2001-2002 Fruit and Vegetable Report

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CONTENTS

Fruit Papers

Vegetable Papers

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FRUIT PAPERS

Performance of 'Apache' Blackberry in South Alabama

Monte Nesbitt, Ron McDaniel, and Malcomb Pegues

Six cultivars of thornless blackberries are being evaluated at the Gulf Coast Research and Extension Center in Fairhope, Alabama. Cultivars being studied include 'Apache', 'Arapaho', 'Chester', 'Loch Ness', 'Navaho', and 'Triple Crown'. Details of the planting and results from the first harvest were described in the *2000 Fruit and Vegetable Research Report.* No data were presented for 'Apache' in the 2000 report because it was planted in midsummer 1999 and did not bear fruit until 2001.

'Apache' was released in 1999 by the University of Arkansas, as a large-fruiting, thornless cultivar with resistance to orange rust disease. Orange rust has been found on three plants of 'Navaho' in this trial, and one plant of 'Arapaho', but has not been detected on 'Apache', 'Chester', 'Loch Ness', or 'Triple Crown'. No double-blossom disease has been detected to date in the entire planting, but minor cane and leaf damage has been caused by *Cercospora* and *Colletotrichum* fungi.

'Apache' was the best performing cultivar in 2001 and 2002, based on yield and fruit size data (see table). Although yield of 'Apache' was slightly lower than 'Arapaho' and 'Navaho' in 2001, it clearly out-yielded either cultivar in 2002. Fruit of 'Apache' have excellent eye appeal and size. While the size is still smaller than some thorny cultivars like 'Kiowa', it is much more impressive than the other thornless cultivars in this trial. Flavor and taste is comparable to 'Navaho', 'Arapaho', and 'Triple Crown', and is better than 'Chester' and 'Loch Ness'. 'Apache' fruit soften quickly after harvest, and shelf-life is limited, which is one disadvantage. 'Apache' has a harvest period similar to 'Navaho' and later than 'Arapaho', beginning in late May or early June, continuing into late July, and peaking in late June.

There was some concern that insufficient chilling might be a problem on the Gulf Coast. Chill hour accumulation at Fairhope was 850 in 2000-01 and 700 in 2001-02, but the high production of 'Apache' in 2002 would suggest that its chill hour requirement is not higher than 700 hours. While continued evaluation is planned, it appears that 'Apache', 'Arapaho', and perhaps 'Navaho', have some merit for the Gulf Coast. We see no potential in 'Chester', 'Loch Ness', or 'Triple Crown' as cultivars for South Alabama.

Yield of Selected Blackberry Cultivars

Cultivar	Fruit (lbs/plant)	Berries (no/lb)	Berries (no/pt)	Pints (no/plant)	Harvest period	Taste score [1]	Maximum brix
2001							
Apache	4.1	62	43	6	5/23-7/27	3.1	11.2
Arapaho	5.8	107	73	9	5/14-6/22	3.4	11.5
Navaho	6	103	74	8	5/21-7/11	3	12.2
2002							
Apache	10	67	46	14	6/7-7/31	3.4	12.9
Arapaho	5.3	133	94	8	5/24-6/26	3.5	14
Navaho	3.7	107	80	5	5/30-7/31	3.1	14

[1] Taste score 1-5, 5=best.

A Promising New Surfactant for Thinning Peach Blossoms, 2001

Bryan Wilkins, Robert Ebel, Jim A. Pitts, and Robert Boozer

Peach trees are prolific fruit producers and set more fruit than the tree can support. Trees must be thinned to have fruit that are of acceptable size for market. Thinning is usually done by hand, which is very costly and time consuming.

In the late 80s and early 90s researchers at Auburn University worked with several different chemicals to try and find an effective bloom thinner. Surfactant WK proved to be very promising. Researchers were able to determine that the active ingredient was Tergitol TMN-6 or Tergitol TMN-10.

In 2000, Tergitol TMN-6 and Tergitol TMN-10 were tested at two rates, 2% and 4%, and at two stages of bloom development, full bloom and petal fall. Both chemicals thinned effectively and had no adverse effects on fruit quality. However, the 4% rate at petal fall defoliated trees and was omitted in future tests.

In 2001, only Tergitol TMN-6 was tested at varying rates. The study was arranged as a randomized complete block design with seven treatments and five replications in single tree plots with a buffer tree between each treatment tree and a buffer row between each treatment row. Trees were sprayed at 90% full bloom and at petal fall with concentrations of either 0%, 1%, 2%, or 3%. Bloom counts were taken before spraying and fruit counts were taken before hand thinning. All normal commercial practices were followed in regards to harvest.

Time of application did not alter thinning but thinning early did increase fruit size at hand thinning (see table). Thinning with the chemical did not adversely affect fruit quality. The extent of thinning correlated with the rate of chemical applied. Fruit quality was not adversely affected by the chemical. Tergitol TMN-6 effectively thinned peach blossoms without adverse effects on the tree or fruit.

Flower Removal and Fruit Growth of Peaches Treated with Tergitol TMN-6, 2001

	Fruit set (%)	–Fruit hand thinned– weight (g/fruit)	number (no/tree)	Total fruit harvested (no/tree)	Yield (lbs/tree)	Fruit weight (g)
Concentration (%)						
0	46.0 a[1]	16.2 c	1416 a	713 a	186	127 d
1	37.0 b	18.8 b	686 b	689 ab	213	144 c
2	23.0 c	20.8 b	456 bc	490 bc	180	167 b
3	9.0 d	24.3 a	138 c	347 c	149	192 a
Time of application						
Control	46 a	16 b	1416 a	713 a	84	127 b
Full bloom	22 b	22 a	348 b	424 b	71	171 a
Petal fall	24 b	21 a	506 b	594 ab	93	165 a

[1] Means separation within columns by Duncan's Multiple Range Test p = 0.05; columns without letters are not significantly different.

Results of Peach Blossom Treated with Tergitol TMN-6, 2002

Bryan Wilkins, Robert Ebel, Jim A. Pitts, and Robert Boozer

This is a continuation of a study that was initiated in 2000 at the Chilton Research and Extension Center in Clanton, Alabama, to test the efficacy of two surfactants as peach blossom thinners.

In 2002, the study was repeated using the same rates and application times as in 2001 [0% (control), 1%, 2%, and 3% concentrations at full bloom and petal fall]. The experimental design consisted of five blocks with single trees treated within each block. There were buffer trees between treated trees within each row and buffer rows between treated rows to reduce contamination by spray drift. Five limbs that were 12 to 18 inches long were tagged on each data tree and the number of flowers were counted and classified according to stage of development. The treatments were applied using an airblast sprayer. All normal commercial practices were followed after treatment. Data collected included pretreatment flower counts, pre-hand thinning fruit counts on data limbs to determine fruit set, and number of fruit hand thinned per tree.

There were no significant differences in fruit weight at hand thinning and the number of fruit hand thinned per tree (see table). Amount of thinning did increase slightly with increasing chemical rate. There were no significant differences in time of application. There were no adverse effects on harvest or fruit quality at harvest by the chemical. These results do not reflect previous work with this chemical nor are there any apparent reasons for these differences from previous studies.

FLOWER REMOVAL AND FRUIT GROWTH OF 'FIREPRINCE' PEACH TREES TREATED WITH TERGITOL TMN-6, 2002

Concentration (%)	Fruit set	–Fruit hand thinned– weight (g/fruit)	number (no/tree)	Total fruit harvested (no/tree)	Yield (lbs/tree)	Fruit weight (g)
0	60.0 a[1]	12.8	356	548	163	143
1	61.0 a	12.9	368	698	187	135
2	54.0 a	14.2	337	590	161	145
3	40.0 b	14.0	328	689	255	167
Time of application						
Control	59	13	712	548	74	143
Full bloom	53	13	779	713	94	145
Petal fall	51	14	597	605	89	154

[1] Means separation within columns by Duncan's Multiple Range Test p = 0.05; columns without letters are not significantly different.

REFINED APPLICATION RATES FOR TERGITOL TMN-6 FOR BLOSSOM REMOVAL OF PEACH

Bryan Wilkins, Robert Ebel, Jim A. Pitts, and Robert Boozer

In previous experiments, Tergitol TMN-6 was effective in thinning peach blossoms; however, the rates that have been tested—1%, 2%, 3%, and 4% by volume—have either not removed enough of the flowers, (1%), or have removed too many flowers, (2%, 3%, and 4%). The objective of this experiment was to determine the most effective rate of Tergitol TMN-6 on the thinning of peach.

This study was initiated in the spring of 2002 at the Chilton Research and Extension Center in Clanton, Alabama. Three trees of 'Sunland' peach were sprayed at petal fall with rates of 0% (control), 1%, 1.5%, and 2% by volume Tergitol TMN-6 with an airblast sprayer. The center tree of the three was used as the data tree and an unsprayed buffer tree was between each plot with a buffer row between treated rows. Four limbs 1 to 2 feet in length were selected on each treatment tree and the total flower count and the stage of physiological development were determined prior to treatment. Before hand thinning, the number of fruit on each tagged limb was counted to determine fruit set. A drop cloth was placed under one half of the tree at time of hand thinning and the fruit collected to determine the number of fruit hand thinned per tree. Fruit were harvested according to normal commercial practices.

There were no significant differences in fruit set or fruit weight at hand thinning; however, there was a trend towards decreased fruit number that required hand thinning with increased rate of Tergitol (see table). There were no adverse effects on harvest or fruit quality.

FLOWER REMOVAL AND FRUIT GROWTH OF 'SUNLAND' PEACH TREES TREATED WITH TERGITOL TMN-6, 2002

	Fruit set (%)	–Fruit hand thinned– weight (g/fruit)	number (no/tree)	Total fruit harvested (no/tree)	Yield (lbs/tree)	Fruit weight (g)
Concentration (%)						
0.0	49[1]	13.0	504	282	79	129 c
1.0	52	12.6	472	249	79	146 a
1.5	46	13.5	442	290	82	132 b
2.0	41	13.8	346	204	63	142 ab

[1] Means separation within columns by Duncan's Multiple Range Test p = 0.05; columns without letters are not significantly different.

EXTENDING THE TIME OF APPLICATION FOR CHEMICALLY THINNING PEACH

Bryan Wilkins, Robert Ebel, Jim A. Pitts, and Robert Boozer

Peach trees set more fruit than the tree is able to support. Therefore, to have fruit that is of acceptable market size, up to 95% of the fruit must be removed from the tree. This is a very costly and time consuming process that is done primarily by hand. Currently no acceptable chemical thinners are available. The chemicals that are available are not consistent from year to year and the results from their applications cannot be seen for several weeks. These chemicals must also be applied within a very narrow application window to be effective. In a previous study conducted at the Chilton Research and Extension Center in Clanton, Alabama, Tergitol TMN-6 was shown to be an effective blossom thinner of peach that could be applied at full bloom and petal fall and still provide adequate thinning.

In the spring of 2002, a study was initiated with the objective of determining the effect of Tergitol TMN-6 after petal fall on the blossom thinning of peach. Tergitol TMN-6 was applied to 'Harvester' peach at four different stages of blossom development (full bloom, petal fall, shuck split, and shuck off) at rates of 0% (control), 1%, 2%, and 3% by volume with an airblast sprayer. The experimental plot was a randomized complete block design with single treatment trees with a buffer tree between treatment trees and a buffer row between treatment rows to minimize drift. Four limbs 1 to 2 feet in length were selected on each treatment tree and the total flower count and the stage of physiological development were determined prior to treatment. Before hand thinning, the number of fruit on each tagged limb were counted to determine fruit set. A drop cloth was placed under one half of the tree at hand thinning and the fruit collected to determine the number of fruit hand thinned per tree. Fruit were harvested according to normal commercial practices.

Time of application had no affect on the amount of thinning, but thinning early did increase fruit size at hand thinning (see table). The amount of thinning increased with the increasing chemical concentration. Some damage occurred to fruit when the chemical was applied after petal fall, with the two highest rates having the most damaged fruit. Also the foliage was severely burned, and at the two highest rates the trees at shuck split were heavily defoliated. Due to concerns about phytotoxicity, the shuck off treatment was not applied. The highest rates had the fewest number of fruit and the lowest yield. There were no adverse effects on fruit quality.

FLOWER REMOVAL AND FRUIT GROWTH OF 'HARVESTER' PEACH TREES TREATED WITH TERGITOL TMN-6, 2002

	Fruit set (%)	–Fruit hand thinned– weight (g/fruit)	number (no/tree)	Scarred fruit (%)	Total fruit harvested (no/tree)	Yield (lbs/tree)	Fruit weight (g)
Concentration (%)							
0	39 a[1]	11.6	3548 a	0 c	705	124	90
1	41 a	14.6	2251 b	2 bc	523	131	120
2	36 ab	15.5	1620 bc	12 ab	425	111	126
3	29 b	15.8	1472 c	16 a	411	108	124
Time of application							
Control	39	11.6 b	3548	0 b	705	124	90
Full bloom	32	16.3 a	1787	0 b	453	120	127
Petal fall	39	15.3 a	1977	1 b	471	121	125
Shuck split	35	14.3 a	1579	28 a	434	109	119

[1] Means separation within columns by Duncan's Multiple Range Test p = 0.05; columns without letters are not significantly different.

EVALUATION OF FLINT AND ELITE FOR BROWN ROT CONTROL ON PEACH

Edward Sikora, Jim A. Pitts, Robert Boozer, and Clifford Sikora

This test was conducted to evaluate fungicides targeted for use in the preharvest period for control of brown rot. The fungicides Elite and Flint were evaluated at various rates individually, and as tank-mix partners. Results showed no differences in brown rot control among the treatments though all were more effective than the unsprayed control treatment. These fungicides did not appear to have a beneficial effect in controlling Rhizopus rot, another postharvest disease of peaches.

