Comparison of Abound 2SC Calendar and AU-Pnut Advisory Programs for the Control of Early Leaf Spot and Southern Stem Rot

on a Multiple Disease Resistant Runner Peanut

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CONTENTS

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INTRODUCTION

In Alabama, the most important diseases of peanut are early and late leaf spot (caused by *Cercospora arachidicola* and *Cercosporidium personatum*, respectively) and white mold (southern stem rot or SSR caused by *Sclerotium rolfsii)* *(15)*. Of the two leaf spot diseases, early leaf spot has been the more common of the two in the peanut production area in southeastern Alabama. Without an intensive fungicide treatment program, early and late leaf spot of peanuts can defoliate plants and cut expected yields by 50 percent or more *(19)*. To maintain effective control of both diseases, fungicide applications should begin 30 to 40 days after planting and treatments must be repeated at 10- to 14-day intervals up until about 14 days before anticipated digging date *(14,20)*. In a 14-day calendar program, a total of six to eight fungicide applications may be made during the growing season. While average losses due to white mold are estimated statewide at 5 percent annually, losses to this disease in isolated fields can easily exceed 30 percent of expected yields. To minimize loss due to this disease, a fungicide program, particularly in fields with a history of damaging white mold outbreaks and frequent peanut production, should include applications of Folicur® 3.6F, Abound® 2SC, Headline® 2.09EC, Moncut® 70DF, or Artisan® 3.6E to control this disease *(14)*.

Numbers of fungicide applications made during a growing season may be reduced by adopting the disease advisory program AU-Pnut *(11,12)*. In simplest terms, fungicide applications are triggered by the AU-Pnut advisory on the basis of accumulated rain events, defined as $\geq$ 0.10 inch of rain or irrigation amount in a 24-hour period and the 5-day average rainfall forecast. Starting from true ground cracking, i.e., when seedlings first emerge, rain events are counted. Depending on the 5-day average rainfall forecast, the first fungicide application is made no later than the sixth rain event. Starting 10 days after that first application, additional fungicide applications

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are triggered after a) three rain events have occurred, b) the 5-day average rainfall is forecast to be above 50 percent, or c) a combination of the number of rain events and 5-day rainfall forecast. Over four years of trials, the average number of fungicide applications for leaf spot control on Florunner peanuts was reduced by 1.25 per year by using AU-Pnut *(11)*.

The AU-Pnut advisory was developed using the fungicide chlorothalonil (Bravo Flowable® 4F) on the peanut cultivar Florunner. More recently, fungicides that have considerable activity against causal fungi of white mold (southern stem rot or southern blight caused by *Sclerotium rolfsii)* and Rhizoctonia limb rot (caused by *Rhizoctonia solani),* as well as leaf spot diseases have become available *(8)*. In addition, newer peanut cultivars that have greater tolerance to leaf spot diseases and white mold than did Florunner are now being grown *(1)*. Florida C-99R, a late maturing runner peanut line, demonstrated partial resistance to early and late leaf spot as well as to white mold *(4,7,9)*. Runner peanut lines AP-3 and GA01R also have better resistance packages than the current industry standard Georgia Green *(10)*. Newer fungicides such as Abound® 2SC and Headline® 2.09EC as well as disease resistant cultivars may allow modification of AU-Pnut. The objective of this work was to compare the standard AU-Pnut disease advisory rules to the advisory with modified rules and to differing calendar schedules of fungicide applications. The trials, which included the fungicide Abound 2SC® (azoxystrobin) for early leaf spot and white mold control, were conducted on currently available peanut cultivars.

MATERIALS AND METHODS

Production methods. Peanuts were planted on May 20, 2002, May 14, 2003, and May 25, 2004 at a rate of approximately six seed per row foot in a Dothan fine sandy loam with less than 1 percent organic material. In 2002 and 2004, the late-maturing (maturity group 5) Florida C-99R peanut was planted, while late maturing (maturity group 5) DP-1 peanut was planted in 2003. Both of these peanut lines have some level of resistance to late leaf spot and white mold *(3,7,10)*. In late March, the plot area, which was maintained in a peanut–cotton–peanut rotation, was sub-soiled, turned with a moldboard plow, and then prepared for planting with a disk harrow. Approximately one month before planting, a pre-emergent application of 1 quart per acre Sonalan plus 0.45 ounce per acre Strongarm was broadcast and lightly incorporated. Temik 15G at 6.7 pounds per acre was applied in-furrow at planting to control thrips. Post emergent grass control was provided by a broadcast application of 8 ounces per acre Select plus 1 quart per acre of a crop oil concentrate. Escape weeds were pulled by hand or killed by cultivating row middles with flat sweeps.

