would impede the movement of the fumigant and lead to possible damage to cotton seedlings. For this reason, it is believed that soil conditions in the fall would be more favorable for fumigation than in the spring. The purpose of this test was to determine if fall fumigation is superior to spring fumigation in managing reniform nematodes in cotton.

A cotton field heavily infested with Reniform nematodes was selected for the test. The field (loam soil) was cultivated and bedded. Treatments were arranged in a randomized complete block design and replicated five times. In the fall, Telone II was injected 14 to 16 inches deep into raised seed beds at rates of three gallons per acre and five gallons per acre, respectively. All other plots that did not receive a fumigant were ripped with a shank as well. After fumigation, rye was planted over the test area. In the spring, Telone was applied to designated plots. Again, all plots were ripped with a shank. Cotton was planted to all plots one week following fumigation. All plots except for the Temik-treated plots were treated with Di-Syston in the seed furrow at planting for early insect control. All other farming practices were followed according to Auburn University recommendations.

Soil samples for nematode analyses were taken before fall fumigation on November 1, 1998; during the winter on February 10, 1999; before spring fumigation on May 11; in the middle of the growing season on July 22; and at harvest on October 21.

TABLE 1. IMPACT OF FUMIGATION ON COTTON PRODUCTION

Nematicide	Rate per acre	Time of application	Seed cotton yield *lbs/ac*
Telone II	5 gals	Fall	2313 a
Telone II	3 gals	Fall	2312 a
Telone II	3 gals	Spring	2193 a
Temik 15G	7 lbs	Spring	2095 ab
Di-Syston 15G	7 lbs	Spring	1961b
LSD (0.05)			***205***

Means with the same letter are not significantly different at the p=0.05 level.

During both spring and fall, Telone-fumigated plots produced slightly better yields than Temik-treated plots and significantly better yields than the plots not receiving a nematicide (Table 1). Fall fumigation was slightly superior to spring fumigation in this test. However, there were no differences between the three gallons and the five gallons per acre fall application rates of Telone.

The slight difference between fall and spring Telone application could be due to the relatively favorable conditions for Telone application in the spring of 1999. More tests need to be conducted over time and under more adverse conditions in the spring to determine if fall application of Telone would indeed be superior. Fall application of Telone did appear to reduce reniform nematode populations significantly in the spring (Table 2). Populations in all treatments rebounded to damaging levels by the end of the growing season, however.

TABLE 2. EFFECT OF FUMIGATION ON RENIFORM NEMATODE POPULATIONS

Nematicide	Rate per acre	Timing	——Reniform nematodes per 100 cc soil——				
			11/1/98	2/10/99	5/11/99	7/22/99	10/21/99
Telone II	5 gals	Fall	1084 a	1036 c	230 c	2177 a	1505 a
Telone II	3 gals	Fall	1486 a	957 c	392 bc	1995 a	1603 a
Telone II	3 gals	Spring	1396 a	1507 bc	1000 a	2396 a	1052 a
Temik 15G	7 lbs	Spring	1456 a	2015 ab	647 b	2310 a	1173 a
Di-Syston	7 lbs	Spring	1678 a	2533 a	621 b	2453 a	1476 a
LSD (0.05)			***802***	***882***	***336***	***1249***	***763***

FUNGICIDE APPLICATIONS

EVALUATION OF SELECTED EXPERIMENTAL SEED TREATMENTS FOR CONTROL OF SEEDLING DISEASE OF COTTON

Kathy S. McLean and William S. Gazaway

The objective of this test was to evaluate selected esperimental cotton seed treatments for control of *Rhizoctonia solani* and *Pythium* spp. for seedling disease of cotton. LS 288 and RTU BaytanThiram + Allegiance were applied to a known amount of seed in a ziploc bag and shaken until completely covered and then allowed to dry before planting. All other fungicides were applied to the seed by the manufacturer. Each plot was infested with *Pythium* spp. and *R. solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Tennessee Valley Research and Extension Center with Stoneville 474 on May 3. Plots consisted of two rows, 25 feet long and 40 inches wide. Blocks were separated by 20-foot alleys and were arranged in a randomized complete block design with four replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 19 and June 2. Plant maturity was estimated by the percent of open bolls on September 10. Plots were harvested on September 28. 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.

Significant differences in seedling stand were observed at 16 and 30 days after planting. At two and four weeks after planting, Vitavax-PCNB + Allegiance FL, WE -120C + Nu-Flow M + WE-147 + Nu-Grow Film Coat, and RTU Baytan Thiram + Allegiance had significantly greater stands than the untreated control (Tables 1 and 2). Vitavax-PCNB + Allegiance FL and RTU Baytan Thiram + Allegiance also produced a significantly lower skip index indicating a more uniform seedling stand

TABLE 1. EFFECT OF SELECTED SEED TREATMENTS ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR 16 DAYS AFTER PLANTING

Treatment	Rate *fl oz/cwt*	Emergence per 10 ft of row	Plants per foot of row	Skip index	Vigor rating
Untreated control	—	14.25 d	0.57 d	20.0 a	3.0 a
Vitavax-PCNB + Allegiance FL	6.0 + 0.75	46.25 a	1.85 a	10.5 c	3.62 a
RTU Baytan Thiram + Apron FL	3.0 + 0.75	23.75 bcd	0.95 bcd	16.2 abc	3.25 a
NU-Flow T + Nu-Flow M + Apron XL	2.25 + 1.25 + 0.32	25.25 bcd	1.01 bcd	15.0 abc	2.88 a
Maxim + Nu-Flow M + Apron XL	0.08 + 1.75 + 0.32	26.0 bcd	1.04 bcd	16.8 ab	3.38 a
WE-120C + Nu-Flow M + WE-147 + Nu-Grow Film Coat	0.24 + 1.25 + 2.0 + 2.0	37.25 ab	1.49 ab	14.3 abc	3.50 a
WE-142 + WE-147 + Nu-Grow Film Coat	2.0 + 2.0 + 2.0	17.5 cd	0.70 cd	15.8 abc	3.00 a
LS 288	0.5 oz/cwt	24.0 bcd	0.96 bcd	16.0 abc	3.50 a
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz/cwt	33.0 abc	1.32 abc	13.8 bc	3.38 a
LSD (0.05)		***17.30***	***0.69***	***5.9***	***0.96***

Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED SEED TREATMENTS ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR 30 DAYS AFTER PLANTING

Treatment	Rate *fl oz/cwt*	Emergence per 10 ft of row	Plants per foot of row	Skip index	Vigor rating
Untreated control	—	9.75 c	0.39 c	21.3 a	2.25 b
Vitavax-PCNB + Allegiance FL	6.0 + 0.75	31.00 a	1.24 a	14.8 b	3.75 a
RTU Baytan Thiram + Apron FL	3.0 + 0.75	18.75 abc	0.75 abc	18.3 ab	2.88 ab
NU-Flow T + Nu-Flow M + Apron XL	2.25 + 1.25 + 0.32	22.25 abc	0.89 abc	18.8 ab	3.38 ab
Maxim + Nu-Flow M + Apron XL	0.08 + 1.75 + 0.32	19.25 abc	0.77 abc	20.0 ab	3.25 ab
WE-120C + Nu-Flow M + WE-147 + Nu-Grow Film Coat	0.24 + 1.25 + 2.0 + 2.0	28.00 ab	1.12 ab	15.2 ab	3.38 ab
WE-142 + WE-147 + Nu-Grow Film Coat	2.0 + 2.0 + 2.0	15.00 bc	0.60 bc	19.0 ab	2.63 ab
LS 288	0.5 oz/cwt	20.25 abc	0.81 abc	17.5 ab	3.38 ab
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz/cwt	25.25 ab	1.01 ab	18.0 ab	2.75 ab
LSD (0.05)		***14.34***	***0.57***	***6.0***	***1.14***

Means with the same letter are not significantly different at p=0.05.

than the untreated control. However, 30 days after planting only Vitavax-PCNB + Allegiance FL produced a significantly lower skip index.