The experiment was conducted on a block of 'Harvester' peach trees at the Chilton Research and Extension Center in Clanton, Alabama. The experiment consisted of eight treatments, replicated five times, in a randomized complete block design. Treatments consisted of preharvest spray programs that compared Elite, Flint, or tank mixes of the two products in various combinations. All trees were maintained during the bloom and cover period following commercial production practices typical for the area. All trees were sprayed with Captan 50 WP at 5 pounds per acre on March 13, and with Captan 50 WP 3 pounds per acre plus sulfur 80% at 5.5 pounds per acre on March 22, April 2, April 6, April 20, May 4, and May 14. Preharvest treatments were applied on June 4, June 7, June 11, and June 13. The station superintendent decided on the closely spaced application schedule, which he felt was necessary as he suspected the fungicides did not have a sufficient time to dry on the fruit before heavy rains prevailed shortly after the fungicides were applied.

No symptoms of brown rot or any signs of phytotoxicity were observed on trees one day prior to the first harvest date. A total of 40 fruit per plot was sub-sampled at harvest (June 14) and stored in trays at approximately 75°F for eight days. Percent fruit with brown rot and Rhizopus rot was determined four and eight days after the first harvest date.

A second harvest was conducted on June 18, five days after the last fungicide application. A total of 20 fruit per plot were sub-sampled on the second harvest date and stored in trays at approximately 75°F for four days. Percent of fruit with brown rot and Rhizopus rot was determined four days after the second harvest (June 22), which was nine days after the final fungicide application. Yield in pounds of marketable fruit was determined.

All the fungicide treatments had significantly less brown rot than the unsprayed control at both four and eight days postharvest (with the last fungicide application one day prior to harvest) (Table 1). There were no significant differences in Rhizopus rot among the treatments at either rating period.

All the fungicide treatments had significantly less brown rot than the unsprayed control four days postharvest (with the last fungicide application five days prior to harvest) (Table 2). There were no significant differences in Rhizopus rot among the treatments.

The Flint 50 WG treatment at 3 ounces per acre had the highest yield, significantly higher than the two lower rates of Elite treatments. In general, yields were highest in the Flint-only treatments followed by the Flint/Elite tank-mix treatments and the Elite-only treatments.

TABLE 1. PERCENT BROWN ROT AND RHIZOPUS ROT FOUR AND EIGHT DAYS POSTHARVEST[1]

Treatment	Rate/acre	–Four days postharvest– Brown rot (%)	Rhizopus (%)	–Eight days postharvest– Brown rot (%)	Rhizopus (%)
Unsprayed control	—	5.0 a [2]	1.5 a	20.5 a	8.5 a
ELITE 45 WG w/t Induce 0.06%	5 oz	0.0 b	0.5 a	0.0 b	9.5 a
ELITE 45 WG w/t Induce 0.06%	6 oz	0.0 b	0.5 a	0.0 b	10.0 a
ELITE 45 WG w/t Induce 0.06%	8 oz	0.0 b	1.0 a	0.0 b	9.5 a
FLINT 50 WG	2 oz	0.0 b	0.6 a	0.0 b	8.7 a
FLINT 50 WG	3 oz	1.5 b	1.5 a	1.5 b	9.5 a
ELITE 45 WG + FLINT 50 WG	2.9 oz 2.6 oz	0.0 b	0.0 a	0.0 b	3.0 a
ELITE 45 WG + FLINT 50 WG	3.5 oz 3.1 oz	0.5 b	1.5 a	0.0 b	11.0 a

[1] The last fungicide application was one day prior to harvest, 2001.
[2] Numbers followed by the same letter are not significantly different.

TABLE 2. PERCENT BROWN ROT AND RHIZOPUS ROT FOUR DAYS POSTHARVEST[1]

Treatment	Rate/acre	–Four days postharvest– Brown rot (%)	Rhizopus (%)	Yield (lbs/plot)
Unsprayed control	—	22.0 a[2]	8.0 a	141.4 ab
ELITE 45 WG w/t Induce 0.06%	5 oz	0.0 b	3.6 ab	129.5 b
ELITE 45 WG w/t Induce 0.06%	6 oz	0.0 b	5.0 ab	119.2 b
ELITE 45 WG w/t Induce 0.06%	8 oz	0.0 b	0.0 b	140.1 ab
FLINT 50 WG	2 oz	0.0 b	2.2 ab	168.7 ab
FLINT 50 WG	3 oz	0.0 b	5.7 ab	205.1 a
ELITE 45 WG + FLINT 50 WG	2.9 oz 2.6 oz	0.0 b	1.3 ab	162.0 ab
ELITE 45 WG + FLINT 50 WG	3.5 oz 3.1 oz	0.0 b	2.5 ab	181.5 ab

[1] The last fungicide application was five days prior to harvest, 2001.
[2] Numbers followed the same letter are not significantly different.

EVALUATION OF SULFUR-BASED FUNGICIDES FOR SCAB CONTROL ON PEACHES

Edward Sikora and Jim A. Pitts

Peach scab is a common fungal disease of peaches in Alabama resulting in spotted and scarred fruit and reduced fruit quality. This test was conducted to evaluate various cover spray programs using Microthiol Disperss, a sulfur-based fungicide. These programs were compared to the Alabama peach industry standards of Wettable Sulfur 90 W and Captan 50 WP for scab control on peaches. Results from this study indicate that Microthiol Disperss at rates from 6 to 10 pounds per acre and in a tank-mix or rotational program with Captan 50 WP controlled scab as well as Wettable sulfur at 9 pounds per acre. The Microthiol Disperss/Captan tank-mix treatment and the Microthiol Disperss/Captan rotation treatments also performed as well as Captan 50 WP 5 pounds per acre in controlling scab.

This experiment was conducted at the Chilton Research and Extension Center in Clanton, Alabama, in 2002. The test consisted of seven treatments replicated five times in a randomized complete block design. All treatments including the control received two Bravo Weatherstik applications at petal fall and shuck split and preharvest applications of Orbit at standard rates. There

EFFECT OF FUNGICIDE SPRAY PROGRAMS ON SCAB INCIDENCE, CLANTON, 2002

Treatment rate per acre[1]	Fruit with scab (%)	Marketable fruit (%)
Unsprayed control	37.5	81.5
Microthiol Disperss 10 lb	3.5	98.5
Microthiol Disperss 6 lb	5.0	98.5
Microthiol Disperss 3 lb + Captan 50 WP 3.0 lb	0.5	100.0
Captan 50 WP 5.0 lb rotated with Microthiol Disperss[2]	0.5	100.0
Wettable sulfur 90 WP 9 lb	4.5	100.0
Captan 50 WP 5 lb	0.5	99.5

[1] Each treatment received eight cover sprays.
[2] Captan was used in cover sprays 1, 3, 5, and 7 and Microthiol Disperss was used in sprays 2, 4, 6, and 8.

were a total of eight cover sprays applied for each treatment. Forty fruit were collected from each two-tree replication at harvest and evaluated for incidence and marketability (disease severity) of scab. Fruit were stored at 75°F for seven days then rated for the postharvest fungal diseases brown rot and Rhizopus rot.

All fungicide treatments performed significantly better than the unsprayed control (see table). Scab incidence ranged from 0.5 to 5.0% among the fungicide treatments. Treatments that used Captan 50 WP had slightly lower levels of scab incidence than programs that used Microthiol Disperss or Wettable sulfur alone full season. There were no significant differences among the fungicide programs in fruit marketability, and all produced significantly more marketable fruit than the unsprayed control. There were no differences in brown rot or Rhizopus rot control among the treatments, including the unsprayed control (data not shown).

EVALUATION OF CAPTAN/SULFUR TANK MIXES FOR PEACH SCAB AND BROWN SPOT CONTROL ON PEACHES

Edward Sikora, Jim A. Pitts, Robert Boozer, and Clifford Sikora

Peach producers in Alabama commonly use sulfur as part of their disease management program. To improve its effectiveness, and to keep costs relatively low, some growers tank-mix sulfur with the fungicide Captan for spraying during the cover period. How effective this program is in controlling peach diseases and the relative ratio of sulfur to Captan needed for control are still not clear. This reports outlines the results of the third year of a three-year study comparing two sulfur/Captan tank-mix programs with the standard, full season cover spray programs of sulfur or Captan alone.

The experiment was conducted at the Chilton Research and Extension Center near Clanton, Alabama, on the cultivar 'Alred Alberta'. Treatments consisted of cover spray programs of (1) unsprayed control, (2) Captan 50 WP at 5 pounds per acre, (3) Sulfur 80% at 9 pounds per acre, (4) Captan 50 WP 3 pounds per acre plus Sulfur 80% at 5.5 pounds per acre, and (5) Captan 50 WP 2 pounds per acre plus Sulfur 80% at 3.5 pounds per acre.

All the fungicide programs performed significantly better than the unsprayed control in terms of scab incidence and marketability of fruit (see table). The sulfur-only program had a significantly higher level of scab incidence compared to the Captan and the Captan/sulfur tank-mix programs. The sulfur-only program also produced significantly less marketable fruit than the Captan program and the higher rate program of the Captan/sulfur tank mix. Brown rot was a significant problem based on the high level of disease incidence on the unsprayed control. There was no significant difference in brown rot incidence among the fungicide programs; however disease incidence was highest in the sulfur-only program and progressively less with higher rates of Captan. There were no significant differences in Rhizopus rot among the treatments, including the unsprayed control.

Results from this trial are similar to what was observed in 1999. Spray programs consisting of Captan alone at 5 pounds per acre or Captan 3 pounds per acre plus Sulfur at 5.5 pounds per acre had fewer fruit with scab lesions and higher levels of marketable fruit compared to the sulfur-only program. In the three-year study, the tank-mix programs have usually performed as well as the Captan-only program, though the lower rate of the Captan/sulfur tank-mix program is less effective in high scab pressure situations. The Captan/sulfur tank-mix programs and the sulfur-only program may also suffer from heavier losses from brown rot in high brown rot-pressure years, though this needs to be investigated further.

EVALUATION OF CAPTAN/SULFUR TANK MIXES FOR PEACH SCAB AND BROWN ROT CONTROL ON PEACHES, 2001

Fungicide cover spray program[1]	Fruit with scab	Marketable fruit	Brown rot	Rhizopus rot
	%			
Unsprayed control	92.7 a[2]	16.2 c	65.6 a	18.4 a
Captan 50 WP 5 lb/ac	5.7 c	96.8 a	8.8 b	23.9 a
Sulfur 80% 9 lb/ac	31.3 b	84.1 b	19.2 b	28.6 a
Captan 50 WP 3 lb/ac + Sulfur 80% 5.5 lb/ac	5.0 c	98.0 a	11.6 b	26.4 a
Captan 50 WP 2 lb/ac + Sulfur 80% 3.5 lb/ac	17.5 c	91.2 ab	16.5 b	25.7 a

[1] Bravo Ultrex was applied at shuck split and petal-fall and two Orbit sprays were applied at seven and one day before harvest for all treatments except the control. A total of 40 fruit were picked from the center two trees of each treatment/replication. Percent of fruit with scab and percent marketable fruit were determined at harvest. Incidence of brown rot and Rhizopus rot was determined seven days after harvest.

[2] Numbers followed by the same letter are not significantly different from one another.

EVALUATION OF ZIRAM 76 DF FOR RED SPOT CONTROL ON PEACHES, 2002

Edward Sikora, Jim A. Pitts, Robert Boozer, and Wheeler Foshee

Red spot is a common problem in Chilton County on light-skinned peaches. The cause of the disease is still unclear. One report suggests red spot is caused by an Alternaria-type fungus, but this has not been confirmed in Alabama. Ziram 76 DF has been observed to suppress red spot in South Carolina. This trial was conducted to determine if Ziram would reduce red spot severity in Alabama. Results indicate that the 4- and 5-pound rates of Ziram reduced red spot severity on peach fruit.

The experiment was conducted at the Chilton Research and Extension Center in Clanton, Alabama, in 2002. The test consisted of four treatments replicated four times in a randomized complete block design. All treatments including the control received two Bravo Weatherstik applications at petal fall and shuck split and one preharvest application of Orbit at standard rates. There were a total of 14 Ziram 76 DF applications applied weekly starting on April 18 and ending on July 19. Twenty fruit were collected from each replication at harvest and the number of red spots per fruit was determined.

All Ziram 76 DF treatments performed better than the unsprayed control in reducing severity of red spot on peach fruit (see table). None of the treatments provided 100% control. There were no significant difference between the 4- and 5-pound rates of Ziram. The success of Ziram 76 DF in reducing red spot does suggest that the disease is caused by a fungal pathogen.

The recommendation in South Carolina calls for three to four applications of Ziram 76 DF at a rate of 4 pounds per acre beginning seven to 10 days after shuck split and reapplication every 14 days with a total of three to four applications, followed by standard cover spray program. In this trial, Ziram was applied weekly with a total of 14 applications, which may not be economical. In 2003, the experiment will be repeated and the recommendations suggested in South Carolina followed.

EFFECT OF ZIRAM 76 DF ON RED SPOT ON PEACHES, 2002

Treatment rate/acre[1]	Percent of fruit with red spots (ranging from 0 to 15<) 0	1-5	6-15	15<
Unsprayed control	46.2	16.2	12.5	25.0
Ziram 76 DF 3 lb	78.7	3.7	11.2	6.2
Ziram 76 DF 4 lb	92.5	1.2	3.7	2.5
Ziram 76 DF 5 lb	91.2	1.2	3.7	3.7

[1] Each treatment received 14 Ziram 76 DF applications.

SCREENING OF NEW INSECTICIDES FOR CONTROL OF PLUM CURCULIO IN PEACHES

Wheeler Foshee, Robert Boozer, Dan Horton, and Johnny Staples

The plum curculio (*Conotrachelus nenuphur*) is the most destructive pest of peaches grown in the Southeast. Control of plum cucurlio in the past was very effective with organophosphates, particularly the use of encapsulated methyl parathion until it was canceled by EPA in 1999. In 2001, use of azinphos-methyl (Guthion), another organophosphate, was restricted in the number of applications and this insecticide will be canceled by the end of 2005.