The test area received approximately 1 inch of water per acre through a center pivot irrigation unit on August 7, August 19, and September 7, 2002. Due to frequent summer rains in 2003, the test area was not irrigated. In 2004, the equivalent of 1 inch of irrigation water per acre was applied on July 30 and August 17.

Fungicide programs. A randomized complete block design with four replications per treatment schedule was used. Plots consisted of four 30-foot rows spaced

3 feet apart and were irrigated as needed (see production methods). Fungicide programs with 2-, 3-, and 4-week intervals between applications (calendar schedules), the standard 6/3 AU-Pnut advisory, and modified 8/4 and 10/5 AU-Pnut leaf spot advisories were evaluated. These AU-Pnut advisories differed by the numerical designation where x/y are: x = the number of rain events (greater than or equal to 0.10 inch) to trigger the first fungicide application, and y = the number of rain events to trigger each subsequent fungicide application *(12,20)*. The 2-week calendar schedule is considered the industry standard and served as a positive control in these tests.

In all calendar and advisory programs, the first fungicide application was 1.4 pounds per acre of Bravo Ultrex®. Two applications of Abound 2SC® at 18.3 fluid ounces per acre were made mid-season (Table 1). Bravo Ultrex® was applied in all other treatment slots (Table 1). A tractor-mounted boom sprayer with three TX-3 hollow cone nozzles per row that was calibrated to deliver 15 gallons of water per acre of spray volume was used to apply all fungicides.

In 2002, Bravo Ultrex® applications were initiated on June 24 for the 2-, 3-, and 4-week calendar schedules (Table 1). Fungicide was applied according to the 6/3 AU-Pnut advisory on June 17, July 8, July 22, August 19, and September 15, while applications for the 8/4 AU-Pnut advisory programs occurred on June 23, July 22, August 19 , and September 15, 2002 (Table 1). According to the 10/5 AU-Pnut advisory, fungicide applications were triggered on July 2, August 5, August 19, and September 15, 2002 (Table 1). In 2003, applications began on June 30 for the calendar schedules (Table 2). Fungicide applications were triggered by the 6/3 and 8/4 AU-Pnut advisories on July 3, July 31, August 14, and August 28, 2003; and on July 3, August 4, August 14, and August 28, 2003 for the 10/5 advisory. For 2004, fungicide applications for all

TABLE 1. COMPARISON OF CALENDAR TREATMENT SCHEDULES WITH THE STANDARD AND MODIFIED AU-PNUT LEAF SPOT ADVISORY PROGRAMS ON THE CONTROL OF LEAF SPOT (LS) DISEASES AND SOUTHERN STEM ROT ON FLORIDA C-99R WITH ABOUND 2SC, 2002

	—Application—		Final early	AUDPC	White	Yield
Program and rate/ac	Schedule	Timing, DAP[1]	LS rating	rating	mold[2]	lb/ac
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	2-week	35, 49, 77, 101, 118 63, 91	3.0	159.0	10.3	3287
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	3-week	35, 77, 118 56, 101	5.3	213.5	14.2	2565
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	4-week	35, 118 63, 91	3.7	175.0	11.3	3426
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	6/3[3]	28, 63, 118 49, 91	3.7	182.0	8.5	3489
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	8/4	34, 118 63, 91	4.0	179.7	9.7	3440
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	10/5	43, 118 77, 91	3.8	211.2	9.0	3069

[1] DAP = days after May 20 planting date when fungicide applications were made.
[2] White mold incidence is expressed as the number of disease loci or hits per 60 foot of row in each plot.
[3] Number of rain events ($\geq$0.10 inch) in a standard and modified AU-Pnut advisory required to trigger first fungicide application/number of rain events need to trigger the second and all subsequent fungicide applications.

programs (the 2-, 3-, and 4-week schedules as well as the AU-Pnut advisories) began June 23 (Table 3). Fungicide applications were triggered by the 6/3 AU-Pnut advisory