No significant differences were observed in the number of open bolls on five plants per plot (Table 3). Seed cotton yields ranged from 2,540 pounds per acre to 1,094 pounds per acre for the Vitavax-PCNB + Allegiance FL and the untreated control, respectively. Vitavax-PCNB + Allegiance FL, Maxim + Nu-Flow M + Apron XL, WE -120C + Nu-Flow M + WE-147 + Nu-Grow Film Coat and RTU Baytan Thiram + Allegiance all produced significantly greater yields than the control. Averaging all fungicide treatment yields together produced an increase of 606 pounds of seed cotton per acre greater than the untreated control.

TABLE 3. EFFECT OF SELECTED SEED TREATMENTS ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate *fl oz/cwt*	Open bolls *%*	Seed cotton yield *lbs/ac*
Untreated control	—	45 a	1094 d
Vitavax-PCNB + Allegiance FL	6.0 + 0.75	56 a	2540 a
RTU Baytan-Thriam + Apron FL	3.0 + 0.75	52 a	1656 bcd
NU-Flow T + Nu-FLow M + Apron XL	2.25 + 1.25 + 0.32	40 a	1721 bcd
Maxim + Nu-Flow M + Apron XL	0.08 + 1.75 + 0.32	48 a	1956 abc
WE-120C + Nu-Flow M + WE-147 + Nu-Grow Film Coat	0.24 + 1.25 + 2.0 + 2.0	55 a	2325 ab
WE1142 + WE-147 + Nu-Grow Film Coat	2.0 + 2.0 + 2.0	42 a	1450 cd
LS 288	0.5	40 a	1440 cd
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz/cwt	43 a	1672 abc
LSD		***19***	***729***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF SELECTED SEED TREATMENTS FOR CONTROL OF SEEDLING DISEASE OF COTTON

Kathy S. McLean and William S. Gazaway

The objective of this test was to evaluate selected cotton seed treatments for control seedling disease of cotton. All seed treatments were applied by the manufacturer prior to planting. Each plot was infested with *Pythium spp.* and *Rhizoctonia solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Tennessee Valley Research and Extension Center with Stoneville 474 on May 3. Plots consisted of two rows, 25 feet long and 40 inches wide. Blocks were separated by 20-foot alleys and the test was arranged in a randomized complete block design with four replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 19 and June 2. Plant maturity was estimated by the percent of open bolls on September 10. Plots were harvested on September 28. Data were subjected to statistical analysis 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.

TABLE 1. EFFECT OF SELECTED SEED TREATMENTS ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR 16 AND 30 DAYS AFTER PLANTING

Treatment	Rate *fl oz/cwt*	Emergence/ 10 ft of row 16 DAP	Emergence/ 10 ft of row 30 DAP	Skip index	Vigor rating
Untreated control (black seed)	—	7.3 c	14.0 c	36.3 a	2.3 a
Vitavax-PCNB + Allegiance FL	6.0 + 0.75	28.0 a	42.8 a	20.8 c	1.4 b
RTU Baytan Thiram + Apron FL	3.0 + 0.75	14.0 bc	23.0bc	29.5 ab	1.8 abc
NU-Flow T + Nu-Flow M + Apron XL	2.25 + 1.25 + 0.32	21.5 ab	35.3 ab	24.8 bc	1.6 bc
Nu-Flow T + Nu-Flow M + WE-147	2.25 + 1.25 + 2.0	26.0 ab	33.8 ab	22.0 bc	1.5 bc
WE-146 + WE-144 + Nu-Flow T+ Nu-Flow M + WE-147 + Nu-Grow Film Coat	0.0353 + 0.0353 + 2.25 + 1.25 + 2.0 + 2.0	25.5 ab	37.5 ab	22.3 bc	3.5 a
WE-146 + WE-144 + Nu-Grow Film Coat	0.0353 +0.0353 + 2.0	29.5 a	40.8 a	23.3 bc	3.00 a
LSD (0.05)		***13.2***	***16.1***	***7.8***	***0.96***

Means with the same letter are not significantly different at p=0.05.

Significant differences in seedling stand were observed among treatments. At 16 and 30 days after planting, Vitavax-PCNB + Nu-Flow M, Nu-Flow T + Nu-Flow M +Apron XL ,Nu-Flow T + Nu-Flow M + WE 147, WE 146 + WE 144 + Nu-Flow T + Nu-Flow M + WE 147 +

Nu-Gro Film Coat, and WE 146 + WE 144 + Nu-Grow Film Coat produced significantly greater stands than the untreated control (Table 1). The highest skip index was in the control. Vitavax-PCNB + Nu-Flow M had the lowest skip index indicating this treatment produced a more evenly spaced seedling stand than the control.

Three of the fungicide seed treatments produced an increased percentage of open bolls thus indicating earlier maturity (Table 2). Seed cotton yields ranged from 2,135.5 pounds per acre to 858.8 pounds per acre for the Vitavax-PCNB + Nu-Flow M and the untreated control, respectively. All seed treatments significantly increased the seed cotton yield compared to the control.

TABLE 2. EFFECT OF SELECTED SEED TREATMENTS ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate *fl oz/cwt*	Open bolls *%*	Seed cotton yield *lbs/ac*
Untreated control (black seed)	—	32.2 b	858.8 b
Vitavax-PCNB + Nu-flow M	6.0 + 0.75	46.5 ab	2135.5 a
RTU Baytan-Thiram + Apron FL	3.0 + 0.75	47.9 a	1756.8 a
NU-Flow T + Nu-Flow M + Apron XL	2.25 + 1.25 + 0.32	47.4 ab	1809.1 a
Nu-Flow T + Nu-Flow M + WE 147	2.25 + 1.25 + 2.0	52.7 a	1799.2 a
WE-146 + WE-144 + Nu-Flow T + Nu-Flow M + WE-147 + Nu-Grow Film Coat	0.0353 + 0.0353 + 2.25 + 1.25 + + 2.0 + 2.0	54.4 a	2027.8 a
WE-146 + WE-144 + Nu-Grow Film Coat	0.0353 +0.0353 + 2.0	42.1 ab	2083.3 a
LSD (0.05)		*15.3*	*546.8*

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF IN-FURROW FUNGICIDE TREATMENTS AND FUNGICIDE BIOLOGICALS FOR CONTROL OF SEEDLING DISEASE OF COTTON

K. S. McLean and W. S. Gazaway

The objective of this project was to evaluate selected in-furrow fungicides for control of *Rhizoctonia solani* and *Pythium* spp. on seedling disease of cotton. All fungicides were applied as an in-furrow granular or spray application at planting. Two seed treatments, LS 288 and RTU Baytan Thiram + Allegiance were applied to a known amount of seed in a ziploc bag and shaken until the seed was covered and then allowed to dry before planting. Each plot was infested with *Pythium* spp. and *R. solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Wiregrass Research and Extension Center with Deltapine NuCotn 35B on April 20. Plots consisted of two rows, 25 feet long and 40 inches wide. Blocks were separated by 20-foot alleys and were arranged in a randomized complete block design with five replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 5 and May 18. Plant maturity was estimated by the percent of open bolls on September 16. Plots were harvested on September 29. Data were sub-

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON SEEDLING DISEASE AS MEASURED BY COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 15 DAYS AFTER PLANTING