The use of new chemistries as possible alternatives to organophosphates for plum cucurlio control needs evaluating. With many new insecticides available, a faster screening method is needed to select candidates for field testing. The objective of our study was to develop a screening method and to test some newer insecticides for the control of plum curculio in peaches.

During the spring of 2002, adult plum cucurlio were obtained from traps within orchards in Chilton County, Alabama. Insecticides evaluated (Table 1) were applied at an equivalent rate of 50 gallons per acre using a Burkhard hand-applicator at a rate of 0.5 Fl to each plum cucurlio adult. All spray mixtures received a 0.5 v/v addition of Destiny® surfactant, a modified seed-oil. Mortality and insecticide intoxication data were taken at 24, 48, 72, and 96 hours postapplication.

Preliminary results indicate that the organophosphate malathion and the pyrethroid bifenthrin (Capture) performed better, in most cases, than all other treatments. At 24 hours postapplication, the only 100% mortality/intoxicated state was observed in bifenthrin (2x rate), malathion, and malathion (2x rate) treatments. These were also the only treatments at the 48-

hour post-application point that reached 100% mortality/intoxication. Several other treatments did improve at the 48-hour post-application evaluation (Table 2).

At 72 hours postapplication, bifenthrin (2x rate), malathion, and malathion (2x rate) were still at 100% mortality/intoxication. The treatments similar to these were fipronil, fipronil (2x rate), bifenthrin, and thiamethoxam (2x rate) (Table 2).

The final assessment was at 96 hours and natural mortality may have become a factor. The following treatments gave 100% mortality/intoxication: bifenthrin (2x rate), malathion, malathion (2x rate), and fipronil (2x rate). These had higher mortality/intoxication states than thiacloprid (2x rate) (33%) and the untreated 2x check (17%) (Table 2).

The high level of plum curculio mortality by malathion and bifenthrin demonstrated that the older chemistries, at this point, still have superior efficacy. It is worth noting that among other materials tested, only fipronil at the 2x rate gave 100% mortality/intoxication after 96 hours. Fipronil is known to be slow-acting, so these results are noteworthy. At the 72-hour postapplication point, the only new chemistries to give 83% control were the 1x and 2x rates of fipronil. Thiamethoxam and thiacloprid failed, giving only 33% control.

Results are preliminary and further testing of these new chemistries to validate the results is needed before field tested can be suggested.

TABLE 1. INSECTICIDES EVALUATED, FORMULATION, RATES, AND AMOUNTS MIXED FOR A 20ML MIX

Treatment	Formulation	Rate (lb ai/ac)	Amount of product per 20 ml mix	2x rates
Thiamethoxam(Actara®)	25wg	0.078	14.95 mg	29.9 mg
Thiacloprid (Calypso®)	4EC	0.2568	25.68 ml	51.3 ml
Fipronil (Termidor®)	0.8 SC	0.25	125 ml	250 ml
Bifenthrin (Capture®)	2EC	0.10	20 ml	40 ml
Malathion	50% EC	0.5	400 ml	800 ml

TABLE 2. RESULTS OF EFFICACY OF TESTED INSECTICIDES FOR CONTROL OF PLUM CURCULIO

Treatment	Percent intoxicated and mortality			
	24 hours	48 hours	72 hours	96 hours
Thiamethoxam (Actara®)	33 cd[1]	33 bc	33 bc	50 abc
Thiamethoxam – 2x (Actara®)	50 bc	50 abc	67 ab	67 abc
Bifenthrin (Capture®)	50 bc	67 ab	83 a	83 ab
Bifenthrin – 2x (Capture®)	100 a	100 a	100 a	100 a
Thiacloprid (Calypso®)	17 cd	33 bc	33 bc	50 abc
Thiacloprid – 2x (Calypso®)	33 cd	33 bc	33 bc	33 bc
Malathion	100 a	100 a	100 a	100 a
Malathion – 2x	100 a	100 a	100 a	100 a
Fipronil (Termidor®)	50 bc	67 ab	83 a	83 ab
Fipronil – 2x (Termidor®)	83 ab	83 ab	83 a	100 a
Untreated	50 bc	50 abc	17 c	50 abc
Untreated – 2x	0 d	0 c	0 c	17 c

[1] Waller-Duncan K-ration T test. Means within columns followed by the same letter are not significant, $P \leq 0.05$.

FREQUENCY OF WARM WINTERS INCREASES NEED FOR REST-BREAKING COMPOUNDS

Robert Boozer and Jim A. Pitts

One of the major concerns for peach producers in Central Alabama is the occurrence of early spring freeze damage to peaches. In addition, recent winter weather patterns have been warmer than normal resulting in insufficient chill hours. Chilling is necessary for normal rest breaking of fruit and leaf buds. One chill hour is one hour at or below 45°F and total hours are recorded from October 1 through February 15. During five of the past eight years, Central Alabama has not received sufficient chill hours to completely satisfy the bud rest of 850 chill hour and higher peach varieties. Some of these warmer winters have affected leaf buds much more than fruit buds. Natural chilling is more desirable, but rest- breaking chemicals could be beneficial where chill hours might need to be supplemented.

Producers would like to be able to decide as late as possible before committing to applying rest-breaking chemicals. One of the major reasons is the high cost of the only currently labeled product, Dormex (hydrogen cyanamide). Other reasons are concerns for breaking rest too early and trying to utilize as much natural chilling as possible. Earlier work with Dormex indicated that effective applications were made when 72% of natural chilling for a variety had occurred. If chill hour accumulation picked up during February, would waiting until late February or early March before making an application work? This study was conducted to evaluate early and late applications of rest-breaking compounds.

Dormex and Dropp (thidiazuron) are two compounds that have been reported and tested for the ability to stimulate buds into their growth phase. The time of application and rates with these compounds and the effect on fruit number, size, and shape are important questions that are still being investigated. Of the two compounds, only Dormex has a label at this time.

In 2002 a study was conducted at the Chilton Research and Extension Center, Clanton, Alabama, in a block of 'Cresthaven' peaches, 950 chill hour variety. A total of six treatments at two different application dates were evaluated on fruit bud development, fruit size, shape, and total yield. Treatments consisted of Dormex at 1.0%, 2.0%, and 4.0% plus nonionic surfactant at 0.25% applied on January 28 and March 7 (early pink bud stage). Dropp was applied at 200 parts per million and at 300 parts per million plus 2% Dormant Oil on the same dates. As a standard, one treatment consisted of an untreated control. Applications were made with an air-blast sprayer using 130 gallons spray volume per acre.

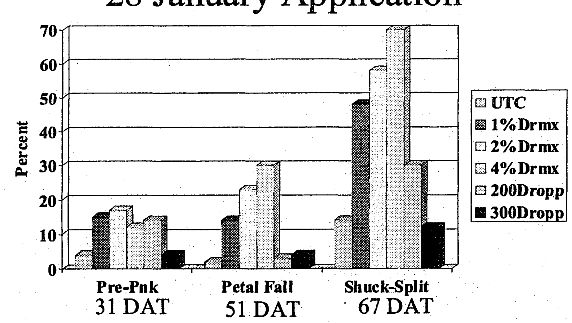
On January 28 the total number of chill hours occurring since October 1, 2001 was 706. Slightly over 74% of the chilling requirement had been satisfied for 'Cresthaven' at the time of the first application. Buds were in very early swell stage and contained light green pollen grains as discerned at 10x magnification when dissected. On March 7, when buds were at the early pink stage, the second application of each treatment was made. Chill hours totaled 923 by February 15 and 1129 by March 7, 2002.

Fruit bud losses within the 'Cresthaven' block appeared to be related to weather as well as application of Dormex and Dropp. The highest rate of Dormex thinned buds, but bud survival was not statistically lower than the untreated control. Dropp seemed to provide some level of freeze protection. Fruit bud development was advanced by the use of Dormex at the first application date, but not the later application. The amount of advancement increased over time and was most significant at shuck-split. It seems the use of Dormex reduces the number of heat units needed to reach a certain fruit bud developmental stage (Figure 1). Dropp did not significantly advance fruit buds on either application date. Visible differences in leaf bud advancement were noted for Dropp with even more leaf bud advancement noticed for Dormex, after the first application.

Fruit were harvested four times from July 15 through July 26. Total number of fruit and size of fruit were not significantly different among treatments. Adverse weather during the early growth phase of fruit was thought to have contributed to poor sizing. Size problems were also a problem in lower chill hour peach varieties near this location.

Quality ratings on fruit shape were improved with Dormex and Dropp (Figure 2). Individual ratings for appearance [round (2), oval (4), tip (6), point (8), and suture (10)] were combined to provide an overall rating. The higher the number the less desirable the characteristics. Fruit quality resulting from the first application was improved by 2% and 4% Dormex, and 200 parts per million Dropp over the untreated control. There were no statisti-

Figure 1. Fruit Bud Development as Affected by Dormex and Dropp, 28 January Application

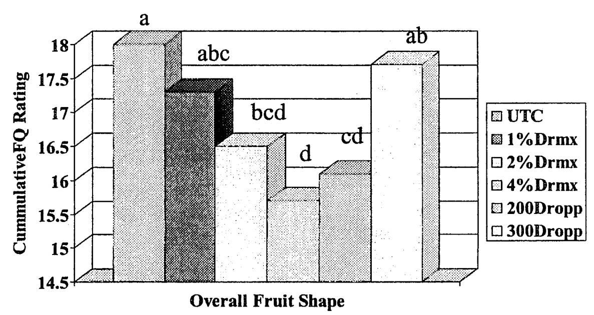


DAT = days after treatment

cal differences in fruit quality due to the second application treatment.

Dormex exceeds Dropp as a compound for breaking rest in fruit buds of peach. The only potential benefit from Dropp that might justify further work would be the potential increase in fruit bud hardiness during late winter and early spring freezes and potential benefit to fruit shape. Time of application was shown to be important for the use of Dormex. Applications made as late as early pink are not effective in advancing fruit buds. Dormex seems to do a good job in compensating chill hours and potentially reducing heat unit requirements, but will not compensate for poor growing conditions during early fruit development. Visible impact on leaf growth was consistent with other studies using Dormex. The physiological condition of the tree should be improved by a more normal transition out of the rest stage into growth stage and would likely benefit future productivity.

Figure 2. Fruit Quality Rating 28 January Application



Higher value, more shape problems, max rating=22, min rating=8, LSD P=0.05

Effects of the Rate of Nitrogen and Times of Pruning on Three Varieties of Peach in Central Alabama, 2001

Bryan Wilkins, Robert Ebel, Robert Boozer, and Jim A. Pitts

This is a continuation of a study initiated in 2000 at the Chilton Research and Extension Center in Clanton, Alabama. The objective of the study was to determine an optimal nitrogen rate and pruning regime for peach. The study is being conducted on three varieties of peach with different ripening dates: 'Surecrop' (early), 'Contender' (mid), and 'Encore' (late). During the growing season, trees were pruned once (winter), twice (winter and shortly before harvest), or three times (right before hand thinning, two to three weeks before harvest, and after harvest). Nitrogen was applied at 30, 60, and 90 pounds per acre per year. The experiment was a blocked (five blocks), split-plot design with nitrogen application as the main plot and pruning treatment as the split plot. Data collected included weights of all prunings, trunk cross sectional area, yield, fruit color, firmness, soluble solids, and average fruit weight.

No fruit were produced in 2001. There were no significant differences for 'Surecrop' (see table) in trunk cross sectional area for the nitrogen treatment or pruning method. Pruning weights by pruning method were different, with the trees that were pruned twice having the least weight. Also photosynthesis and stomatal conductance by method of pruning were different, with the trees that were pruned three times a year having the highest rates.

There were no differences in trunk cross sectional area for 'Contender' with respect to amount of N applied and pruning method. Pruning weights with respect to N rate and pruning method were significantly different. Also photosynthesis and stomatal conductance by method of pruning were different, with the trees that were pruned three times a year having the highest rates.

There were no differences in trunk cross sectional area for 'Encore' with respect to N rate or pruning method. Pruning weights by pruning method were different with the trees that were pruned two times having the highest weights. Also photosynthesis and stomatal conductance by method of pruning were significantly different with the trees that were pruned three times a year having the highest rates.

INFLUENCE OF NITROGEN RATE AND PRUNING METHOD ON PEACH (*PRUNUS PERSICA* (L.) BATSCH) PERFORMANCE IN 2001

	Trunk cross-sectional area (cm^2/tree)	Pruning weight (kg/tree)	Photo-synthesis (μmol $CO_2/m^2/s^1$)	Stomatal conductance (mol H_2O $m^{-2}s^{-1}$)
		'Surecrop'		
Nitrogen rate (lbs/acre)				
30	155 [1]	9.1	15.7	0.190
60	161	10.7	15.6	0.195
90	139	8.8	15.7	0.195
Pruning (no. times/year)				
1	169	12.7 a	14.1 c	0.159 c
2	143	6.2 b	15.5 b	0.182 b
3	143	10.8 a	17.4 a	0.239 a
'Contender'				
Nitrogen rate (lbs/ac)				
30	151	10.6 a	14.9	0.198
60	139	10.1 a	14.5	0.185
90	143	8.3 b	14.7	0.184
Pruning (no. times/year)				
1	142	8.7 b	13.6 c	0.154 c
2	147	12.4 a	14.5 b	0.183 b
3	144	8.2 b	16.1 a	0.230 a
'Encore'				
Nitrogen rate (lbs/ac)				
30	150	14.8	11.3	0.149
60	154	15.5	11.6	0.154
90	141	14.4	11.1	0.145
Pruning (no. times/year)				
1	148	9.2 b	10.7 b	0.128 c
2	154	21.9 a	11.0 b	0.150 b
3	143	12.1 b	12.2 a	0.170 a

[1] Mean separation within columns by Duncan's Multiple Range Test p = 0.05, columns without letters were not significantly different.