Table 2. Comparison of Calendar Treatment Schedules with the Standard and Modified AU-Pnut Leaf Spot Advisory Programs on the Control of Leaf Spot (LS) Diseases and Southern Stem Rot on DP-1 Peanut, 2003

Program and rate/ac	—Application— Schedule	Timing, DAP[1]	Final early LS rating	AUDPC rating	White mold[2]	Yield lb/ac
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	2-week	33,47,75,103,117 61,89	3.5	151.2	6.0	4495
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	3-week	33,75,117 54,96	3.8	163.5	4.0	4792
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	4-week	33,117 61,89	4.0	165.5	8.8	4084
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	6/3[3]	50,106 78,92	3.0	161.0	3.3	4895
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	8/4	50,106 78,92	3.0	162.8	5.0	4998
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	10/5	50,106 82,92	3.8	182.2	5.5	4404

[1] DAP = days after May 14 planting date when fungicide applications were made.
[2] White mold incidence is expressed as the number of disease loci or hits per 60 foot of row in each plot.
[3] Number of rain events (≥0.10 inch) in a standard and modified AU-Pnut advisory required to trigger first fungicide application/number of rain events need to trigger the second and all subsequent fungicide applications.

Table 3. Impact of Application Schedule onthe Control of Diseases with Abound 2SC and on the Yield of Florida C-99R Peanut, 2004

Program and rate/ac	—Application— Schedule	Timing, DAP[1]	Final early LS rating	AUDPC rating	White mold[2]	Yield lb/ac
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	2-week	29,45,70,99,111 58,84	3.8b	255.9b	4.3a	3987b
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	3-week	29,70,111 51,93	4.5a	268.6ab	5.3a	4041ab
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	4-week	29,111 58,84	4.4a	261.0b	4.0a	4102ab
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	6/3[3]	29,52 77,97	4.6a	266.6ab	4.0a	4296a
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	8/4	29 59,97	3.9b	255.2b	4.8a	4048ab
Bravo Ultrex 1.4 lb Abound 2SC 18.2 fl oz	10/5	29 59,97	4.4a	283.7a	6.5a	3430c

[1] DAP = days after May 25 planting date when fungicide applications were made.
[2] White mold incidence is expressed as the number of disease loci or hits per 60 foot of row in each plot.
[3] Number of rain events (≥0.10 inch) in a standard and modified AU-Pnut advisory required to trigger first fungicide application/number of rain events need to trigger the second and all subsequent fungicide applications.

and occurred on June 23, July 16, August 10, and August 30, 2004; and on June 23, July 23, and August 30 for the 8/4 and 10/5 advisories (Table 3).

Disease assessment. Early and late leaf spot were rated together using the 1 to 10 Florida peanut leaf spot scoring system where 1 = no disease, 2 = very few leaf spots in lower canopy, 3 = few leaf spots in lower and upper canopy, 4 = some leaf spots in lower and upper canopy with light defoliation (≤10 percent), 5 = leaf spots noticeable in upper canopy some defoliation (≤25 percent), 6 = leaf spots numerous with significant defoliation (≤50 percent), 7 = leaf spots numerous with heavy defoliation (≤75 percent), 8 = numerous leaf spots on leaves with severe defoliation (≤90 percent), 9 = few remaining leaves covered with leaf spots and severe defoliation (≤95 percent), and 10 = plants defoliated or dead *(5)*. Leaf spot (LS) ratings were recorded every two weeks starting July 11 through September 19, 2002, July 31 through September 25, 2003, and July 13 through October 7, 2004. Incidence of white mold was determined as the number of hits, or loci counts where one hit (locus) is defined as less than or equal to 1 foot of consecutively damaged plants per row *(17)*.

White mold incidence was determined immediately after plot inversion on October 18, 2002, October 13, 2003, and October 28, 2004. Yields were adjusted to 10 percent moisture.

Analysis of data. Areas under disease progress curves (AUDPCs) were calculated *(18)* for each year from leaf spot ratings. AUDPCs were adjusted for the interval of days over which data were collected by dividing by days for analysis across all years. For example, AUDPCs were calculated over 70 days in 2002, so the AUDPC value for 2002 was divided by 70. Correlation coefficients were also calculated to determine the relative influence of diseases on yield. Yield data were regressed on AUDPCs for leaf spots and SSR incidence to determine the relative contribution of each of these diseases to yield in each year.