Treatment	Rate	Emergence per 25 ft of row	Plants per foot of row	Skip index	Vigor rating
Untreated control	—	22.0 e	0.88 d	30.6 a	2.0 c
Terraclor 2E	48 fl oz/ac	55.8 d	2.23 c	16.6 cd	2.7 ab
Terraclor 15G	5.5 lbs/ac	74.4 bcd	2.98 abc	10.2 de	2.8 ab
Rovral 4F	5.2 fl oz/ac	96.2 a	3.71 a	8.6 e	2.9 ab
TSX 18.8G	5.5 lbs/ac	28.4 e	1.14 d	29.4 ab	2.0 c
TSX EC	64 oz/ac	93.4 ab	3.74 a	8.6 e	3.0 a
Ridomil Gold PC 11G	7.0 lbs/ac	85.6 abc	3.42 ab	10.2 de	2.8 ab
TSX 18.8G	7.0 lbs/ac	88.2 abc	3.53 ab	6.6 e	2.9 ab
TSX G/WGB49	7.4 lbs/ac	86.2 abc	3.45 ab	11.0 de	2.7 ab
TSX G/WGB49	5.5 lbs/ac	71.2 cd	3.85 bc	12.6 de	2.9 ab
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz /cwt	26.2 e	1.05 d	31.8 a	2.5 b
LSD (0.05)		*20.58*	*0.82*	*7.28*	*0.47*

Means with the same letter are not significantly different at p=0.05.

jected to statistical analysis 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.

Significant differences in seedling stand were observed at 15 and 28 days after planting. In the *R. solani* inoculated rows, Terraclor 2E, Terraclor 15G, Rovral 4F, TSX EC, Ridomil Gold PC 11G, TSX 18,8 (seven pounds per acre) and TSX G/WGB49 (5.5 pounds per acre and 7.4 pounds per acre) produced greater stands and lower skip indices than the control at 15 and 28 days after planting (Tables 1 and 2). In the *Pythium* spp. inoculated rows, Terraclor 15G, Rovral 4F, TSX EC, TSX 18,8 (seven pounds per acre) and TSX G/WGB49 (5.5 pounds per acre and 7.4 pounds per acre) produced greater stand and lower skip indices than the control at 15 days after planting. However, by 28 days after planting, only TSX EC and TSX G/WGB (7.4 pounds per acre) produced greater stands and lower skip indices than the control.

The inoculated rows were combined for yields. TSX EC produced a significantly higher percentage of open bolls than the control, indicating earlier maturity (Table 3). Seed cotton yields ranged from 2,474 pounds per acre to 1,951 pounds per acre for the TSX G/WGB (7.4 pounds per acre) and Terraclor 2EC treatments, respectively (Table 3). The average fungicide yield compared to the control increased the seed cotton 182 pounds per acre.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON SEEDLING DISEASE AS MEASURED BY COTTON STAND AND SKIP INDEX AT 28 DAYS AFTER PLANTING

Treatment	Rate	Emergence per 25 ft of row	Plants per foot of row	Skip index
Untreated control	—	15.0 d	0.60 d	31.4 a
Terraclor 2E	48 fl oz/ac	39.4 c	1.58 c	16.2 b
Terraclor 15G	5.5 lbs/ac	65.4 ab	2.62 ab	8.2 cd
Rovral 4F	5.2 fl oz/ac	84.0 a	3.36 a	9.0 bcd
TSX 18.8G	5.5 lbs/ac	15.8 d	0.63 d	30.2 a
SX EC	64 oz/ac	74.8 ab	2.99 ab	7.8 cd
Ridomil Gold PC 11G	7.0 lbs/ac	72.8 ab	2.91 ab	12.2 bcd
TSX 18.8G	7.0 lbs/ac	77.4 a	3.09 a	6.6 d
TSX G/WGB49	7.4 lbs/ac	77.0 a	3.08 a	7.8 cd
TSX G/WGB49	5.5 lbs/ac	58.2 b	2.33 b	14.2 bc
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz /cwt	18.8 d	0.75 d	32.2 a
LSD (0.05)		***18.75***	***0.75***	***7.33***

Means with the same letter are not significantly different at p=0.05.

TABLE 3. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls %	Seed cotton yield *lbs/ac*
Untreated control	—	49.44	2091 ab
Terraclor 2E	48 fl oz/ac	59.82	1951 b
Terraclor 15G	5.5 lbs/ac	48.49	2300 ab
Rovral 4F	5.2 fl oz/ac	59.60	2277 ab
TSX 18.8G	5.5 lbs/ac	55.41	2056 ab
TSX EC	64 oz/ac	62.66	2114 ab
Ridomil Gold PC 11G	7.0 lbs/ac	58.78	2335 ab
TSX 18.8G	7.0 lbs/ac	54.08	2323 ab
TSX G/WGB49	7.4 lbs/ac	53.61	2474 a
TSX G/WGB49	5.5 lbs/ac	56.72	2300 ab
RTU Baytan Thiram + Allegiance	3.0 + 0.75 oz/cwt	55.29	2207 ab
LSD (0.05)		***11.15***	***431.96***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF SELECTED IN-FURROW FUNGICIDES AND FUNGICIDE BIOLOGICAL COMBINATIONS FOR CONTROL OF SEEDLING DISEASE OF COTTON

Kathy S. McLean and William S. Gazaway

The objective of this project was to evaluate selected in-furrow fungicides and fungicide biological combinations for control of *Rhizoctonia solani* and *Pythium* spp. on seedling disease of cotton. All fungicides were applied as an in-furrow granular or spray application at planting. Each plot was infested with *Pythium* spp. and *R. solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Tennessee Valley Research and Extension Center with Deltapine NuCotn 35B on April 20. Plots consisted of two rows, 25 feet long and 40 inches wide. Plots were arranged in a randomized complete block design with five replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 12 and May 25. Plant maturity was estimated by the percent of open bolls on September 10. Plots were harvested on September 28. Data were subjected to statistical analysis 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.

At 22 and 35 days after planting all fungicide treatments had significantly greater stands than the control (Table 1). At 22 days after planting, Terraclor Super X G/WGB49 at 7.4 pounds per acre produced the greatest stand at 3.6 plant per foot of row and the control produced the lowest with 0.4 plant per foot of row. All fungicides produced significantly lower skip indexes than the control.

No differences in maturity were observed as measured by the percent open bolls (Table 2). Seed cotton yields ranged from 3,350.3 pounds per acre to 2,122.5 pounds per acre for the Terraclor Super X G/WGB49 at 7.4 pounds per acre and the control treatments, respectively (Table 2). All fungicide treatments produced significantly greater yields than the control.