EFFECTS OF THE RATE OF NITROGEN AND TIMES OF PRUNING ON THREE VARIETIES OF PEACH IN CENTRAL ALABAMA, 2002

Bryan Wilkins, Robert Ebel, Robert Boozer, and Jim A. Pitts

This is a continuation of a study initiated in 2000 at the Chilton Research and Extension Center in Clanton, Alabama. The objective of the study was to determine an optimal nitrogen rate and pruning regime for peach. The study is being conducted on three varieties of peach with different ripening dates: 'Surecrop' (early), 'Contender' (mid), and 'Encore' (late). During the growing season, trees were pruned once (winter), twice (winter and shortly before harvest), or three times (right before hand thinning, two to three weeks before harvest, and after harvest). Nitrogen was applied at 30, 60, and 90 pounds per acre per year. The experiment was a blocked (five blocks), split-plot design with nitrogen application as the main plot and pruning treatment as the split plot. Data collected included weights of all prunings, trunk cross sectional area, yield, fruit color, firmness, soluble solids, and average fruit weight.

This report summarizes the results of the 2002 study. Pruning weights for 'Surecrop' were significantly different with the trees that were pruned three times per year having the smallest weights (see table). There were significant differences in photosynthesis and stomatal conductance by pruning method with the trees that were pruned one time having the lowest rates. Method of pruning made a significant difference on the number of fruit harvested and the total yield per tree. There were no significant differences in fruit weight, red blush, or soluble solids. Trees that had the lowest N rate and were pruned three times had firmer fruit.

For 'Contender', pruning weight by pruning method was significantly different with trees being pruned one time having the lowest weights. There were significant differences in photosynthesis and stomatal conductance by pruning method with the trees that were pruned one time having the lowest rates. Total number of fruit harvested, total yield, soluble solids, or red blush were not affected by N or pruning treatments. There was a significant difference in fruit weight and firmness by pruning method with trees that were pruned one time having the lowest weights and being the least firm.

Pruning weights for 'Encore' were significantly affected by pruning method with trees that were pruned one time having the highest weights. There were significant differences in photosynthesis and stomatal conductance by pruning method with the trees that were pruned one time having the lowest rates. There were significant differences in total number of fruit per tree with trees being pruned one time having the most fruit. There were no significant differences in total yield, fruit weight, soluble solids, or red blush. Fruit firmness was affected by pruning with fruit from trees that were pruned three times being the most firm. At this time except for a few incidences, N rate has not had an effect on any of the parameters for the three varieties in this study.

INFLUENCE OF NITROGEN RATE AND PRUNING METHOD ON PEACH (*PRUNUS PERSICA* (L.) BATSCH) PERFORMANCE IN 2002

	Pruning weight (kg/tree)	Photo-synthesis (μmol $CO_2/m^2/s^1$)	Stomatal conductance (mol H_2O $m^{-2}s^{-1}$)	Total fruit/tree (no)	Yield (kg/tree)	Avg. fruit weight (g/fruit)	Fruit firmness (lbs)
'Surecrop'							
Nitrogen rate (lbs/acre)							
30	12.4 [1]	13.0	0.236	349	39.7	164	7.7 a
60	14.2	13.4	0.242	380	42.0	130	6.5 ab
90	11.2	13.2	0.237	404	42.7	113	5.7 b
Pruning (no. times/year)							
1	18.3 a	12.1 b	0.202 b	396 a	44.6 a	121	6.7 ab
2	15.9 a	13.8 a	0.254 a	474 a	49.1 a	123	5.0 b
3	8.5 b	13.8 a	0.257 a	263 b	30.7 b	165	8.1 a
'Contender'							
Nitrogen rate (lbs/acre)							
30	14.4	12.1	0.260	369	53.8	155	7.2
60	13.6	11.8	0.234	374	48.5	147	7.3
90	14.0	11.6	0.228	401	49.5	145	7.3
Pruning (no. times/year)							
1	22.4 a	10.8 b	0.187 b	427	50.9	139 b	11.9 b
2	15.8 b	12.1 a	0.267 a	367	53.4	153 ab	12.5 a
3	10.0 c	12.6 a	0.269 a	350	47.6	156 a	12.4 a
'Encore'							
Nitrogen rate (lbs/acre)							
30	8.4	12.1	0.171	435	62.6	139	7.5
60	10.1	12.0	0.177	369	52.0	145	8.8
90	9.7	11.7	0.169	366	53.6	143	9.1
Pruning (no. times/year)							
1	17.8 a	10.4 b	0.124 b	482 a	62.3	129	14.3 b
2	8.3 b	12.3 a	0.189 a	357 b	53.4	145	14.0 b
3	7.2 b	13.1 a	0.203 a	330 b	52.4	154	14.6 a

[1] Numbers within columns followed by the same letter are not significantly different (P=0.05, DMRT). Numbers in columns without letters were not significantly different.

EFFICACY OF THE SOIL FUMIGANTS TELONE C-35 AND TELONE II ON GROWTH AND SURVIVAL OF PEACH TREES ON A REPLANT SITE

Bryan Wilkins, Robert Ebel, Jim A. Pitts, Robert Boozer, and Edward Sikora

Because of limited land availability, growers are often forced to plant peach trees on land that had been planted in peach trees for many years. Pathogens build up in soil planted in peach trees, causing replanted trees to perform poorly. Preplant fumigants have been developed to kill soil pathogens. The most popular preplant soil fumigant is methyl bromide because of its high effectiveness; however, methyl bromide is scheduled to be removed from the market in the next few years. Telone II (dichloropropene) has been available for many years, but early reports showed methyl bromide and chloroprycrin as being more effective in promoting growth and survival of trees on replant sites. Telone C-35 contains dichloropropene and chlorpycrin, which should be more effective than Telone II in reducing soil pathogens, and may be a suitable replacement for methyl bromide. The objective of this study was to compare growth, survival, yield, and disease development of peach trees planted in soil treated with Telone II and Telone C-35.

The experiment was conducted on a site that had been planted in peach trees since 1985. In the summer of 1999, the trees were removed. Preplant soil fumigation treatments included Telone II, Telone C-35, and an untreated control that was applied in an 8-foot band or broadcasted across the entire root zone. Telone II was applied at a rate of 30 gallons per acre and Telone C-35 at a rate of 42 gallons per acre. The experiment was set up as a randomized complete block design with five blocks containing four adjacent trees with data collected from the center two trees. The trees in the block were 'Sureprince' on Guardian rootstock planted on a 12- by 20-foot spacing and trained to a four-scaffold Y. The soil was sampled for ring nematode immediately before fumigation and before planting.

There were no significant differences in the nematode populations throughout the block with the exceptions of spiral and stubby root nematodes; however, there was no consistent trend with respect to treatment (Table 1). Populations of all nematodes were low throughout the experiment. There were no statistical differences in truck cross sectional area or tree vigor for any of the treatments in 2001 (Table 2). There was no statistical differences in number of fruit harvested, yield, and fruit quality. These data demonstrate that these soil fumigants do not have a positive effect on growth and yield of peach when nematode populations are low.

TABLE 1. EFFECTS OF TWO TELONE FORMULATIONS AT DIFFERENT APPLICATION RATES AND METHODS ON THE POPULATION DENSITIES OF NEMATODES IN 'SUREPRINCE' PEACH [1]

Nematode	Control	Telone C35 banded (42 gal/ac)	Telone C35 broadcast (42 gal/ac)	Telone II banded (30 gal/ac)	Telone II broadcast (30 gal/ac)
Spiral	2.4 ab [2]	2.5 ab	0.9 b	3.8 a	1.1 b
Lesion	2.8	1.3	0.7	1.4	0.8
Ring	5.5	4.9	5.6	2.3	6.2
Stunt	3.1	0.4	2.2	0.4	2.2
Rootknot	0.9	1.8	1.1	1.0	2.2
Dagger	1.0	0.3	0.1	0.5	0.3
Tylenchus	5.8	5.2	2.2	1.9	5.0
Cyst	0	0.1	0	0	0
Reniform	0	0	1.0	1.0	0.1
Stubby Root	0 b	0 b	0 b	0 b	0.2 a

[1] Means derived from data taken in 1999, 2000, 2001, and 2002.
[2] Mean separation within columns by Duncan's Multiple Range Test p = 0.05, columns without letters were not significantly different.

TABLE 2. EFFECTS OF TWO TELONE FORMULATIONS AT DIFFERENT APPLICATION RATES AND METHODS ON THE GROWTH OF 'SUREPRINCE' PEACH [1]

Telone	Rate (gal/ac)	Application	Trunk cross-sectional area (cm^2/yr)	Total fruit harvested (no)	Yield (lbs)
C35	42	Banded	18.1[2]	174	38
C35	42	Broadcast	16.5	162	351
II	30	Banded	16.4	196	41
II	30	Broadcast	17.8	138	31
Control			14.1	144	33

[1] Means derived from data taken in 2000, 2001, and 2002.
[2] Mean separation within columns by Duncan's Multiple Range Test p = 0.05, columns without letters were not significantly different.

EVALUATION OF FUNGICIDE SPRAYS FOR PECAN SCAB CONTROL

Edward J. Sikora and Jason Burkett

Pecan scab, a fungal disease of pecan, is the most limiting disease to pecan production in the Southeast. To control scab, growers must maintain a calendar-based spray program from bud-break through mid August. In 2001, several new fungicides (Stratego) and some experimental compounds (Folicur and Eminent) were evaluated for scab control. Results showed that all the fungicide treatments were significantly better than the unsprayed control in controlling leaf and nut scab.

The experiment was conducted on a block of 'Desirable' pecan trees at the E. V. Smith Research Center in Shorter, Alabama. All of the fungicide treatments (spray programs) were initiated within 10 days after bud-break and followed a 14-day schedule throughout the season. Leaf scab was assessed on June 3 and nut scab was rated on September 10.

The weather conditions were favorable for leaf scab development. All the fungicide programs were significantly better than the unsprayed control in controlling leaf scab (see table). The Super Tin full-season program, the Folicur/Super Tin block-program and the Super Tin plus Dodine tank-mix program had significantly higher levels of leaf scab than the other seven fungicide programs.

All the fungicide programs controlled nut scab significantly better than the unsprayed control. The Super Tin plus Dodine tank mix and Orbit plus Dodone tank-mix programs were significantly better than the other treatments with the exception of the Stratego/Super Tin block program and the Dodine/Stratego (10 ounce)/ Super Tin program.

EVALUATION OF FUNGICIDE SPRAY PROGRAMS FOR PECAN SCAB CONTROL, 2001

Treatment	Rate/acre	Application timing [1]	Leaf scab (%)	Nut scab (%)
Unsprayed control	—	—	10.8 a [2]	87.5 a
Super Tin 80 WP	7.5 oz	Sprays 1-8	7.1 b	43.0 bcd
Folicur 3.6 F + Induce then Super Tin 80 WP	6 oz 0.06% 7.5 oz	Sprays 1-3 Sprays 4-8	6.6 b	49.1 bc
Stratego 2 EC then SuperTin 80 WP	8 oz 7.5 oz	Sprays 1-3 Sprays 4-8	2.1 c	37.2 de
Dodine 65 WP then Stratego 2 EC then SuperTin 80 WP	32 oz 8 oz 7.5 oz	Sprays 1-3 Sprays 4-7 Spray 8	3.3 c	42.2 cd
Dodine 65 WP then Stratego 2 EC then SuperTin 80 WP	32 oz 10 oz 7.5 oz	Sprays 1-3 Sprays 4-7 Spray 8	3.3 c	38.1 de
Eminent 125 SL + Dodine 65 WP	8 oz 16 oz	Sprays 1-8	3.5 c	50.3 b
Eminent 125 SL then Agri Tin 80 WP	1 pint 7.5 oz	Sprays 1-3 Sprays 4-8	2.8 c	49.8 bc
Super Tin 80WP + Dodine 65 WP	3.75 oz 16 oz	Sprays 1-8	7.2 b	33.1 e
Enable 75 W + Dodine 65 WP	2 oz 16 oz	Sprays 1-8	1.5 c	50.0 b
Orbit + Dodine 65 WP	4 oz 16 oz	Sprays 1-8	2.3 c	30.6 e
LSD (P=0.05)			2.9	7.8

[1] Total of eight sprays.
[2] Numbers followed by the same letter are not significantly different.

ALTERNATE BEARING IN SATSUMAS

Monte Nesbitt, Robert Ebel, William Dozier, Ron McDaniel. and Malcomb Pegues

Satsuma mandarin trees are commonly known to experience alternate bearing. Alternating years of heavy and light production is a serious obstacle to developing a thriving satsuma industry in Alabama because marketing problems arise when the crop fluctuates from year to year. In the 2000 crop season, 11-year-old 'Owari' trees at the Gulf Coast Research and Extension Center (GCREC) in Fairhope, Alabama, averaged 473 pounds of fruit, with some individual trees yielding as much as 792 pounds. In the following year, average tree yield in the same grove was only 157 pounds per tree.

Harvest date is a factor that can contribute to alternate bearing in some crops. A satsuma tree with 792 pounds of fruit may actually have some 3,900 individual fruit on it (five fruit per pound average), which can take a great deal of time to hand harvest, especially in a commercial planting with 100 or more trees per acre. If removal of the fruit is extended over a 30- to 60-day period, the fruit that remain on the tree continue to act as sinks for carbohydrates, depressing the trees' ability to build up carbohydrates essential to produce a normal crop the following year.

In 1999 and 2000, a study was conducted at the GCREC to determine the effects of late fruit harvest on alternate bearing. Six trees were completely harvested on each of three dates: November 1, December 1, or January 1, and yield was measured the following season. Yield was significantly reduced in 2000 only when harvest was delayed until January 1. The lower yield for January-harvested trees, although significant, is not dramatic, and most growers harvest most of their fruit before January 1. Thus normal harvesting, which usually begins in early November and extends into mid-December, may not be a major contributing factor to alternate bearing, at least on a moderately large crop. The average yield of trees in this study in 1999 was 372 pounds, which may not have been enough to cause severe alternate bearing.