RESULTS

In 2002, through most of the growing season (July through September), rainfall was generally low with few rain days (Table 4). Rain fell more often in 2003, and total amounts were greater than in the two other years of this study. August 2004 was a relative dry month, with only 1.8 inches of rain falling on five days but rainfall totals for June and July were near normal for the Wiregrass Research and Extension Center (Table 4).

Table 4. Rainfall Amounts and Numbers of Rain Days for July, August, and September 2002–2004, Wiregrass Research and Extension Center

	July		August		September		Total	
Year	Rain *in.*	Rain days *≥ 1 in.*	Rain *in.*	Rain days *≥ 1 in.*	Rain *in.*	Rain days *≥ 1 in.*	Rain *in.*	Rain days *≥ 1 in.*
2002	3.6	6	2.8	5	2.6	4	9.0	15
2003	6.2	11	5.8	13	4.3	3	16.3	27
2004	4.1	6	1.8	5	6.3	7	12.3	18

Analysis of variance on the AUDPCs value for early leaf spot, incidence of white mold, and yield indicated significant differences among years. Therefore, further analyses were done on data for individual years. Overall, early leaf spot AUDPCs were greater in 2004, incidence of white mold was higher in 2002, and yields were greater in 2003 than in other years.

In 2002, the lowest final rating and AUDPC for early leaf spot were recorded for the standard seven-application, 2-week calendar fungicide program (Table 1, Figure 1). With a final disease rating of 5.3, the poorest leaf spot control was seen with the 3-week calendar program in which defoliation levels exceeded 25 percent. In all other treatments, defoliation on September 19 was limited to about 10 percent of the canopy. There were no differences in final leaf spot ratings for the 4-week calendar schedule

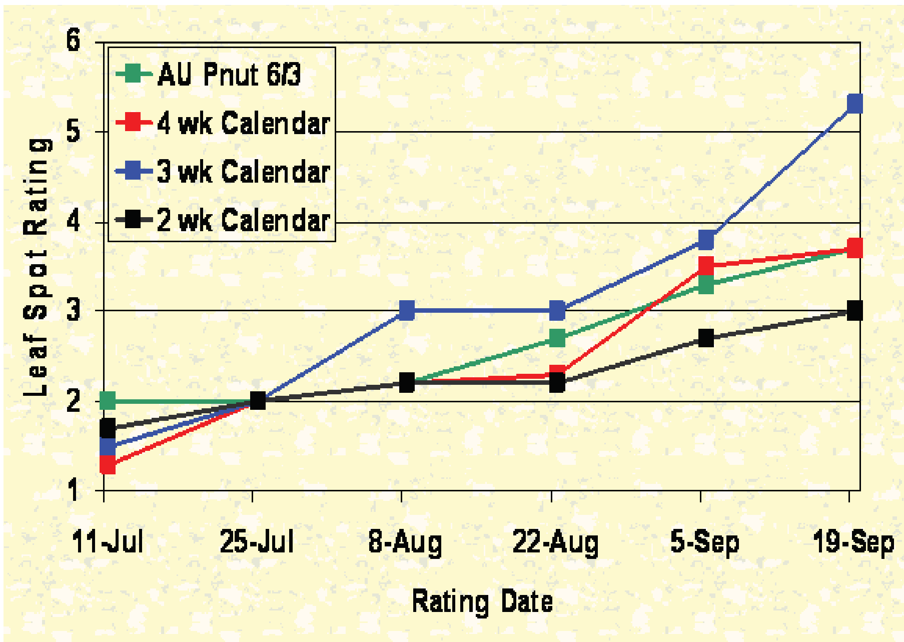

Figure 1 (top). Development of early leaf spot in 2002 for each of the calendar programs with 2-, 3-, and 4-week intervals between applications compared to the standard AU-Pnut advisory.