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 22 AND 35 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 22 DAP	Emergence/ 25 ft of row 35 DAP	Skip index 22 DAP	Vigor rating 35 DAP
Untreated control	—	4.0 d	11.8 d	33.0 a	3.1 a
Terraclor Super X 18.8 G	7.0 lbs/ac	28.3 ab	63.3 ab	7.3 c	1.9 b
Terraclor Super X 18.8 G	5.5 lbs/ac	27.5 ab	67.5 ab	4.8 c	1.7 b
Terraclor Super X G/ WGB 49	5.5 lbs/ac	35.0 ab	66.3 ab	3.5 c	1.6 b
Terraclor Super X G/WGB 49	7.4 lbs/ac	36.0 a	75.3 a	2.8 c	1.8 b
Terraclor Super X EC	64 oz/ac	26.3 ab	61.8 b	4.8 c	1.6 b
Ridomil Gold PC 11G	7.0 lbs/ac	25.8 b	61.5 b	5.3 c	2.1 b
Rovral	5.3 oz/ac	15.8 c	30.8 c	19.3 b	2.1 b
LSD (0.05)		***9.1***	***11.8***	***4.2***	***0.7***

Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls *%*	Seed cotton yield *lbs/ac*
Untreated control	—	46.9 a	2122.5 b
Terraclor Super X 18.8 G	7.0 lbs/ac	51.1 a	3281.7 a
Terraclor Super X 18.8 G	5.5 lbs/ac	53.2 a	3089.0 a
Terraclor Super X G/ WGB 49	5.5 lbs/ac	57.5 a	3131.5 a
Terraclor Super X G/WGB 49	7.4 lbs/ac	53.5 a	3350.3 a
Terraclor Super X EC	64 oz/ac	55.9 a	3193.5 a
Ridomil Gold PC 11G	7.0 lbs/ac	56.8 a	3242.5 a
Rovral	5.3 oz/ac	51.8 a	3000.9 a
LSD (0.05)		***16.9***	***395.4***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF TERRACLOR AND ROVRAL FOR CONTROL OF SEEDLING DISEASE OF COTTON IN CENTRAL ALABAMA

Kathy S. McLean and William S. Gazaway

The objective of this research was to evaluate selected in-furrow granular and spray fungicides for control of *Rhizoctonia solani* and *Pythium* spp. on seedling disease of cotton. All fungicides were applied as an in-furrow granular or spray application at planting. Each plot was infested with *Pythium* spp. and *R. solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Prattville Research Field with Deltapine DP 436RR on April 14. Plots consisted of two rows, 25 feet long and 40 inches wide. Plots were arranged in a randomized complete block design with four replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System

Stand counts were collected on May 4 and May 18. Plant maturity was estimated by the percent of open bolls on September 9. Plots were harvested on September 28. Data were subjected to statistical analysis 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.

Significant differences in seedling stand were observed. At 20 days after planting, Terraclor 15G and Rovral 4F had a significantly greater stand than Terraclor 2E (Table 1). However, by 34 days after planting no significant differences in stand were observed among any treatments. Ridomil Gold PC 11G had the most uniform stand with a skip index of 11.5.

No differences in maturity were observed as measured by the percent open bolls (Table 2). Seed cotton yields ranged from 3,259.7 pounds per acre to 2,2214.3 pounds per acre for the Ridomil Gold PC 11 G and Terraclor 2E treatments, respectively (Table 2). There were no significant differences in yields among treatments including the control.

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 20 AND 34 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 20 DAP	Emergence/ 25 ft of row 34 DAP	Skip index 34 DAP	Vigor rating 34 DAP
Untreated control	—	4.8 ab	7.5 a	20.3 c	1.8 b
Terraclor Super X 18.8 G	7.0 lbs/ac	7.0 ab	8.0 a	21.5 c	1.9 b
Terraclor Super X 18.8 G	5.5 lbs/ac	8.3 ab	9.5 a	20.0 c	1.9 b
Terraclor Super X G/ WGB 49	7.4 lbs/ac	5.3 ab	6.3 a	30.0 ab	1.9 b
Terraclor Super X G/WGB 49	5.5 lbs/ac	7.0 ab	9.0 a	22.3 bc	2.0 ab
Terraclor Super X EC	64 oz/ac	6.3 ab	8.0 a	17.8 cd	1.8 b
Ridomil Gold PC 11G	7.0 lbs/ac	6.0 ab	9.5 a	11.5 d	1.5 b
Rovral 4F	5.3 oz/ac	8.5 a	9.3 a	24.3 abc	1.9 b
Terraclor 2E	48 fl oz/ac	3.0 b	4.0 a	32.0 a	2.5 a
Terraclor 15G	5.0 lbs/ac	10.0 a	9.0 a	22.3 bc	1.7 b
LSD (0.05)		***5.4***	***5.6***	***8.4***	***0.5***

Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls %	Seed cotton yield *lbs/ac*
Untreated control	—	63.5 a	2954.8 abc
Terraclor Super X 18.8 G	7.0 lbs/ac	62.6 a	2860.4 abc
Terraclor Super X 18.8 G	5.5 lbs/ac	61.4 a	2889.5 abc
Terraclor Super X G/ WGB 49	7.4 lbs/ac	55.2 a	2541.0 cd
Terraclor Super X G/WGB 49	5.5 lbs/ac	62.5 a	2679.0 bc
Terraclor Super X EC	64 oz/ac	54.6 a	3012.9 ab
Ridomil Gold PC 11G	7.0 lbs/ac	55.0 a	3259.7 a
Rovral 4F	5.3 oz/ac	56.3 a	2962.1 abc
Terraclor 2E	48 fl oz/ac	55.9 a	2214.3 d
Terraclor 15G	5.0 lbs/ac	55.5 a	3071.0 ab
LSD (0.05)		***12.2***	***434.3***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF TERRACLOR AND ROVRAL FOR CONTROL OF SEEDLING DISEASE OF COTTON IN NORTH ALABAMA

Kathy S. McLean and William S. Gazaway

The objective of this research was to evaluate Terraclor and Rovral in-furrow fungicide sprays for control of *Rhizoctonia solani* and *Pythium* spp. seedling disease of cotton. All fungicides were applied as an in-furrow spray application at planting. Each plot was infested with *Pythium* spp. and *R. solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Tennessee Valley Research and Extension Center with Deltapine NuCotn 33B on April 21. Plots consisted of two rows, 25 feet long and 40 inches wide. Plots were arranged in a randomized complete block design with four replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 12 and May 25. Plant maturity was estimated by the percent of open bolls on September 10 and harvested September 28. Data were subjected to statistical analysis 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.

At 21 and 34 days after planting, all fungicide treatments produced significantly greater stands than the control (Table 1). Terraclor 15G produced the greatest stand at 2.38 plant per foot of row and the control produced the lowest with 0.25 plant per foot of row at 35 days after planting, respectively. All fungicides produced significantly lower skip indices than the control.

No differences in maturity were observed as measured by the percent open bolls (Table 2). Seed cotton yields ranged from 3,627.9 pounds per acre to 2,044.1 pounds per acre for the Terraclor 15G and the control treatments, respectively (Table 2). All fungicide treatments produced significantly greater yields than the control.

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 21 AND 34 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 21 DAP	Emergence/ 25 ft of row 34 DAP	Skip index 21 DAP	Vigor rating 34 DAP
Untreated control	—	3.5 b	6.3 c	37.0 a	3.3 a
Terraclor 2E	48 fl oz/ac	21.5 a	52.3 ab	9.0 bc	1.9 b
Terraclor 15G	5 lbs/ac	27.5 a	59.5 a	5.3 c	1.9 b
Rovral 4F	5.2 oz/ac	23.0 a	38.5 b	13.0 b	1.6 b
LSD (0.05)		***16.4***	***17.8***	***6.9***	***0.6***

Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls %	Seed cotton yield *lbs/ac*
Untreated control	—	47.3 a	2044.1 b
Terraclor 2E	48 fl oz/ac	59.6 a	3425.4 a
Terraclor 15G	5 lbs/ac	64.1 a	3627.9 a
Rovral 4F	5.2 lb/ac	58.7 a	3236.0 a
LSD (0.05)		***15.4***	***534.4***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF QUADRIS FOR CONTROL OF SEEDLING DISEASE OF COTTON IN SOUTH ALABAMA

Kathy S. McLean and William S. Gazaway

The objective of this research was to evaluate Quadris as an in-furrow fungicide spray and seed treatment for control of seedling disease of cotton. All fungicides were applied either as a seed treatment before planting or as an in-furrow spray at planting. Each plot was infested with *Pythium* spp. and *Rhizoctonia solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Wiregrass Research and Extension Center with Deltapine NuCotn 35B on April 23. Plots consisted of two rows, 25 feet long and 40 inches wide. Plots were arranged in a randomized complete block design with five replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 13 and May 27. Plant maturity was estimated by the percent of open bolls on September 16. Plots were harvested on September 29. Data were subjected to statistical analysis 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.