EFFECT OF HARVEST DATE ON YIELD OF SATSUMA, 2000 AND 2001

Harvest date	Pounds/tree 2000	Pounds/tree 2001
November 1	576	271
December 1	559	122
January 1	419	232

The 2000 crop was larger and alternate bearing did occur in 2001 (see table). Although it appeared that yields in 2001 were reduced by the December harvest date, the differences were not statistically significant, due to a high degree of variation in yield in the test trees. The variation was caused by freeze damage to the foliage in the winter of 2000-01. Trees in the study that lost less than 40% of their foliage produced 300 pounds per tree in 2001, and those that lost more produced only 100 pounds per tree. Winter injury to foliage combined with heavy production and delayed harvest are major causes for alternate bearing in satsumas.

SATSUMA DISEASE SURVEY OF ALABAMA

Kathy McLean, Edward Sikora, Robert Ebel, S. L. Burchett, and Monte Nesbitt

Satsuma mandarins are a type of citrus that are characteristically loose-skinned, brightly colored, and have a very flavorful taste. Citrus trees were introduced into Florida by Spanish explorers in 1565. Small satsuma orchards developed along the Gulf of Mexico by the late 1800s. However, severe winters late in the century severely diminished the numbers of trees surviving. Satsuma acreage did increase again with milder weather and by the early 1920s, approximately 18,000 acres of satsumas were growing in the coastal regions of Alabama, Florida, and Louisiana. In Alabama, satsumas were considered to produce more consistent crops, ripen within the growing season, and require less cold protection than other citrus. However, satsuma trees are not tolerant to extended freezing temperatures and multiple severe winters in the 1930s and 1940s depreciated the satsuma acreage.

Alabama currently has a new and emerging commercial satsuma industry in the Mobile Bay area. But the type and extent of disease incidence in the growing region is currently not well characterized. A survey was conducted in November of 2000 and 2001 to determine the disease incidence and pathogens present in the satsuma acreage in Alabama.

Seven orchards representing the majority of the commercial acreage were surveyed for symptomatic fruit and foliage in 2000 and 2001. Samples of fruit and foliage with disease symptoms were collected from each orchard, labeled, and immediately placed in plastic bags in a cooler of ice. Samples were transported back to the laboratory and placed in a cold room at 4°C. Within 24 hours samples were photographed and disease symptoms described. Tissue sections were excised from the leaves and fruits of each diseased sample collected. Tissue sections were surface-sterilized and aseptically plated on acidified potato dextrose agar. Plates were incubated at 24°C for 10 days, during and after which colonies of fungi growing from the tissue were identified, or subcultures were prepared for later identification.

Seven diseases were identified. Alternaria leaf spot and brown spot of satsuma caused by *Alternaria alternata* Fr. (Kiessler) pv. *citri* was found in 85 and 75% of the orchards surveyed in 2000 and 2001, respectively (see table). Mycelia of *A. alternata* pv. *citri* is dark olive in color and grows rapidly at 24°C. Conidia are dark, obclavate to elliptical with both cross and longitudinal septa borne in apical chains. On leaves the lesions appeared as circular or irregular blighted areas that were often surrounded by a yellow halo. On the mature fruit the symptoms varied from small dark specks to large black lesions sometimes surrounded by a yellow halo. Fruit blemishes will significantly reduce the market price and can be an economical factor in production.

Anthracnose, caused by *Colletotrichum gloeosporiodes* (Penz.) Penz. & Sacc., was found in 85 and 50% of the orchards surveyed in 2000 and 2001, respectively. Mycelia of *C. gloeosporiodes* is gray to brown in color with spore masses that appear salmon in color. Acervuli are produced which are disk-shaped with dark setae among the conidiophores. Conidia are abundant, hyaline, one-celled, oblong to fusiform. Symptoms on leaves include necrotic areas which may coalesce. Anthracnose on mature fruit are usually considered secondary but appear as brown to black spots or tear-stain blemishes.

Blue and green molds of fruit caused by *Penicillium* spp. were found in 71 and 87% of the orchards in 2000 and 2001, respectively. Mycelia of *Penicillium* spp. appeared blue to blue gray or olive green in the center surrounded by white to light-colored areas. Conidia are one-celled, globose in shape and borne on phialids in dry basipetal chains. Symptoms on mature fruit include soft discolored areas 5 to 10 centimeters in diameter, to the entire fruit surface being encompassed by mycelium and spores.

PERCENT OF SATSUMA ORCHARDS AND SAMPLES INFESTED IN THE ALABAMA SURVEY, 2000 AND 2001

Disease	Orchards infested 2000	Orchards infested 2001	Samples infested 2001
		%	
Alternaria leaf spot	85	75	43
Anthracnose	85	50	22
Penicillium fruit rot	71	87	27
Melanose	85	25	8
Twig die back	71	37	4
Distorted fruit	29	75	15
Mean	73	58	20

Melanose of mature fruits, caused by *Phomopsis citri* H. Fawc. (Sacc.) Traverso & Spessa., was found in 85 and 25% of the orchards in 2000 and 2001, respectively. *Phomopsis citri* produces white to cream, ropy mycelia with dark pycnidia in scattered stroma. Conidia are ovoid to fusoid (alpha) or filiform and curved (beta). Symptoms on mature fruit appear as small, brown discrete specks or streaks of tear stains across the fruit surface.

Twig tip dieback and distorted fruit were observed in 71 and 37% and 29 and 75% of the orchards in 2000 and 2001, respectively; however, no causal agent for these disorders was determined.

Overall, 73 and 58% of the orchards were infested with at least one fungal pathogen in 2000 and 2001, respectively. However, the incidence and severity of fruit and foliar diseases of satsuma in each orchard were relatively light. The 2000 and 2001 seasons were considered dry years for Alabama, which may have resulted in low disease pressure.

EVALUATION OF FUNGICIDES FOR BOTRYTIS GRAY MOLD CONTROL ON STRAWBERRIES, 2002

Edward Sikora and Jim A. Pitts

Botrytis gray mold is a fungal disease that causes a fruit rot of strawberries in Alabama. The loss of the fungicides Benlate and Ronilan in recent years has reduced the number of fungicides available to growers to combat this disease. In 2001-2002, a number of fungicides in various spray programs were evaluated to determine their efficacy against this disease. Results indicate that all the fungicide programs evaluated controlled gray mold equally well. There also was no apparent difference among the fungicides in controlling anthracnose, a fungal disease that was a common problem in strawberry production fields in 2002.

The test was conducted at the Chilton Research and Extension Center in Clanton, Alabama. The strawberry variety 'Chandler' was transplanted to the field in October of 2001. Plants were grown on raised beds with black plastic mulch and drip irrigation. Treatments were initiated in the spring of 2002 at 10% bloom. There were a total of eight fungicide applications made on the following days: March 20, March 28, April 3, April 10, April 17, April 26, May 1, and May 8. Total marketable fruit weight and percent fruit with symptoms of Botrytis gray mold and/or anthracnose were determined.

All the fungicide programs had higher marketable fruit weights than the unsprayed control (see table). The program that alternated Rovral with Topsin M plus Captan produced approximately 8% less marketable fruit than the Topsin M plus Captan full season program. There were no apparent differences among the fungicide programs in their ability to control Botrytis gray mold or anthracnose.

EVALUATION OF FUNGICIDES FOR CONTROL OF BOTRYTIS GRAY MOLD AND ANTHRACNOSE OF STRAWBERRIES, 2002

Fungicide treatment/ Rate/acre	Marketable fruit (g)	Botrytis gray mold (%)	Fruit anthracnose (%)
Unsprayed control	4317	11.0	2.3
Topsin M 1 lb + Captan 50WP 4 lb	6360	>1.0	5.4
Topsin M 1 lb + Captan 50WP 4 lb **ALTERNATED WITH** Elevate 50WG 1.5 lb +Captan 50WP 4 lb	6164	>1.0	5.5
Topsin M 1 lb + Captan 50WP 4 lb **ALTERNATED WITH** Switch 62.5 WG 14 oz	6336	>1.0	4.1
Topsin M 1 lb + Captan 50WP 4 lb **ALTERNATED WITH** Rovral 50WP 2 lb	5325	2.9	4.1
Topsin M 1 lb + Captan 50WP 4 lb **ALTERNATED WITH** Cabrio EG 14 oz	5854	>1.0	5.5

VEGETABLE PAPERS

EVALUATION OF FUNGICIDES FOR CONTROL OF ALERNARIA LEAF SPOT OF CABBAGE

Edward Sikora and Arnold Caylor

More than 800 acres of cabbage are planted annually in Alabama with an estimated value of $2.5 million. The main disease problem of cabbage is Alternaria leaf spot. Production of marketable cabbage can be severely affected if this disease goes uncontrolled. Alternaria causes a leaf spot that can result in significant defoliation in the field. In storage, the disease can predispose infected cabbage heads to soft rot bacteria.

Fungicides with the active ingredient chlorothalonil or maneb are labeled for control of Alternaria leaf spot on cabbage but are only moderately effective against the disease. For this reason, alternative products were evaluated in this study through the IR-4 program.

The trial was conducted in 2001 at the North Alabama Horticulture Research Center in Cullman, Alabama. Cabbage was transplanted in mid September. Each treatment consisted of a one-row plot 15 feet long. The experiment consisted of four treatments, replicated five times, in a randomized complete block design. Disease ratings were taken in late November and early December. Cabbage was harvested and total number of marketable heads, total marketable weight, and average marketable head weight were determined.

Alternaria leaf spot was observed in trace amounts on one replication of the untreated control. There were no significant differences among the treatments in terms of total number of marketable heads produced, total marketable head weight, or average marketable head weight (see table). No symptoms of phytotoxicity among the fungicide treatments were observed.

EVALUATION OF FUNGICIDES FOR CONTROL OF FOLIAR DISEASE OF CABBAGE, 2001

Treatments rate/acre [1]	Marketable heads (no/plot)	Marketable weight (lb/plot)	Average head weight (lb)
Untreated	9.75 a [2]	63.57 a	6.55 a
Bravo Weather Stik 1.50 pt	10.50 a	67.15 a	6.40 a
BAS 500 0.75 lb	9.75 a	59.92 a	6.15 a
BAS 500 1.00 lb	10.50 a	67.02 a	6.35 a

[1] Bravo Weather Stik and the BAS 500 treatments were applied three times at seven-day intervals beginning when Alternaria leaf spot first appeared in late November.

[2] Means with the same letter are not significantly different.

EFFECT OF NITROGEN SOURCE ON QUALITY AND YIELD OF 'LAROUGE' IRISH POTATO

Joseph Kemble, Edgar Vinson, and Tony Dawkins

Growers have often asked the question "How does nitrogen source affect various vegetable crops?" In the case of tomatoes, research has shown that tomatoes perform better (improved quality and fewer fruit defects) when they are fertilized solely with nitrate-nitrogen (potassium nitrate, calcium nitrate) as opposed to ammonium-nitrogen (ammonium nitrate). This experiment was initiated to determine if nitrogen source would affect the quality and yield of Irish potato. After one season, no differences were found among the treatments; however, this experiment will be repeated.

An experiment was initiated at the Sand Mountain Research and Extension Center in Crossville, Alabama, to determine the effect of various percentages of preplant and sidedress applications of ammonium nitrate and/or calcium nitrate on Irish potato. There were four treatments: (1) 100% calcium nitrate (preplant)/ 100% calcium nitrate (sidedress); (2) 100% calcium nitrate (preplant)/100% ammonium nitrate (sidedress); (3) 100% ammonium nitrate (preplant)/100% ammonium nitrate (sidedress); and (4) 100% ammonium nitrate (preplant)/100% calcium nitrate (sidedress).

Soil pH and fertility (except for nitrogen) were adjusted based on soil test results from the AU Soil Testing Lab. Preplant nitrogen treatments were applied to meet 50% of the crop's nitrogen need. Seed pieces of 'LaRouge' were cut, treated with fungicide, and set on March 15, 2002. The remaining nitrogen was applied in two sidedress treatments, the first sidedress one month after planting, and the second about one month after the first sidedress.

Vines were rolled prior to applying Diquat. Tubers were dug on July 3, 2002 and then graded and weighed. Tubers were separated based on size as size A potatoes (diameter greater than or equal to 1 7/8 inches), size B potatoes (diameter 1 1/2 to 1 1/7 inches), or culls (diameter of less than 1 1/7 inches). Total marketable yield equaled the sum of the size A and B potatoes for a particular treatment. In addition to grading and weighing, skin set and skin color were evaluated.

No differences were found in terms of total marketable yield, tuber sizes, or culls among the four treatments (see table). In fact, no differences were found among the treatments for skin set or skin color (data not shown). Some lack of difference could be do to the extended hot, dry weather during most of the late spring through midsummer before the tubers were harvested. This experiment will be repeated next season.

EFFECT OF NITROGEN SOURCE ON QUALITY AND YIELD OF 'LAROUGE' IRISH POTATO AT SAND MOUNTAIN RESEARCH AND EXTENSION CENTER, CROSSVILLE, AL, 2002

Treatment	Total marketable yield (lb/ac)	Size A [1] (lb/ac)	Size B [2] (lb/ac)	Cull [3] (lb/ac)
(3) Am nit/Am nit	17,739 a [4]	15,397 a	2,341 a	478 a
(4) Am nit/Ca nit	17,249 a	14,944 a	2,305 a	472 a
(1) Ca nit/Ca nit	17,067 a	15,046 a	2,021 a	823 a
(2) Ca nit/Am nit	15,936 a	13,818 a	2,118 a	424 a

[1] Size A potatoes have a $\geq$1 7/8 inch diameter.
[2] Size B potatoes have a 1 1/2 - 1 1/7 inch diameter.
[3] Cull potatoes are those with a diameter of less than a 1 1/7 inch.
[4] Values followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($p<0.05$).