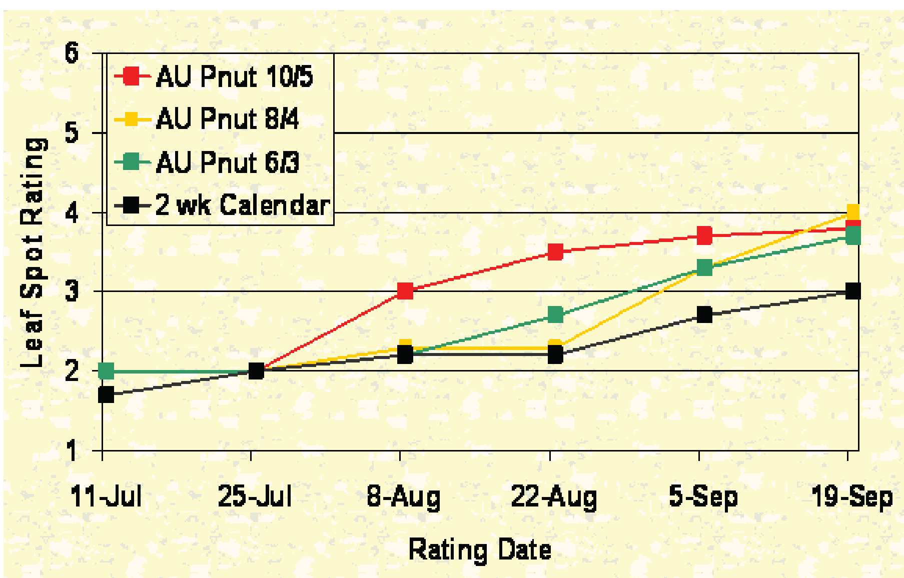

Figure 1 (bottom). Early leaf spot development for the standard and modified AU-Pnut programs compared to that of the recommended 2-week calendar program in 2002.

and any of the three AU-Pnut advisory schedules. AUDPC values reflected the final disease ratings except that the 10/5 AU-Pnut program had an AUDPC value that was very similar to the 3-week calendar program, which gave the worst leaf spot control. (Table 1).

None of the calendar or AU-Pnut advisory programs with Abound 2SC prevented white mold development in 2002, with eight or more hits observed in all plots. White mold damage was highest with the 3-week calendar program and greater than all other programs except the 4-week calendar program (Table 1). While the lowest incidence of white mold was observed for the standard 6/3 AU-Pnut program, incidence of this disease did not greatly differ from that of the other AU-Pnut programs, or from the 2- and 4-week calendar programs (Table1).

Yields in 2002 with the 2- and 4-week calendar and all three AU-Pnut advisory programs were similar, even though up to three applications were saved with the 4-week calendar and 10/5 AU-Pnut programs (Table 1). High early leaf spot and white mold ratings for the 3-week calendar program were reflected in lower yields.

In 2003, defoliation levels in all plots were generally less than 10 percent and each of the AU-Pnut leaf spot advisory programs, with four fungicide applications, provided as good or better disease control than any of the calendar programs according to final leaf spot ratings (Table 2). The final leaf spot rating for the 2-week calendar program (six total fungicide applications) was intermediate between those of the AU-Pnut advisory programs and the 3-week and 4-week calendar programs. AUDPCs for early leaf spot were generally similar for all fungicide application programs, except for the 10/5 AU-Pnut advisory program, which had a greater AUDPC and poorer season-long leaf spot control than the other programs.

Highest white mold incidence in 2003 was noted in plots treated on a 4-week calendar program (Table 2). White mold incidence was similar with fungicides applied according to any of the tested AU-Pnut advisory programs and the 3-week calendar schedule, and was lower with the 6/3 AU-Pnut program than the 2-week calendar schedule (Table 2).

The highest pod yields were obtained with the 6/3 and 8/4 AU-Pnut advisories, which were similar to the 2- and 3-week calendar schedules and the 10/5 AU-Pnut advisory. Lowest yields were observed from plots treated on the 4-week calendar schedule (Table 2).

On the basis of the final leaf spot ratings in 2004, the 2-week calendar program gave better disease control than either the 3- or 4-week calendar schedules or the 6/3 and 10/5 AU-Pnut advisory programs (Table 3). The 8/4 AU-Pnut advisory program was similar in effectiveness to the 2-week calendar program in protecting the Florida C-99R peanut from early leaf spot and gave better disease control than the 6/3 and 10/5 AU-Pnut programs. The AUDPC for early leaf spot was higher for the 10/5 AU-Pnut program compared to the 2-and 4-week calendar and the 8/4 AU-Pnut programs in 2004.

No differences in white mold incidence were seen between any of the calendar and advisory programs in 2004 (Table 3), although the 10/5 AU-Pnut program tended to have higher white mold incidence than did other programs. Higher yield was recorded with the 6/3 AU-Pnut advisory program than for the 2-week calendar program despite three fewer fungicide applications with this advisory. Yields for the 10/5 AU-Pnut program plots were lower than those of any other advisory or calendar treatment program.