Significant differences in seedling stand were observed at 20 and 34 days after planting. At 20 days after planting, Quadris, Terraclor, Ridomil + Terraclor and the Protege + Allegiance + Quadris treatments produced significantly greater stands than the black seed control and the Protege + Allegiance + Ascend seed treatment (Table 1). By 34 days after planting, the Quadris in-furrow treatments produced a significantly greater stand than the Protege + Allegiance + Quadris seed treatment (Table 1). The skip index rating at 20 days after planting found all Quadris, Terraclor, Ridomil + Terraclor, and Protege + Allegiance + Quadris treatments produced significantly more uniform stands than the black seed control and the Protege + Allegiance + Ascend seed treatment (Table 1).

No differences in the percent of open bolls were observed (Table 2). Seed cotton yields ranged from 1,858.6 pounds per acre to 1,488.3 pounds per acre for the Protege + Allegiance + Ascend and Protege + Allegiance + Quadris treatments respectively (Table 2). There were no significant differences in yield among treatments including the control.

TABLE 1. EFFECT OF QUADRIS ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 20 AND 34 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 20 DAP	Emergence/ 25 ft of row 34 DAP	Skip index 20 DAP	Vigor rating 34 DAP
Untreated control (black seed)	—	11.0 b	23.0 c	24.5 a	2.6 a
Quadris	5.56 fl oz/ac	36.3 a	73.3 a	3.0 b	1.7 b
Quadris	8.35 fl oz/ac	36.0 a	73.5 a	1.8 b	1.7 b
Terraclor	7.4 fl oz/1000 ft	38.8 a	69.0 ab	2.0 b	2.2 ab
Ridomil + Terraclor	0.75 oz/1000 ft + 7.4 fl oz/1000 ft	30.0 a	59.5 b	4.8 b	1.8 ab
Protege + Allegiance + Ascend[1]	40 ppm + 0.75 fl oz/cwt	15.5 b	28.8 c	18.5 a	2.2 a
Protege + Allegiance + Quadris[1]	40 ppm + 0.75 fl oz/cwt	33.3 a	56.8 b	5.0 b	1.8 ab
LSD (0.05)		***12.6***	***12.9***	***9.2***	***0.8***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls %	Seed cotton yield *lbs/ac*
Untreated control (black seed)	—	54.3 a	1640.8 a
Quadris	5.56 fl oz/ac	56.8 a	1844.0 a
Quadris	8.35 fl oz/ac	50.5 a	1611.7 a
Terraclor	7.4 fl oz/1000 ft	54.2 a	1786.0 a
Ridomil + Terraclor	0.75 oz/1000 ft+ 7.4 fl oz/1000 ft	52.8 a	1539.1 a
Protege + Allegiance + Ascend[1]	40 ppm + 0.75 fl oz/cwt	62.0 a	1858.6 a
Protege + Allegiance + Quadris[1]	40 ppm + 0.75 fl oz/cwt	46.9 a	1488.3 a
LSD (0.05)		***18.9***	***585.3***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

EVALUATION OF QUADRIS FOR CONTROL OF SEEDLING DISEASE OF COTTON IN CENTRAL ALABAMA

Kathy S. McLean and William S. Gazaway

The objective of this research was to evaluate Quadris as an in-furrow fungicide spray and seed treatment for control of seedling disease of cotton. All fungicides were either applied as a seed treatment before planting or as an in-furrow spray at planting. Each plot was infested with *Pythium* spp. and *Rhizoctonia solani* by applying inoculated millet seed in the furrow at planting. Plots were planted at the Prattville Research Field with Deltapine DP 436RR on April 14.

Plots consisted of two rows, 25 feet long and 40 inches wide. Plots arranged in a randomized complete block design with five replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 4 and May 18. Plant maturity was estimated by the percent of open bolls on September 9. Plots were harvested on September 28. Data were subjected to statistical analysis 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.

Significant differences in seedling stand were observed at 20 and 34 days after planting. At 20 days after planting, Quadris at 5.56 fluid ounces per acre produced a significantly greater stand than the black seed control and Quadris at 8.35 fluid ounces per acre (Table 1). By 34 days after planting Quadris at 5.56 fluid ounces per acre and Ridomil + Terraclor produced a significantly greater stand than all other treatments (Table 1). The skip index rating at 20 days after planting found Quadris at 5.56 fluid ounces per acre, Terraclor, Ridomil + Terraclor, Protege + Allegiance + Ascend, and Protege + Allegiance + Quadris treatments produced significantly more uniform stands than the black seed control and Quadris at 8.35 fluid ounces per acre (Table 1).

No differences in the percent of open bolls were observed between fungicide treatments and the control (Table 2). Seed cotton yields ranged from 3,659.1 pounds per acre to 1,248.7 pounds per acre for the Quadris at 5.56 fluid ounces per acre and the black seed control treatments, respectively (Table 2). All fungicide treatments produced significantly greater yields than the black seed control and the Protege + Allegiance + Ascend seed treatment.

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 20 AND 34 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 20 DAP	Emergence/ 25 ft of row 34 DAP	Skip index 20 DAP	Vigor rating 34 DAP
Untreated control (black seed)	—	5.0 b	4.0 c	35.3 a	2.8 a
Quadris	5.56 fl oz/ac	11.5 a	16.0 a	6.5 b	1.6 b
Quadris	8.35 fl oz/ac	6.0 b	4.0 c	28.0 a	2.1 ab
Terraclor 2E	7.4 fl oz/1000 ft	7.3 ab	9.5 b	16.3 b	1.9 b
Ridomil + Terraclor	0.75 oz/1000 ft+ 7.4 fl oz/1000 ft	8.3 ab	15.8 a	6.3 b	1.5 b
Protege + Allegiance + Ascend[1]	40 ppm + 0.75 fl oz/cwt	7.0 ab	9.0 bc	12.8 b	1.9 b
Protege + Allegiance + Quadris[1]	40 ppm + 0.75 fl oz/cwt	8.0 ab	11.0 ab	10.0 b	1.8 b
LSD (0.05)		***4.6***	***5.5***	***10.9***	***0.8***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls *%*	Seed cotton yield *lbs/ac*
Untreated control (black seed)	—	54.1 ab	1248.7 e
Quadris	5.56 fl oz/ac	51.2 b	3659.1 a
Quadris	8.35 fl oz/ac	50.4 b	2780.6 cd
Terraclor	7.4 fl oz/1000 ft	55.2 ab	3121.8 bc
Ridomil + Terraclor	0.75 oz/1000 ft+ 7.4 fl oz/1000 ft	58.6 ab	3317.8 ab
Protege + Allegiance + Ascend[1]	40 ppm + 0.75 fl oz/cwt	56.6 ab	2606.4 d
Protege + Allegiance + Quadris[1]	40 ppm + 0.75 fl oz/cwt	63.4 a	3230.7 abc
LSD (0.05)		***12.8***	***462.0***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

EVALUATION OF QUADRIS FOR CONTROL OF SEEDLING DISEASE OF COTTON IN NORTH ALABAMA

Kathy S. McLean and William S. Gazaway

The objective of this research was to evaluate Quadris as an in-furrow fungicide spray and seed treatment for control of seedling disease of cotton. All fungicides were either applied as a seed treatment before planting or as an in-furrow spray at planting. Each plot was infested with *Pythium* spp. and *Rhizoctonia solani* by applying inoculated millet seed in the furrow at planting.