EFFECT OF SPLIT APPLICATION OF DESICCANT AND VINE ROLLING ON QUALITY AND YIELD OF 'LAROUGE' IRISH POTATO

Joseph Kemble, Edgar Vinson, and Tony Dawkins

Growers in Alabama commonly use a vine desiccant, such as Diquat, on Irish potatoes in order to kill the actively growing vines to facilitate harvesting. These desiccants also aid in promoting skin set – a toughening of the potato skin, which helps extend the post-harvest life of the tuber. In other potato-producing regions of the United States, growers often use split applications of desiccants (with reduced rates) and have found favorable results and fewer problems with stem-end browning of tubers. In addition, vine rolling, in combination with split applications of desiccant, has also been found to aid in skin set. This research was initiated to determine if these procedures could aid Irish potato growers in Alabama. In 2002, research indicated that marketable yields of potatoes sprayed with spit applications of desiccant were greater, although not statistically, than those treated with a single higher rate of desiccant. This work will be continued in 2003.

This experiment was initiated at the Sand Mountain Research and Extension Center in Crossville, Alabama, to determine the effect of split applications of the desiccant Diquat and vine rolling on the quality and yield of 'La Rouge' Irish potatoes. There were four treatments: (1) single application of Diquat (1 quart per acre); (2) split application of Diquat (1 pint per acre, then a second application four days after the first); (3) single application of Diquat (1 quart per acre), vine rolling; and (4) split application of Diquat (1 pint per acre, then a second application four days after the first), vine rolling.

Soil pH and fertility (except for nitrogen) were adjusted based on soil test results from the AU Soil Testing Lab. Preplant nitrogen treatments were applied to meet 50% of the crop's nitrogen need. Seed pieces of 'LaRouge' were cut, treated with fungicide, and set on March 15, 2002. The remaining nitrogen was applied in two sidedress treatments, the first sidedress one month after planting, and the second about one month after the first sidedress.

Vines in treatments 3 and 4 were rolled on June 21. Diquat was applied on June 25 on all treatments at either 1 quart per acre or 1 pint per acre. A second application of Diquat was made on June 29 to treatments 2 and 4 (the 1-pint-per-acre treatments). Tubers were dug on July 3 and then graded and weighed. Tubers were separated based on size as size A potatoes (diameter greater than or equal to 1 7/8 inches), size B potatoes (diameter of 1 1/2 to 1 1/7 inches), or culls (diameter of less than 1 1/7 inches). Total marketable yield equaled the sum of the size A and B potatoes for a particular treatment.

Treatments 2 and 4 (spilt applications of Diquat) showed a slight, although not significant, increase in total marketable yields compared to treatments 1 and 3 (single application of Diquat) (see table). Treatments 1 and 3 (single application of Diquat) produced the lowest marketable yield, although it was not statistically lower (see table). Based on these results, this experiment will be repeated in 2003.

EFFECT OF SPLIT APPLICATION OF DESICCANT AND VINE ROLLING ON QUALITY AND YIELD OF 'LAROUGE' IRISH POTATO AT SAND MOUNTAIN RESEARCH AND EXTENSION CENTER, CROSSVILLE, AL, 2002

Treatment	Total marketable yield (lb/ac)	Size A[1] (lb/ac)	Size B[2] (lb/ac)	Cull[3] (lb/ac)
Treatment 2	19,306 a[4]	16,964 a	2,341 ab	581 a
Treatment 4	19,027 a	16,256 a	2,771 a	532 a
Treatment 3	18,894 a	16,571 a	2,323 ab	696 a
Treatment 1	16,202 a	14,617 a	1,585 b	484 a

[1] Size A potatoes have a ≥1 7/8 inch diameter.
[2] Size B potatoes have a 1 1/2 - 1 1/7 inch diameter.
[3] Cull potatoes are those with a diameter of less than a 1 1/7 inch.
[4] Values followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($p<0.05$).

EVALUATION OF SYNTHETIC AND BIOLOGICAL FUNGICIDES FOR CONTROL OF POWDERY MILDEW ON PUMPKIN

Edward Sikora and Tony Dawkins

Powdery mildew is a common fungal disease of pumpkin in Alabama. Powdery mildew reduces yield by decreasing the size and number of fruit or the length of time the crop has to mature. In 2002, both commercially available synthetic fungicides (Quadris, Bravo, Ridomil, and Microthiol Disperss) as well as two experimental biological fungicides (QRD 283 and 286) were evaluated. Results showed that Microthiol Disperss (a sulfur-based product) controlled powdery mildew better than the other products evaluated.

This trial was conducted at the Sand Mountain Research Station in Crossville, Alabama. The variety 'Appalachian' was direct seeded into the field in late June. The experiment consisted of six treatments, replicated four times, in a randomized complete block design. Each treatment/replication consisted of a one-row plot, 20 to 25 feet long. The fungicide programs were started when the vines began to run. Fungicides were applied every seven days (some treatments alternated between two products). Disease ratings were taken approximately 10 days before harvest. Yield data were yet not available for inclusion in this publication.

Powdery mildew was the dominant disease observed in the trial (low levels of downy mildew were also noted). The

EVALUATION OF FUNGICIDES FOR CONTROL OF POWDERY MILDEW, SAND MOUNTAIN, ALABAMA, 2002

Treatments/rate[1]	% Powdery mildew
Unsprayed control	75.5
Quadris (11 oz/acre) ALTERNATED WEEKLY WITH Bravo Ultrex (2.7 lb./acre)	24.7
Microthiol Disperss 80 DF (8 lb./acre)	17.2
QRD 286 AS (1% by volume)	49.2
QRD 283 WP (4 lb./acre)	32.2
QRD 283 WP (4 lb./acre) ALTERNATED WEEKLY WITH Ridomil Gold Bravo WP (3 lb./acre)	27.0

[1]Spray programs were initiated at vine run and sprayed every 7 days.

Microthiol Disperss treatment had the lowest incidence of powdery mildew among the treatments (see table). Microthiol Disperss is a sulfur-based product, and sulfur fungicides have proven to be very effective in controlling powdery mildew in previous trials in Alabama. The Quadris/Bravo treatment and both QRD 283 treatments also performed well in this trial.

Microthiol Disperss and other sulfur products do a good job in controlling powdery mildew on pumpkins. Growers should be aware, however, that sulfur is only effective against powdery mildew, not downy mildew. Growers need to scout pumpkin fields weekly to determine if wet weather diseases such as downy mildew are developing. If diseases other than powdery mildew appear, the grower must begin spraying broad-spectrum materials such as Bravo and Quadris to reduce damage from these other diseases.

EVALUATION OF IPM SPRAY PROGRAMS FOR CONTROL OF FOLIAR DISEASES OF PUMPKIN, 2001

Edward Sikora, Joseph Kemble, and Tony Dawkins

Downy mildew and powdery mildew are two common fungal diseases of pumpkin in Alabama. Powdery mildew is most common in dry years while downy mildew is considered a wet-weather disease. Both diseases reduce yield by decreasing the size and number of fruit or the length of time the crop has to mature. In 2001, a powdery-mildew-tolerant pumpkin variety was evaluated with two Integrated Pest Management (IPM) strategies. The two-IPM strategies were as follows. First, the fungicide spray program was initiated if and when disease was first observed in the field by way of a twice-a-week-scouting program; and second, the period between fungicide applications was extended from seven days to 10 to 12 days.

Results were greatly affected by the appearance of a new disease to Alabama. The fungal disease Plectosporium blight developed early in our trials and was confused with spray burn by the researchers. This was the first report of Plectosporium blight in Alabama. This resulted in greater defoliation and lower yields in the two scouting treatments than in the standard seven-day fungicide program.

This trial was conducted at the Sand Mountain Research and Extension Center in Crossville, Alabama. The variety 'Merlin' was direct seeded into the field on June 20. The experiment consisted of five treatments, replicated five times in a randomized complete block design. Each treatment/replication consisted of a one-row plot, 30 feet long. The experiment compared four fungicide programs and an unsprayed control. The four fungicide programs consisted of Quadris alternated with Bravo Ultrex on a seven-day or a 10- to12-day schedule with programs initiated at vine run or when disease was first observed in the field. Disease ratings were taken on September 12.

EFFECTIVENESS OF IPM PROGRAMS ON DISEASE DEVELOPMENT ON A POWDERY-MILDEW TOLERANT PUMPKIN VARIETY, SAND MOUNTAIN, 2001

Fungicide timing/ When initiated [1]	Downy mildew %	Plectosporium blight %
Unsprayed control	48.0	43.0
7 days/vine run	12.0	2.0
10-12 days/vine run	29.0	9.0
7 days/scouting	28.0	37.0
10-12 days/ scouting	32.0	34.0

[1] Treatments were sprayed on a seven-day or 10-12 day interval. Treatments were initiated at vine run or at first appearance of disease when following a biweekly scouting program. The fungicide program for all treatments, with the exception of the unsprayed control, was Quadris alternated with Bravo Ultrex.

Results showed that 'Merlin' grown following the seven-day fungicide schedule initiated at vine-run had the lowest levels of downy mildew and Plectosporium blight (see table) and the highest marketable yields (data not shown). No differences in yield were observed among the other three fungicide spray programs. Three to four fewer fungicide applications were required when following the scouting program resulting in lower input costs except for the scouting, possibly offsetting loss in marketable yields. This trial demonstrates that growers/field scouts must be aware of all potential plant diseases and pests that may damage a crop.

COMPARISON OF TERRAPY G AND TERRAPY B TO METHYL BROMIDE AS GROWTH PROMOTERS FOR TOMATO, 2001

Edward Sikora and Arnold Caylor

TerraPy B and TerraPy G are organic products that have been shown to reduce plant stress and plant disease activity by stimulating soil microbiological activity and promoting nutrient uptake of various horticultural and agronomic crops in Europe and Asia. The objective of this study was to determine if the products would promote growth and boost yields of tomato in Alabama. Results show that four weeks after application, plants treated with TerraPy G had a higher health rating than those treated with TerraPy B. Unfortunately, no significant differences were observed in terms of total marketable fruit weights or in fruit size among the treatments.

This experiment was conducted at the North Alabama Horticultural Research Center in Cullman, Alabama. Tomato transplants were set in the field on June 6. Plants were grown on raised beds covered with white plastic mulch and drip irrigated. The experiment consisted of four treatments replicated six times in a randomized complete block design. Each treatment replication consisted of a one-row plot, 20 feet long. The methyl bromide treatment was applied at the standard commercial rate approximately one month before transplanting. TerraPy B (20 grams per square meter) and TerraPy G (20 grams per square meter) were applied as a soil drench at transplanting. Plots were sprayed weekly with a tank mix of mancozeb plus copper for foliar disease control. Plots were evaluated for plant health (height, color, and vigor) four and eight weeks after transplanting. Tomatoes were harvested weekly at the breaker stage and graded for size then weighed by size (extra large, large, medium, and small) and total marketable weights were determined.

TerraPy G had the highest plant health rating among the treatments (see table), significantly higher than the TerraPy B 20 treatment four weeks after transplanting. There were no differences among treatments eight weeks after transplanting. There were few significant differences in yield among treatments (data not shown). The methyl bromide treatment produced a significantly higher medium fruit weight than TerraPy B. There were no significant differences in total marketable yield among treatments.

PLANT HEALTH RATINGS AND TOTAL MARKETABLE WEIGHT OF TOMATOES, 2001

Treatment	Plant health ratings 4 weeks	Total marketable weight (lb)
TerraPy G (20 g/m^2)	3.4 a [1]	108.3 a
TerraPy B (20 g/m^2)	2.6 b	90.5 a
Methyl bromide	3.2 ab	122.3 a
Control (water only)	3.0 ab	101.1 a

[1] Numbers followed by the same letter are not significantly different.

EVALUATION OF TERRAPY G AT MULTIPLE RATES AS A GROWTH PROMOTER FOR TOMATO, NORTH ALABAMA, 2001

Edward J. Sikora and Arnold Caylor

TerraPy G is an organic product that has been shown to reduce plant stress and plant disease activity by stimulating soil microbiological activity and promoting nutrient uptake of various horticultural and agronomic crops in Europe and Asia. The objective of this study was to determine the optimum rate of TerraPy G as a growth promoter on tomato. Results indicate that TerraPy G at the high rate (20 grams per square meter) may be phytotoxic to tomato, based on growth ratings at four and eight weeks after application. The low (2 grams per square meter) and high (20 grams per square meter) rates of TerraPy G produced significantly lower marketable fruit weights than the control and the 5 and 10 grams per square meter TerraPy G treatments.

This experiment was conducted at the North Alabama Horticultural Research Center in Cullman, Alabama. Tomato transplants were set in the field on May 25. Plants were grown on raised beds covered with white plastic mulch and drip irrigated. The experiment consisted of five treatments replicated five times in a randomized complete block design. Each treatment replication consisted of a one-row plot, 20 feet long. The TerraPy G treatments were applied as a soil drench at transplanting.

Plots were sprayed weekly with a tank mix of mancozeb plus copper for foliar disease control. Plots were evaluated for plant health (height, color, and vigor) four and eight weeks after transplanting. Tomatoes were harvested weekly at the breaker stage and graded for size then weighed by size (extra large, large, medium, and small) and total marketable weights were determined.

PLANT HEALTH RATINGS AND TOTAL MARKETABLE WEIGHT OF TOMATOES, CULLMAN 2001

Treatment	Plant health ratings		Total marketable weight
	4 weeks	8 weeks	(lb)
TerraPy G (2 g/m^2)	3.2 a [1]	3.0 a	139.6 b
TerraPy G (5 g/m^2)	3.2 a	3.0 a	159.9 ab
TerraPy G (10 g/m^2)	3.2 a	2.8 a	164.9 ab
TerraPy G (20 g/m^2)	2.0 b	2.2 b	137.0 b
Control (water only)	3.6 a	3.0 a	178.9 a

[1] Numbers followed by the same letter are not significantly different.

TerraPy G (20 grams per square meter) had the lowest plant health rating at both four and eight weeks after transplanting (see table). The low (2 grams per square meter) and high (20 grams per square meter) rates of TerraPy G produced significantly lower total marketable fruit weights than the control and the 5 and 10 grams per square meter TerraPy G treatments. Based on the results of this trial and an identical trial at the Sand Mountain Research and Extension Center, TerraPy G at any tested rate did not appear to promote plant health or improve yield production of tomatoes in Alabama.