DISCUSSION

In the southeastern United States, it is standard practice when producing peanuts to apply fungicides on 10- to 14-day intervals *(14)*. Longer intervals between applications may provide sufficient disease control when a resistant cultivar is used or if the weather is dry and a spray advisory is being used *(14)* as well as cut the number of fungicide applications, which decreases production costs. Strategies for reducing fungicide applications numbers that were evaluated on a partially leaf spot and white mold resistant cultivar were a calendar-based program with extended application intervals and use of the standard and modified rules of the AU-Pnut advisory *(11,12)*.

Previous work has shown that extending application intervals beyond 2 weeks generally decreases leaf spot control, with a corresponding loss in yield, compared to 2-week fungicide schedule *(2,16)*. These previous studies have included cultivars with partial resistance to late leaf spot, including Southern Runner and Florida C-99R. Results of the current study are similar to previously published observations in that final ratings for leaf spot diseases tended to be greater when fungicide applications were made every 3 or 4 weeks instead of on 2-week intervals. Final ratings for leaf spots, as well as pod yields, did not differ among the 2-, 3- and 4-week application schedules in 2 of the 3 years in the current study, even though up to three fungicide applications were saved with the longer application intervals. However, in 2002, AUDPC severity rating for early leaf spot was 34 percent greater, incidence of white mold was 38 percent greater, and yield was 22 percent lower, with the 3-week application interval than with the 2-week interval. To a producer, this indicates a one in three chance of inadequate control of early or late leaf spot.

Another strategy for reducing fungicide application numbers is to apply fungicides according to the AU-Pnut disease advisory *(2,11)*. Further reductions in fungicide application numbers are possible when a leaf spot resistant cultivar is grown and AU-Pnut thresholds are raised *(13)*. In this study, in 2 of 3 years, AUDPCs for leaf spot were similar in plots treated every 2 weeks according to the original AU-Pnut advisory, despite two (in 2003) or three (in 2004) fewer fungicide applications using the advisory system. Previous work had demonstrated that the use of AU-Pnut can reduce the numbers of fungicide applications without loss in disease control or reduced yields *(2,11)*.

Two modifications of the original AU-Pnut rules were also evaluated in the current study. These modifications allowed additional rainfall events before a fungicide application was triggered. In each of the 3 study years, seasonal AUDPC rating was similar when fungicides were applied according to the original AU-Pnut (6/3 thresholds) *(11)* or according to the 8/4 modification. The 8/4 modification of AU-Pnut saved one fungicide application in two years (2002 and 2004) compared to the original

AU-Pnut advisory rules, and saved up to four applications compared to the 2-week calendar-based application schedule.

Incidence of white mold and yields were similar among all treatments in all years of this study, except for yield from plots treated according to the AU-Pnut 10/5 advisory, which was lower in 2004 than in all other treatments in that year. These results are similar to those of Jacobi *et al. (12)* when modifications to AU-Pnut were tested on the partially leaf spot and white mold resistant Southern Runner peanut. Over 2 years, two to four fungicide applications were saved without yield decreases with 9/4 or 12/4 thresholds for AU-Pnuts.

The AU-Pnut advisory was originally developed and validated using only Bravo Flowable 4F® (chlorothalonil) applications. Abound 2SC® has also proven to be an effective fungicide component in the AU-Pnut disease advisory for the control of leaf spot diseases and white mold in this series of field trials. Over the past decade, other fungicides have become available that have activity against leaf spots of peanuts and/or soil-borne pathogens, particularly white mold. These newer products, such as Folicur 3.6F®, Moncut 70DF®, and Heritage 2.09E®, have contact and some systemic activity, which may give them a good fit to apply according to the AU-Pnut advisory. Previous studies have demonstrated that Folicur® 3.6F *(2)* Abound 2SC and Headline 2.09E *(13)* can be applied according to the AU-Pnut advisory for leaf spot control. Since the inclusion of a systemic fungicide in the season-long regime for leaf spot control is common practice, the current study did not have regimes with only Bravo Ultrex®, Bravo Weather Stik®, Echo 720® (chlorothalonil).