Plots were planted at the Tennessee Valley Research and Extension Center with Deltapine DP 436RR on April 21. Plots consisted of two rows, 25 feet long and 40 inches wide. Plots were arranged in a randomized complete block design with five replications. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Stand counts were collected on May 12 and May 26. Plant maturity was estimated by the percent of open bolls on September 10. Plots were harvested on September 28. Data were subjected to statistical analysis 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.

Significant differences in seedling stand were observed at 21 and 35 days after planting. At 21 days after planting, all Quadris treatments produced a significantly greater stand than the black seed control and Protege + Allegiance + Ascend seed treatment (Table 1). By 35 days after planting Quadris at 8.35 fluid ounces per acre and Protege + Allegiance + Quadris produced a significantly greater stand than all other treatments (Table 1). All fungicide treatments produced a significantly greater stand than the control. The skip index rating at 21 days after planting found all fungicide treatments produced a significantly more uniform stand than the black seed control and the Protege + Allegiance + Ascend seed treatment (Table 1).

No differences in the percent of open bolls was observed between any treatments (Table 2). Seed cotton yields ranged from 3,262.1 pounds per acre to 1,459.6 pounds per acre for the Protege + Allegiance + Quadris and the untreated black seed control treatments, respectively (Table 2). All fungicide treatments produced significantly greater yields than the black seed control.

TABLE 1. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON COTTON STAND, SKIP INDEX, AND PLANT VIGOR AT 21 AND 35 DAYS AFTER PLANTING

Treatment	Rate	Emergence/ 10 ft of row 21 DAP	Emergence/ 25 ft of row 35 DAP	Skip index 21 DAP	Vigor rating 35 DAP
Untreated control (black seed)	—	5.3 d	8.5 e	37.3 a	3.1 a
Quadris	5.56 fl oz/ac	20.3 ab	43.8 b	8.5 de	1.8 d
Quadris	8.35 fl oz/ac	27.5 a	53.5 a	8.5 de	1.8 d
Terraclor	7.4 fl oz/1000 ft	13.5 bc	40.8 b	12.5 cde	2.2 bcd
Ridomil + Terraclor	0.75 oz/1000 ft + 7.4 fl oz/1000 ft	18.0 b	39.5 b	11.3 de	2.3 bcd
Protege + Allegiance + Ascend	40 ppm + 0.75 fl oz/cwt	8.5 cd	20.0 d	27.5 b	2.8 ab
Protege + Allegiance + Quadris	40 ppm + 0.75 fl oz/cwt	20.8 ab	55.8 a	7.8 e	1.9 cd
Ridomil Gold	0.040 lb ai/ac	14.5 bc	26.5 cd	18.0 c	2.6 abc
Ridomil Gold + Flint	0.40 lb ai/ac + 0.125 lb ai/ac	16.0 bc	29.5 c	14.0 cd	2.3 bcd
LSD (0.05)		***7.8***	***9.3***	***5.9***	***0.7***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

TABLE 2. EFFECT OF SELECTED IN-FURROW FUNGICIDES ON PERCENT OPEN BOLLS AND SEED COTTON YIELD

Treatment	Rate	Open bolls %	Seed cotton yield *lbs/ac*
Untreated control (black seed)	—	50.9 a	1459.6 d
Quadris	5.56 fl oz/ac	58.5 a	3062.9 a
Quadris	8.35 fl oz/ac	56.2 a	3164.1 a
Terraclor	7.4 fl oz/1000 ft	49.1 a	2997.6 ab
Ridomil + Terraclor	0.75 oz/1000 ft + 7.4 fl oz/1000 ft	49.4 a	3040.1 ab
Protege + Allegiance + Ascend[1]	40 ppm + 0.75 fl oz/cwt	56.3 a	2566.6 c
Protege + Allegiance + Quadris[1]	40 ppm + 0.75 fl oz/cwt	63.8 a	3262.1 a
Ridomil Gold	0.040 lb ai/ac	55.38 a	2703.7 bc
Ridomil Gold + Flint	0.40 lb ai/ac + 0.125 lb ai/ac	53.7 a	2759.2 bc
LSD (0.05)		***16.8***	***382.4***

[1] Seed treatment. Means with the same letter are not significantly different at p=0.05.

Evaluation of Selected Fungicides for Control of Cotton Boll Rot Disease on Deltapine NuCotn 33B

Kathy S. McLean and William S. Gazaway

A cotton boll rot fungicide test was conducted to determine effects of selected fungicides on cotton boll rot and yield. All fungicides were applied as a foliar spray.

Plots were planted at the Gulf Coast Research and Extension Center with Deltapine NuCotn 33B cotton on May 19. Plots were arranged in a randomized complete block design with five replications and consisted of two rows, 40 feet long and 38 inches wide. Alleys were bush hogged to create a 10-foot alley at defoliation to facilitate harvest. All plots were maintained with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Fungicides were applied at full bloom on August 3 and at boll cracking on September 8. Boll rot disease ratings were determined on October 13. Plots were harvested on November 3. Data were subjected to statistical analysis 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.

Quadris 2SC, Benlate 50 WP, Tilt, Terraclor 4F, and Rovral 4F all significantly reduced the number of rotted cotton bolls as compared to the control (see table). Cotton boll rot was not significantly reduced by two applications (full bloom plus boll cracking) of any of the fungicides compared to the full bloom and boll cracking single applications. Seed cotton yields ranged from 2,895 pounds per acre to 2,111 pounds per acre for the Rovral 4F applied at full bloom and Benlate 50WP applied at boll cracking, respectively. There were no significant differences in yield among treatments; however, full bloom fungicide applications increased cotton yield an average of 77 pounds per acre compared to the control.

Effect of Selected Foliar Fungicides on Cotton Boll Rot and Seed Yield

Treatment	Rate *per acre*	Spray schedule	Diseased bolls *no*	Seed cotton yield *lbs/ac*
Quadris 2 SC	0.20 lb	Full bloom	56 bc	2608 abc
Quadris 2 SC	0.20 lb	Full bloom + boll cracking	62 bc	2472 abc
Quadris 2 SC	0.20 lb	Boll cracking	57 bc	2159 bc
Benlate 50WP	0.10 lb	Full bloom	49 bc	2667 ab
Benlate 50WP	0.10 lb	Full bloom + boll cracking	52 bc	2190 bc
Benlate 50WP	0.10 lb	Boll cracking	73 ab	2111 c
Tilt	4 oz	Full bloom	72 ab	2618 abc
Tilt	4 oz	Full bloom + boll cracking	59 bc	2348 bc
Tilt	4 oz	Boll cracking	38 c	2331 bc
Terraclor 4F	16 oz	Full bloom	59 bc	2254 abc
Terraclor 4F	16 oz	Full bloom + boll cracking	55 bc	2557 abc
Terraclor 4F	16 oz	Boll cracking	61 bc	2434 abc
Rovral 4F	4 oz	Full bloom	44 c	2895 a
Rovral 4F	4 oz	Full bloom + boll cracking	63 bc	2419 abc
Rovral 4F	4 oz	Boll cracking	58 bc	2286 bc
Untreated control			92 a	2531 abc
LSD (0.05)			***26.5***	***526.5***

Means with the same letter are not significantly different at p=0.05.

EVALUATION OF SELECTED FUNGICIDES FOR CONTROL OF COTTON BOLL ROT DISEASE ON PAYMASTER PM 1220BG/RR

Kathy S. McLean and William S. Gazaway

A cotton boll rot fungicide test was conducted to determine effects of selected fungicides on cotton boll rot and yield. Fungicides were applied as a broadcast spray. The field was not irrigated.