EVALUATION OF TERRAPY G AT MULTIPLE RATES AS A GROWTH PROMOTER FOR TOMATO, SAND MOUNTAIN, 2001

Edward J. Sikora and Tony Dawkins

TerraPy G is an organic product that has been shown to reduce plant stress and plant disease activity by stimulating soil microbiological activity and promoting nutrient uptake of various horticultural and agronomic crops in Europe and Asia. The objective of this study was to determine the optimum rate of TerraPy G as a growth promoter on tomato. Results indicate that TerraPy G at any of the tested rates had little effect on growth and yield of tomato.

This experiment was conducted at the Sand Mountain Research and Extension Center in Crossville, Alabama. Tomato transplants were set in the field on May 24. Plants were grown on raised beds covered with white plastic mulch and drip irrigated. The experiment consisted of five treatments replicated five times in a randomized complete block design. Each treatment replication consisted of a one-row plot, 20 feet long. The TerraPy G treatments were applied as a soil drench at transplanting.

Plots were sprayed weekly with a tank mix of mancozeb plus copper for foliar disease control. Plots were evaluated for plant health (height, color, and vigor) five weeks after transplanting. Tomatoes were harvested weekly at the breaker stage and graded then weighed by size (extra large, large, medium, and small) and total marketable weights were determined.

PLANT HEALTH RATINGS AND TOTAL MARKETABLE WEIGHT OF TOMATOES, SAND MOUNTAIN 2001

Treatment	Plant health ratings 5 weeks	Total marketable weight (lb)
TerraPy G (2 g/m^2)	3.2 a [1]	167.2 a
TerraPy G (5 g/m^2)	3.2 a	147.2 a
TerraPy G (10 g/m^2)	2.8 a	165.8 a
TerraPy G (20 g/m^2)	2.6 ab	160.2 a
Control (water only)	2.0 b	165.7 a

[1] Numbers followed by the same letter are not significantly different

The control treatment had the lowest plant health rating five weeks after transplanting; however, the ratings were not significantly different from the TerraPy G treatments at 10 and 20 grams per square meter (see table). There were no significant differences among treatments in total marketable fruit weight. Based on the results of this trial and an identical trial at the North Alabama Horticultural Research Center in Cullman, TerraPy G at any tested rate did not appear to promote plant health or improve yield production of tomatoes in Alabama.

GREENHOUSE TOMATO TRIAL REVEALS FEW DIFFERENCES

Joseph Kemble, Edgar Vinson, Floyd M. Woods, and Raymond Thomas

Production of greenhouse tomatoes is becoming a popular business among vegetable growers and nursery owners. The quality of greenhouse tomatoes and their off season availability help insure a steady market.

Greenhouse or hydroponic tomato production is labor intensive and requires steadfast, daily oversight and care. Many variables must be monitored and choices made to insure a productive crop. One such choice is that of variety selection. For greenhouse production, tomatoes specifically bred for that purpose, not for field production, should be used.

A greenhouse tomato variety trial was conducted at Miss Emily's Hydroponic Tomatoes in Coker, Alabama, in the spring of 2002. Six-week-old tomato seedlings were planted on February 18, 2002. Tomato seedlings were planted into 2-cubic-foot polyethylene bags filled with coconut coir. Three bags containing two plants represented each variety. Tomato varieties were replicated four times and were arranged in a randomized complete block.

Tomatoes were harvested once weekly from April 4 through May 3 for a total of six harvests. Tomatoes were weighed and graded. Grades and corresponding fruit diameters (D) of fresh market tomatoes were adapted from the *Tomato Grader's Guide* (Circular ANR 643 from the Alabama Cooperative Extension System) and graded as extra-large (D greater than 2.9 inches), large (D greater than 2.5 inches), medium (D greater than 2.3 inches), and small (D less than 2.3 inches). Marketable yield was calculated by combining the extra-large, large, medium, and small grades (Table 1). Culled tomatoes were separated based on physiological disorders such as concentric cracking, radial cracking, catfacing, blossom end rot, and russeting.

In marketable yield, marketable number, and size distribution categories, there were no significant differences among varieties (Table 1). Total cull weights were significantly different among varieties (Table 2). 'Style' had significantly higher total cull weights than '73-36RZ' and 'Blitz' but was similar in cull weight to all other varieties. 'Grace' and 'Blitz' also differed in total cull weight with 'Grace' having a higher total cull weight than 'Blitz'. Blossom end rot was highest with 'Style' when compared to 'Blitz' but when compared to other varieties there were no differences. 'Mariachi' had a higher incidence of radial cracking than 'Blitz,' while the remaining varieties were similar to 'Blitz' in terms of cracking.

There were few differences among varieties in physiochemical attributes such as pH and soluble solids (°brix). 'Style' was similar to 'Grace', 'Trust', and 'Blitz' but had a significantly lower pH than 'Mariachi' and '73-36RZ'. 'Mariachi' and '73-36RZ' were similar to 'Grace', 'Trust', and 'Blitz'. Soluble solids content of '7336RZ' were higher than 'Blitz' but similar to all other varieties.

When compared to standard varieties 'Blitz', 'Grace', and 'Trust', the other varieties differed little. Of the three standards, 'Blitz' appeared to be the better performer overall when comparisons were made with newer varieties. Though few differences existed among varieties in terms of quality (cull fruit and physiochemical attributes), there were no real differences in marketable yield.

TABLE 1. MARKETABLE YIELD OF TOMATO FRUIT FROM A GREENHOUSE TOMATO VARIETY TRIAL, COKER, ALABAMA 2002[1]

Variety	Marketable yield (lb/plot)	Marketable yield (no/plot)	Extra large yield (lb/plot)	Large yield (lb/plot)	Medium yield (lb/plot)	Small yield (lb/plot)	Average weight/fruit (oz)
Blitz	33 a [2]	68 a	21 a	7.88 a	3.18 a	0.84 a	7.98 a
Mariachi	33 a	64 a	20 a	8.87 a	3.67 a	0.82 a	8.35 a
Trust	31 a	51 a	20 a	5.81 a	4.35 a	1.00 a	9.53 a
73-36RZ	28 a	58 a	18 a	7.47 a	2.84 a	0.63 a	7.89 a
Grace	25 a	54 a	14 a	7.12 a	3.10 a	0.82 a	7.56 a
Style	22 a	57 a	11 a	7.49 a	3.02 a	0.71 a	6.41 a
Significance [3]	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*

[1] Trial was conducted at Miss Emily's Hydroponic Tomatoes. Yields are based on six-plant plots.
[2] Numbers followed by different letters are significantly different based on Duncan's Multiple Range Test.
[3] *ns* indicates not significant at *p=0.05.*

TABLE 2. CULL DISTRIBUTION AND PHYSIOCHEMICAL ATTRIBUTES OF TOMATO FRUIT FROM A GREENHOUSE TOMATO VARIETY TRIAL, COKER, ALABAMA 2002[1]

Variety	Total cull (lb/plot)	Catfacing (lb/plot)	Concentric cracking (lb/plot)	Blossom end rot (lb/plot)	Radial cracking (lb/plot)	Russeting (lb/plot)	pH	Soluble solids (°brix)
Style	11.4 a [2]	—	0.5	1.0 a	4.4 ab	5.0	4.72 a	3.10 b
Grace	9.2 ab	—	0.5	0.2 ab	3.1 ab	4.5	4.75 ab	3.35 ab
Mariachi	8.4 abc	—	—	0.1 ab	4.5 a	2.6	4.75 ab	3.30 ab
Trust	8.2 abc	0.2	0.2	0.1 ab	4.2 ab	2.8	4.77 ab	3.20 b
73-36RZ	6.4 bc	0.1	1.4	—	2.7 ab	1.5	4.80 b	3.35 ab
Blitz	5.0 c	0.3	0.1	0.5 ab	1.2 b	2.3	4.82 b	3.70 a
Significance [3]	**	*ns*	*ns*	**	**	*ns*	**	*ns*

[1] Trial was conducted at Miss Emily's Hydroponic Tomatoes. Yields are based on six-plant plots.
[2] Numbers followed by different letters are significantly different based on Duncan's Multiple Range Test.
[3] ** indicates significance at *p=0.05*; *ns* indicates not significant at *p=0.05.*

EFFECTS OF POULTRY LITTER ON THE YIELD AND QUALITY OF STAKED TOMATOES

Edgar Vinson, Joseph Kemble, and Jeff Sibley

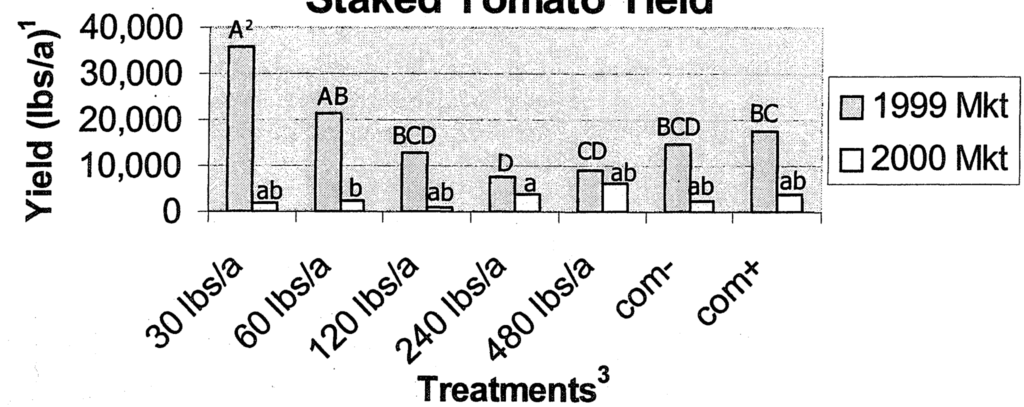
Vast accumulations of poultry litter have prompted the search for beneficial and environmentally sound incorporation of this by-product into the fertility programs of vegetable growers. To determine the effects of poultry litter on specific vegetable crops, more research must be done.

As a contribution to this multifaceted endeavor, a study was conducted at the E.V. Smith Research Center in Shorter, Alabama, in the spring of 1999 and 2000 to determine the effects of poultry litter on yield and quality of staked tomatoes. Quality attributes measured were citric acid content, soluble solids, total acidity, and the types of culls produced such as radial cracking, blossom end rot, and catfacing.

Composted poultry litter was applied at rates of 30, 60, 120, 240, and 480 pounds of nitrogen per acre and incorporated into the soil with a roto-tiller prior to mulch bed formation. No methyl bromide was applied. 'Mt. Spring' tomato transplants were planted on these poultry-litter-amended beds. Yields of tomatoes grown in poultry litter were compared to the control treatment, which received 120 pounds of nitrogen per acre from a mixture of calcium nitrate and potassium nitrate (7-0-7) and was fumigated with 67% methyl bromide and 33% chloropicrin (see figure).

In 1999, tomato fruit yields decreased with increasing amounts of poultry litter. Poultry litter applied at rates of 30 and 60 pounds per acre were sufficient for tomato production. In 2000 tomato yields were significantly higher in the 480 pounds-per-acre rate than in all other treatments. In this case, test plots were overcome by nutsedge so tomatoes grown in the heavily amended soils fared better because of a more abundant supply of nutrients for which to compete. The production of cull fruit such as blossom end rot, cracking, and cat-facing was similar in all treatments (see table). Total fruit acidity was significantly lower in the 480 pounds-per-acre treatment when compared to the control (see table). Total acidity, soluble solids, and citric acid content play a role in tomato flavor. Increased total acid content has been known to reduce flavor scores in taste tests.

Figure 1. Effect of Poultry Litter on Staked Tomato Yield



[1]Marketable yield data for 1999 and 2000 were analyzed separately because of treatment and year interactions.
[2]Columns headed by different letters represent means that are significantly different.
[3]"Com-" =non-methyl bromide treated control and "com+" = methyl bromide treated control.

According to the 1999 experiment, poultry litter applied at a rate of 30 pounds of nitrogen per acre is enough to produce yields above that of inorganic fertilizer without increasing the occurrence of culled fruit. A similar conclusion was reached in the 2000 study where tomatoes grown in poultry litter treatments produced similar yields as tomatoes grown in with inorganic fertilizer. Physiochemical attributes of tomatoes grown in soils amended with poultry litter at this rate are comparable to those grown using inorganic fertilizers.

EFFECT OF VARYING AMOUNTS OF POULTRY LITTER ON CULLS OF 'MT. SPRING' TOMATOES, 2000[1]

Poultry litter treatment	Crack (lb/ac)	Blossom end rot (lb/ac)	Cat-facing (lb/ac)	Citric acid (%)	Soluble solids (%)	pH
30 lbs N acre^{-1}	362.0 a [4]	144 a	2,957 a	0.37 bcd	4.5 a	4.1 a
60 lbs N acre^{-1}	784.0 a	673 a	4,526 a	0.34 cd	4.1 ab	4.1 a
120 lbs N acre^{-1}	663.0 a	1,251 a	3,259 a	0.40 b	3.9 b	4.1 a
240 lbs N acre^{-1}	1,026.0 a	1,251 a	6,457 a	0.40 b	4.1 ab	4.0 a
480 lbs N acre^{-1}	2,294.0 a	673 a	3,439 a	0.48 a	3.9 b	4.1 a
Control-[2]	302.0 a	144 a	3,379 a	0.39 cd	4.2 ab	4.2 a
Control+[3]	1,328.0 a	385 a	4,523 a	0.33 d	4.4 a	4.2 a

[1] Study was conducted at E.V. Smith Research Center in Shorter, Alabama. Results are in pounds per acre^{-1}.
[2] Non methyl bromide treated control.
[3] Methyl bromide treated control.
[4] Within columns, means followed by different letters are significantly different.