In 2002, scrutiny of the seasonal AUDPCs indicates that leaf spot infection increased more after July 25 for the 3-week and AU-Pnut 10/5 programs than with other programs. Prior to the July 25, 2002 assessment date, fungicide applications had been made on July 15 (Abound 2SC®) and July 2 (Bravo Ultrex®) for the 3-week calendar program and the AU-Pnut 10/5 treatment, respectively; both of these treatments also received fungicide on August 5 (Bravo Ultrex in the 3-week program; Abound 2SC in the 10/5 AU-Pnut program). Unprotected new growth may have been present or the fungicide had lost efficacy in these treatments by July 28 and/or August 3 when substantial rainfall occurred allowing infection of the leaves to occur. With all other programs in 2002, the fungicide had been applied on July 22. This indicates that 3-week intervals or five rain events between fungicide applications are likely to be inadequate even with cultivars that have some leaf spot resistance. Distinct differences in the seasonal AUDPCs among treatments were not observed in 2003 or 2004, so possible rain effects in those years could not be scrutinized.

Grower use of the AU-Pnut advisory for scheduling fungicide applications on peanuts can help reduce fungicide and labor costs cutting the numbers of applications. This advisory was developed with Florunner peanut and the protectant fungicide Bravo Flowable® 4F (chlorothalonil) *(11,12)*. Over the past decade, both new fungicides, which have efficacy against soil-borne pathogens, and new peanut cultivars, which have multiple disease resistance, have become available. Results of the current study demonstrate that modifications of the AU-Pnut advisory, so that thresholds between fungicide applications are higher, can provide adequate disease control without yield loss when a leaf spot resistant cultivar is grown.

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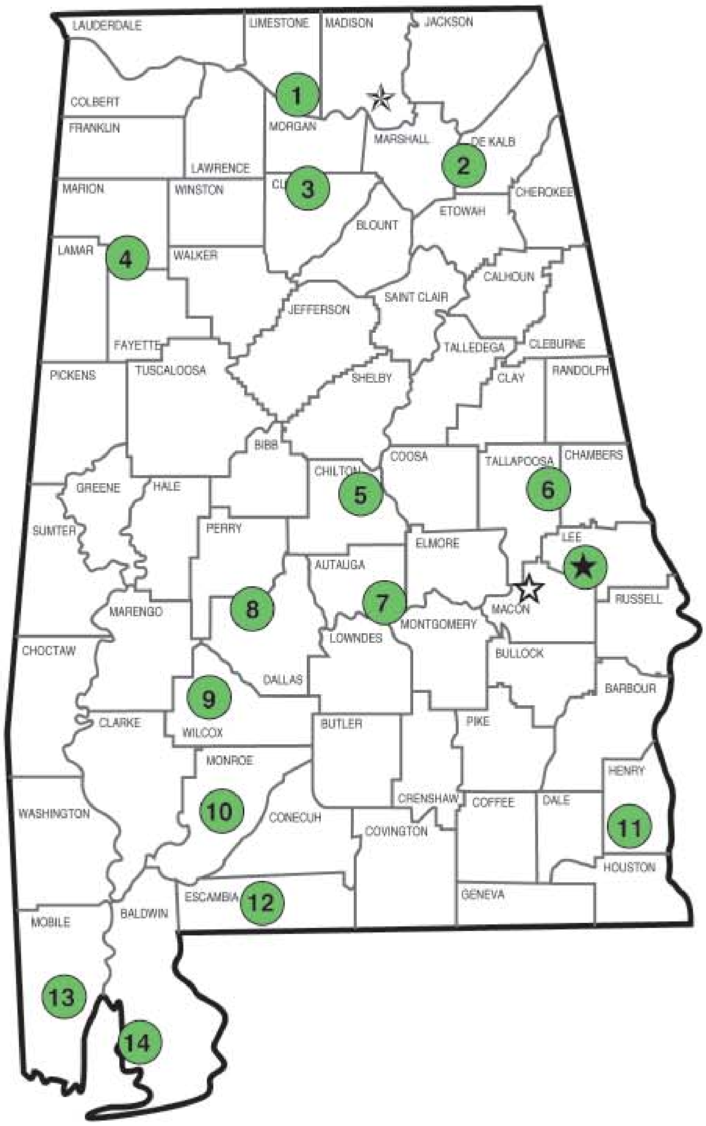
Alabama's Agricultural Experiment Station
AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the state has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



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 Center, Cullman.
4. Upper Coastal Plain Agricultural Research Center, 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.