Plots were planted at the Monroeville Research Field with Paymaster PM 1220BG/RR cotton on May 5. Plots were arranged in a randomized complete block design with five replications and consisted of two rows, 40 feet long and 36 inches wide. Blocks were separated by 20-foot alleys. All plots were maintained with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System.

Fungicides were applied at full bloom on August 2 and at boll cracking on September 8. Boll rot disease ratings were determined on October 13. Plots were harvested October 29. 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.

Boll rot was not observed due to the intense drought. Seed cotton yields ranged from 1,612 pounds per acre to 1,408 pounds per acre for the Quadris 2SC full bloom application and the Rovral 4F full bloom plus boll cracking application, respectively (see table). There were no significant differences in yield among treatments.

EFFECT OF SELECTED FOLIAR FUNGICIDES ON COTTON BOLL ROT AND SEED YIELD

Treatment	Rate per acre	Spray schedule	Seed cotton yield *(lbs/ac)*
Quadris 2 SC	0.20 lb	Full bloom	1612 a
Quadris 2 SC	0.20 lb	Full bloom + boll cracking	1583 ab
Quadris 2 SC	0.20 lb	Boll cracking	1548 ab
Benlate 50WP	0.10 lb	Full bloom	1562 ab
Benlate 50WP	0.10 lb	Full bloom + boll cracking	1606 ab
Benlate 50WP	0.10 lb	Boll cracking	1518 ab
Tilt	4 oz	Full bloom	1562 ab
Tilt	4 oz	Full bloom + boll cracking	1461 ab
Tilt	4 oz	Boll cracking	1583 ab
Terraclor 4F	16 oz	Full bloom	1551 ab
Terraclor 4F	16 oz	Full bloom + boll cracking	1423 ab
Terraclor 4F	16 oz	Boll cracking	1493 ab
Rovral 4F	4 oz	Full bloom	1519 ab
Rovral 4F	4 oz	Full bloom + boll cracking	1408 b
Rovral 4F	4 oz	Boll cracking	1528 ab
Untreated control			1536 ab
LSD (0.05)			***200.56***

Means with the same letter are not significantly different at p=0.05.

DEFOLIANT APPLICATIONS

EVALUATION OF FLAIR AS A COTTON DEFOLIANT

Charles Burmester

Flair is an endothall salt product that has been formulated for increased effectiveness when used as a cotton defoliant. The objective of this research was to evaluate Flair's effectiveness as a cotton defoliant and boll opening product and determine Flair's usefulness in combination with other cotton defoliants.

The cotton variety in this study was Deltapine NuCotn 33B planted at the Tennessee Valley Research and Extension Center, Belle Mina, Alabama. Plots consisted of four rows 30 feet long, arranged in a randomized complete block with four replications. Cotton defoliants (see table) were applied in 10 gallons of spray volume on September 8. Defoliation ratings were taken on September 13, September 15, and September 22. Percent open bolls were determined on September 8, September 15, and September 22. Terminal and basal regrowth were determined three weeks after application, and yields were determined by mechanically picking the two center rows of each plot.

Due to hot, dry weather all defoliants worked quickly and defoliation was generally good (see table). Two days after application it appeared many leaves were desiccated and might not fall off the plants. These leaves, however, did fall off quickly and desiccation was not a problem. Flair at two pints per acre numerically enhanced defoliation in combination with the Def/Folex mixture. The combination of Flair (one pint) and Ginstar (five ounces), however, had the highest defoliation rating. In most treatments some green immature leaves were left in the top of the plants, which resulted in the lower ratings.

Differences in cotton boll opening were difficult to determine because of the rapid maturity of this cotton crop. Treatments had little effect on boll opening under these hot dry conditions. Regrowth was also very low due to the hot dry weather (see table). Small differences in yields were determined to be caused by small elevation differences in the field.

EFFECT OF FLAIR ON DEFOLIATION, OPEN BOLLS, REGROWTH, AND YIELD

Treatment	Rate per acre	—Percent defoliation—			—Percent open bolls—			—Regrowth—		Yields
		Sept. 13	Sept. 15	Sept. 22	Sept. 8	Sept. 15	Sept. 22	top	base	*lbs/ac*
Def/Folex	0.75 pt	81.7 ab	90.0 ab	93.3 cd	63.0 ab	96.7 ab	100.0 a	0.0 a	16.7 a	2002 bcd
Def/Folex + Flair	0.75 + 2.0 pt	85.0 a	95.0 a	95.0 bc	69.3 a	95.0 ab	97.8 ab	0.0 a	6.7 ab	1980 cd
Def/Folex + Flair	0.75 + 1.0 pt	80.0 ab	91.7 ab	93.3 cd	65.0 ab	98.3 a	98.3	0.0 a	3.3 ab	2144 a-d
Def/Folex + Finish	0.75 + 0.5 pt	81.7 ab	88.3 ab	90.0 def	55.6 ab	97.9 a	98.6 ab	0.0 a	0.0 b	1857 d
Def/Folex + Prep	0.75 + 1.33 pt	76.7 ab	90.0 ab	91.7 cde	57.0 ab	99.1 a	100.0 a	0.0 a	5.0 ab	2013 bcd
Def + Prep	0.75 + 0.5 pt	73.3 bc	85.0 bc	88.3 ef	47.3 b	85.2 b	92.9 b	0.0 a	3.3 ab	2050 bcd
Finish	1.5 pt	76.7 ab	83.3 bc	86.7 f	62.7 ab	91.3 ab	94.8 ab	0.0 a	5.0 ab	2020 bcd
Finish + Flair	1.5 + 1.0 pt	76.7 ab	85.0 bc	93.3 cd	59.4 ab	91.6 ab	95.1 ab	0.0 a	1.7 ab	2260 abc
Ginstar	5 oz	66.7 c	79.3 c	98.3 ab	52.8 ab	91.8 ab	97.1 ab	0.0 a	0.0 b	2278 ab
Ginstar + Flair	5 oz + 1.0 pt	81.7 ab	95.0 a	100.0 a	57.2 ab	93.9 ab	97.7 ab	0.0 a	3.3 ab	2373 a
LSD (0.10)		***7.67***	***7.46***	***4.11***	***16.56***	***10.51***	***6.03***	***0.00***	***13.98***	***258.3***

Means with the same letter are not significantly different at the p=0.10 level.

EVALUATION OF GINSTAR AS A COTTON DEFOLIANT

Charles Burmester

Ginstar is a combination of the defoliant Dropp and the herbicide Diuron. It is formulated as a liquid product. The objective of this study was to evaluate how Ginstar could best fit into a cotton defoliation program.

The cotton variety Deltapine NuCotn 33B was planted at the Tennessee Valley Research and Extension Center, Belle Mina, Alabama. Plots consisted of four rows 30 feet long arranged in a randomized block with four replications. Treatments (see table) were applied in 10 gallons of spray volume on August 23. Defoliation ratings were made on August 27, August 30, and September 6. Percent open bolls were counted on August 23, August 27, and September 6. Terminal and basal regrowth ratings were made three weeks after treatment, and yields were determined by mechanically picking the two center rows of each plot.

The combination of Ginstar (six ounces) and Finish (32 ounces) had the highest early defoliation ratings (see table). However, after 14 days all treatments had similar ratings. Due to hot dry condition many upper bolls on the cotton were shed and cotton matured very quickly. Under these conditions all defoliation product produced similar results.

Percent open bolls and regrowth ratings were also very similar for all defoliant tests (see table). Yields (see table) were slightly higher where Ginstar was used alone, but this was determined to be caused by small elevation differences in the trial area.