RHIZOBACTERIAL-MEDIATED MATURE PLANT RESISTANCE IN TOMATO TO CUCUMBER MOSAIC VIRUS

John F. Murphy, M.S. Reddy, and Joseph W. Kloepper

The use of plant growth-promoting rhizobacteria (PGPR) to induce resistance to infection by Cucumber mosaic virus (CMV) in tomato has been investigated. Previous studies have showed that selected PGPR strains induced protection against CMV in tomato plants under greenhouse and field conditions and that PGPR treatments protected tomato plants from the whitefly-transmitted Tomato mottle virus (ToMoV) under field conditions consisting of heavy whitefly/ToMoV pressure.

Mature plant resistance is an established but poorly understood phenomenon whereby plants vary in their susceptibility to infection by certain pathogens due to their age or stage of development. For example, in bell pepper plants the mechanism of mature plant resistance to CMV involves interference in processes that allow the virus to move throughout the plant. While previous studies focused on the use of PGPR to induce resistance against viruses, recent efforts have shifted to evaluate the enhanced plant growth effects that result from treatments consisting of combinations of PGPR formulated in chitosan. The purpose of this study was to determine whether enhanced plant growth may serve to shorten the window of time leading to expression of mature plant resistance.

Tomato 'Solar Set' seed was sown in Speedling trays under greenhouse conditions. Five PGPR preparations (termed LS series) were used in each experiment. Each LS preparation contained industrially formulated endospores of two *Bacillus* strains and the formulation carrier chitosan. Tomato seeds were sown directly into the LS/soilless growth medium mixture. Treatments consisted of five LS preparations and two non-bacterized control treatments. One control treatment was the same age as plants in the LS treatments, while the second was 10 days older. Plants in the older control treatment were the same size as those in the LS treatments. Plants were mechanically inoculated with CMV when the same age control treatment plants were at the early 5 to 6 leaf stage.

Three growth parameters were evaluated at the end of the experiment [30 days postinoculation (dpi)]: plant height (a measure of stem growth from one day prior to CMV inoculation to 30 dpi), plant fresh weight of above ground tissues, and the number of flowers and fruit. The mean plant height was significantly greater for all LS treatments and the older control compared with the control treatment (Table 1). No differences were observed for

TABLE 1. RESPONSE OF LS- AND MOCK-TREATED TOMATO PLANTS TO INOCULATION WITH CMV[1]

Treatment	Height (cm)	Weight (g)	Flower/fruit (no)
LS254	26.4 b	123.5 cd	10.6 b
LS255	26.5 b	130.0 d	13.6 cd
LS256	26.5 b	119.5 cd	13.4 cd
LS257	24.3 b	117.7 cd	13.7 cd
LS213	26.9 b	114.5 cd	12.4 bc
Control (old)	25.5 b	99.7 b	10.3 b
Control	19.6 a	30.7 a	1.8 a

[1]Tomato plant response to Cucumber mosaic virus was measured at 30 days post inoculation.

plant height among LS treatments and the older control treatment. The mean plant fresh weight was significantly greater for all LS treatments and the older control treatment compared with the control treatment. In addition, plant fresh weight for all LS treatments was significantly greater than for the older control treatment. The mean number of flowers and fruits was significantly greater for all LS treatments and the older control than for the control treatment. LS treatments 255, 256, and 257 had significantly more flowers and fruit than plants in the LS254 and older control treatments.

Initial signs of vein clearing and mosaic first occurred in control treatment plants by seven dpi, whereas plants in the other treatments were symptomless at that time. When plants were rated for symptom severity, the control treatment had a significantly higher average disease rating than for each of the other treatments at 14 and 28 dpi, whereas the LS and older control treatments did not differ from one another. More than half of the plants in the LS254, LS255, LS213 and older control treatments and half of the plants in LS256 remained symptomless at 28 dpi.

CMV accumulation in young, uninoculated leaves was measured at 14 and 28 dpi by ELISA. At 14 dpi, the mean ELISA value for samples collected from each LS and the older control treatment was significantly lower than for the control treatment (Table 2). CMV accumulation in plants treated with LS213 was significantly lower than in plants treated with LS257 but neither treatment differed from the other PGPR treatments or the older control. When plants were tested at 28 dpi, mean ELISA values for treatments LS254, LS255, LS256, LS213, and the older control were significantly lower than for LS257 and the control treatment.

ELISA data, used to determine percent infection within each treatment, revealed that significantly fewer plants were infected with CMV in the PGPR treatments LS255, LS213, and the older control than in the control treatment at 14 dpi (Table 2). At 28 dpi, treatments LS254, LS255, LS213, and the older control had significantly fewer infected plants than in the control treatment. In addition, the percentage of infected plants was significantly lower for treatments LS254, LS213, and the older control than for LS257.

Since mature plant resistance has been used as a management tool to reduce virus infection and associated yield losses under field conditions, the LS-based treatments reported here may offer a form of PGPR-mediated induced mature plant resistance that would integrate well with other pest management schemes.

Table 2. Detection of CMV in Leaf Tissues of PGPR-treated and Non-treated Tomato Plants[1]

Treatment	ELISA[2]		Percent infection[3]	
	14 dpi	28 dpi	14 dpi	28 dpi
LS254	0.496 bc	0.328 b	40 abc	30 c
LS255	0.362 bc	0.455 b	35 c	55 bc
LS256	0.633 bc	0.409 b	60 abc	60 abc
LS257	0.697 b	0.715 a	65 abc	85 ab
LS213	0.318 cd	0.336 b	25 c	30 c
Control (old)	0.423 bc	0.332 b	35 c	35 c
Control	1.228 a	0.774 a	90 ab	90 a

[1] Cucumber mosaic virus was detected by enzyme-linked immunosorbent assay (ELISA) at 14 and 28 days postinoculation.

[2] Mean ELISA values for CMV-inoculated tomato plants subjected to the stated treatments. The numbers represent the mean ELISA value for all (20) plants per treatment. Different letters represent a significant difference of the means at P=0.05.

[3] Percent infection is based on the number of samples shown to be infected with CMV based on ELISA per 20 samples for each treatment. Different letters represent a significant difference of the means at P=0.05.

EVALUATION OF CUPROFIX MZ DISPERSS FOR THE CONTROL OF CERCOSPORA LEAF SPOT ON TOMATO, 2002

Edward Sikora and Arnold Caylor

Cuprofix MZ Disperss is a new product from Cerexagri. It is a fungicide/bactericide that combines the active ingredients copper and mancozeb. Mancozeb is effective in controlling fungal diseases such as early blight, whereas copper acts as both a fungicide and a bactericide and is effective against bacterial leaf spot.

This trial was conducted to determine the efficacy of Cuprofix MZ Disperss against Cercospora leaf spot on tomato. Cercospora leaf spot is often a problem on fall-grown tomatoes in Alabama. Results indicate that the 4- and 6-pound-per-acre rates of Cuprofix MZ Disperss applied weekly were effective in controlling the disease.

This trial was conducted at the North Alabama Horticultural Research Center in Cullman, Alabama. Tomatoes were transplanted in July of 2002. Plants were grown on bare ground and drip irrigated. The experiment consisted of five treatments, replicated five times, in a randomized complete block design. Each treatment/replication consisted of a one row plot bordered on each side by an unsprayed guard row. Rows were 25 feet long with an in-row spacing of 18 inches. Treatments were applied weekly. Assessment of disease was conducted on October 12 and October 23. Yield data were not available at the time of publication.

EFFECTIVENESS OF TREATMENTS ON CERCOSPORA LEAF SPOT ON TOMATO

Treatments rate/acre	Percent Cercospora leaf spot October 12	October 23
Untreated control	14.0	69.2
Cuprofix MZ Disperss 4.0 lb	2.6	12.3
Cuprofix MZ Disperss 6.0 lb	2.0	8.6
Cuprofix MZ Disperss 4.0 lb ALTERNATED weekly with Actigard 1/3 - 3/4 oz + Cuprofix MZ Disperss 2.0 lb	10.4	22.2
ManKocide 5.0 lb	16.0	60.6

The 4- and 6-pound rates of Cuprofix MZ Disperss had the lowest Cercospora leaf spot ratings on both rating dates (see table). It appears the 2-pound rate of Cuprofix MZ Disperss in the alternating treatment was too low to control Cercospora leaf spot. ManKocide performed poorly with disease ratings in the same range as the untreated control.

IR-4 FOOD-USE RESEARCH ON TURNIP GREENS

Edward Sikora and Arnold Caylor

Alabama is the second leading producer of turnip greens in the United States with more than 2,000 acres planted annually with an average yield estimated at 11,000 pounds per acre. The crop is valued at more than $5 million in Alabama. Production of turnip greens can be affected by a variety of plant diseases. Damage can range from minor spotting to complete loss of a crop depending on the pathogen involved. Because leaves are typically the marketable products in green production in Alabama, a minor leaf spot problem can cause a significant loss in yield.

Only a few fungicides are labeled for use on turnip greens in Alabama. For this reason, funding from the IR-4 program was used to evaluate non-labeled and new chemistry fungicides for control of foliar diseases of turnip. Results indicated that two rates of Quadris F and BAS 500 (an experimental product from BASF) reduced damage from Alternaria leaf spot compared to an unsprayed control on the variety 'Purple Top'.

These experiments were conducted at the North Alabama Horticultural Research Center in Cullman in 2001. The turnip varieties 'Purple Top' and 'Shogun' were transplanted in September into separate trials. Each experiment consisted of five treatments replicated four times in a randomized complete block design. Plants were grown in one-row plots that were 15 feet long. Treatments included (1) an unsprayed control, (2) BAS 500 (1 pound per acre), (3) BAS 516 (0.66 pound per acre), (4) Quadris F (142 milliliters per acre), and (5) Quadris F (237 milliliters per

EVALUATION OF FUNGICIDES FOR CONTROL OF ALTERNARIA LEAF SPOT ON TURNIP GREENS, 2001

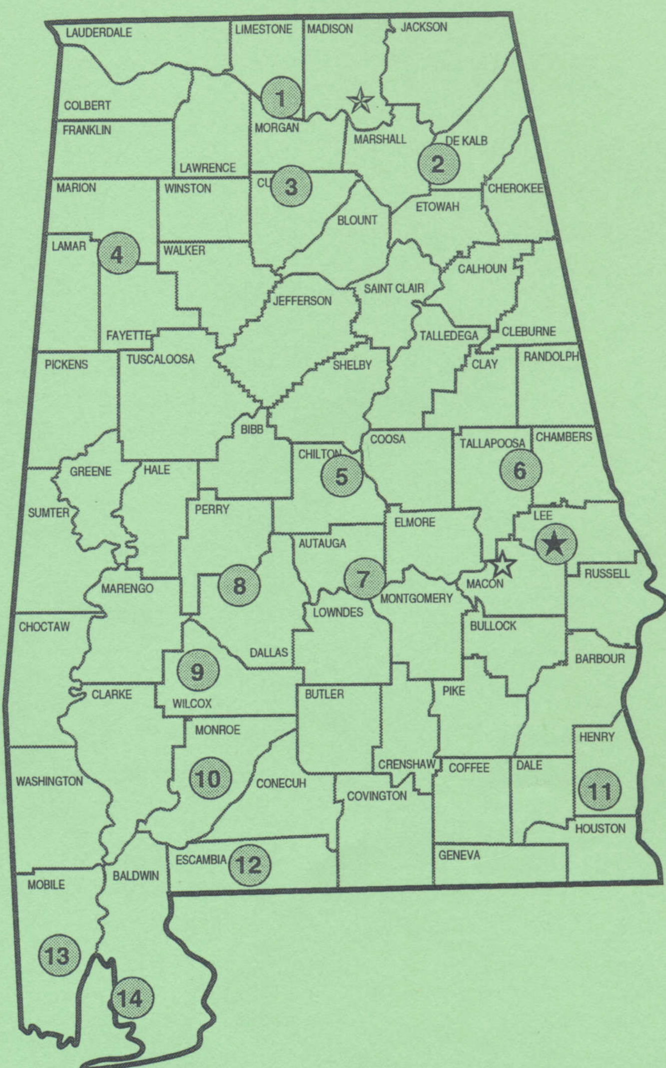
Treatments/ rate/acre	—Percent Alternaria leaf spot— Shogun	Purple Top
Untreated	4.2 a [1]	14.2 a
BAS 500 (1 lb/acre)	4.7 a	7.0 b
BAS 516 (0.66 lb/acre)	4.5 a	10.0 a
Quadris F (142 ml/acre)	3.7 a	7.2 b
Quadris F (237 ml/acre)	3.5 a	6.2 b

[1] Numbers followed by the same letter are significantly different.

acre). Fungicide applications were initiated at the first sign of disease and a total of three applications were made at 14-day intervals. Disease ratings were taken in late November and marketable top and root weights were determined at harvest.

Alternaria leaf spot, a common fungal disease of turnips, was the most common disease detected in these trials (see table). Disease pressure was relatively low in the 'Shogun' trial apparently due to the variety's higher level of resistance to the disease. There were no significant differences in disease ratings among the fungicides and the unsprayed control in the 'Shogun' trial. Damage from Alternaria leaf spot was significantly higher on the unsprayed control and in the BAS 516 treatment compared to the other three fungicide treatments in the 'Purple Top' trial. There were no significant differences in yield (top or root weights) among the treatments in either trial (data not shown).

Alabama's Agricultural Experiment Station Auburn University



Research Unit Identification

- ★ 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 Research Station, Cullman.
4. Upper Coastal Plain Agricultural Research Station, Winfield.
5. Chilton Research and Extension Center, Clanton.
6. Piedmont Substation, Camp Hill.
7. Prattville Agricultural Research Unit, Prattville.
8. Black Belt Research and Extension Center, Marion Junction.
9. Lower Coastal Plain Substation, Camden.
10. Monroeville Agricultural Research Unit, Monroeville.
11. Wiregrass Research and Extension Center, Headland.
12. Brewton Agricultural Research Unit, Brewton.
13. Ornamental Horticulture Research Center, Spring Hill.
14. Gulf Coast Research and Extension Center, Fairhope.