EFFECT OF GINSTAR ON DEFOLIATION, OPEN BOLLS, REGROWTH, AND YIELD

Treatment	Rate per acre	—Percent defoliation— Aug. 27	Aug. 30	Sept. 6	—Percent open bolls— Aug. 23	Aug. 27	Sept. 6	—Regrowth— top	base	Yields *lbs/ac*
Ginstar	6 oz	63.8 b	83.8 b	93.8 a	76.7 a	91.1 a	98.4 a	0.0 a	0.0 d	2102 a
Ginstar	8 oz	67.5 ab	82.5 b	95.0 a	68.8 a	93.1 a	100.0 a	1.3 a	2.5 cd	2005 ab
Ginstar + Prep	6 oz + 21 oz	66.3 ab	82.5 b	95.0 a	68.2 a	87.8 a	100.0 a	1.3 a	7.5 ab	1958 b
Ginstar + Finish	6 oz + 32 oz	76.3 a	95.0 a	93.8 a	76.4 a	90.9 a	100.0 a	0.0 a	10.0 a	1944 b
Ginstar + Harvade + Crop Oil	6 oz + 8 oz + 16 oz	63.8 b	83.8 b	91.3 a	72.8 a	89.8 a	99.4 a	2.5 a	6.3 abc	1930 b
Ginstar + Crop Oil	6 oz + 16 oz	67.5 ab	85.0 b	93.8 a	71.8 a	88.4 a	98.2 a	0.0 a	5.0 bc	1933 b
LSD (0.10)		***9.69***	***7.27***	***3.52***	***12.69***	***11.73***	***1.72***	***2.36***	***3.80***	***109.1***

Means with the same letter are not significantly different at the p=0.10 level.

MOLECULAR STUDIES

EVOLUTIONARY DIVERSITY OF CELLULOSE SYNTHASE (CESA) IN *GOSSYPIUM*

Aaron Jeffries, Allan Zipf, Khairy Soliman, Johnie Jenkins, S. Saha, and Deborah Delmer

The overall goal of this multi-laboratory project was to study the evolution and diversity of one of the most important gene families in plants, cellulose synthase, specifically, the catalytic subunit of cellulose synthase (CesA) which makes the glucose polymer we call cellulose. Cell walls of plants are primarily made up of cellulose and so CesA is thought to be an important enzyme for all plants.

One aspect of this project was to investigate the CesA family in cotton, the fibers of which are almost pure cellulose. In the first step, the CesA primers were used to screen two to three representatives from each assumed ancestor species as well as from the current cultivated species in an evolutionary/taxonomic survey.

Researchers then tried to identify which chromosomes these CesA genes were located on. Good quality genomic DNA has been extracted from several ancestral and modern species. Using a molecular technique, similar to that used in forensics, researchers amplified the DNA in a polymerase chain reaction (PCR) using primers designed at the University of California-Davis. Several other primers, based on similarities in their DNA, have been selected and are being evaluated for their utility in detecting gene differences.

INDUCTION OF HIGHLY EMBRYOGENIC CALLI AND PLANT REGENERATION IN DIPLOID AND TETRAPLOID COTTONS

H. F. Sakhanokho, Allan Zipf, Govind C. Sharma, Mehmet Karaca, S. Saha, and K. Rajasekaran

Successful plant transformation depends on regeneration of plants from transformed cells. The current commercial transgenic cottons were derived from COKER cultivars. This lack of variability in transgenic cotton could potentially contribute to a narrow genetic base. Therefore, there is a need to broaden the number of regenerable cotton lines. Through a combination of technique, media, and timely manipulations, researchers have developed a method to produce large numbers of somatic embryos (SEs) in two tetraploid as well as in two diploid accessions. SEs are just like zygotic embryos found in a seed except these develop from cells other than a fertilized egg. SEs germinate and give rise to plants, just like zygotic embryos, only SEs are produced by tissue culture means.

Callus, an unorganized mass of cells, was started from pieces of seedling stem or leaf and transferred, within a critical time frame, to a callus proliferation/maintenance medium. Potential embryogenic calli were then identified and transferred to liquid culture for four weeks, strained through a mesh screen to enrich for embryogenic cells, and placed on an embryo development/maturation medium. Large numbers of somatic embryos were reproducibly developed from all these lines. Mature SEs, placed on medium with no hormones, germinated and produced plants.

Plant regeneration efficiency was improved by a combination of media compositions from cultures of different ages. In addition, genetic changes due to the culturing process (known as "somaclonal variation") were also investigated. Preliminary molecular analysis indicated little somaclonal variation due to the culturing process.

This report offers, for the first time, a reliable and reproducible method to obtain regenerable and highly embryogenic lines in ancestral *Gossypium* species as well as modern commercial lines that can be utilized for development of transgenic plants. In addition, the method has the potential for improving plant production from other commercial cotton lines that are difficult to culture.

AUTHORS' INDEX

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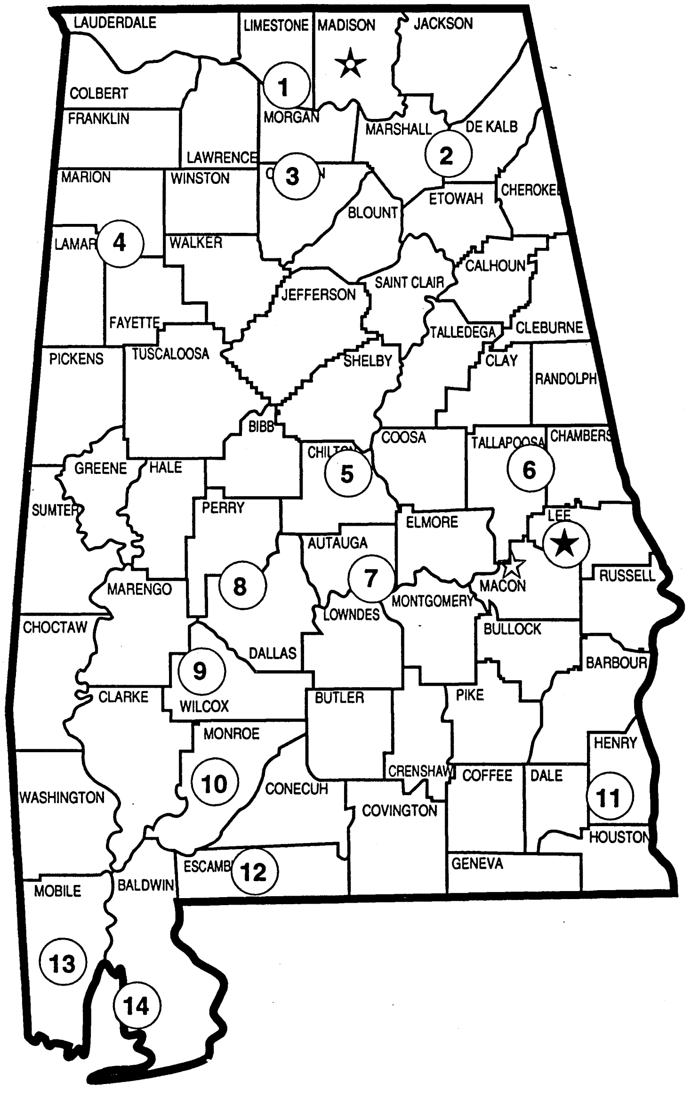

- ★ Main Agricultural Experiment Station, Auburn.
- ★ Alabama A&M University
- ☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Research and Extension Center, Belle Mina.
2. Sand Mountain Research and Extension Center, Crossville.
3. North Alabama Horticulture Station, Cullman.
4. Upper Coastal Plain Research Station, Winfield.
5. Chilton Area Horticulture Station, Clanton.
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