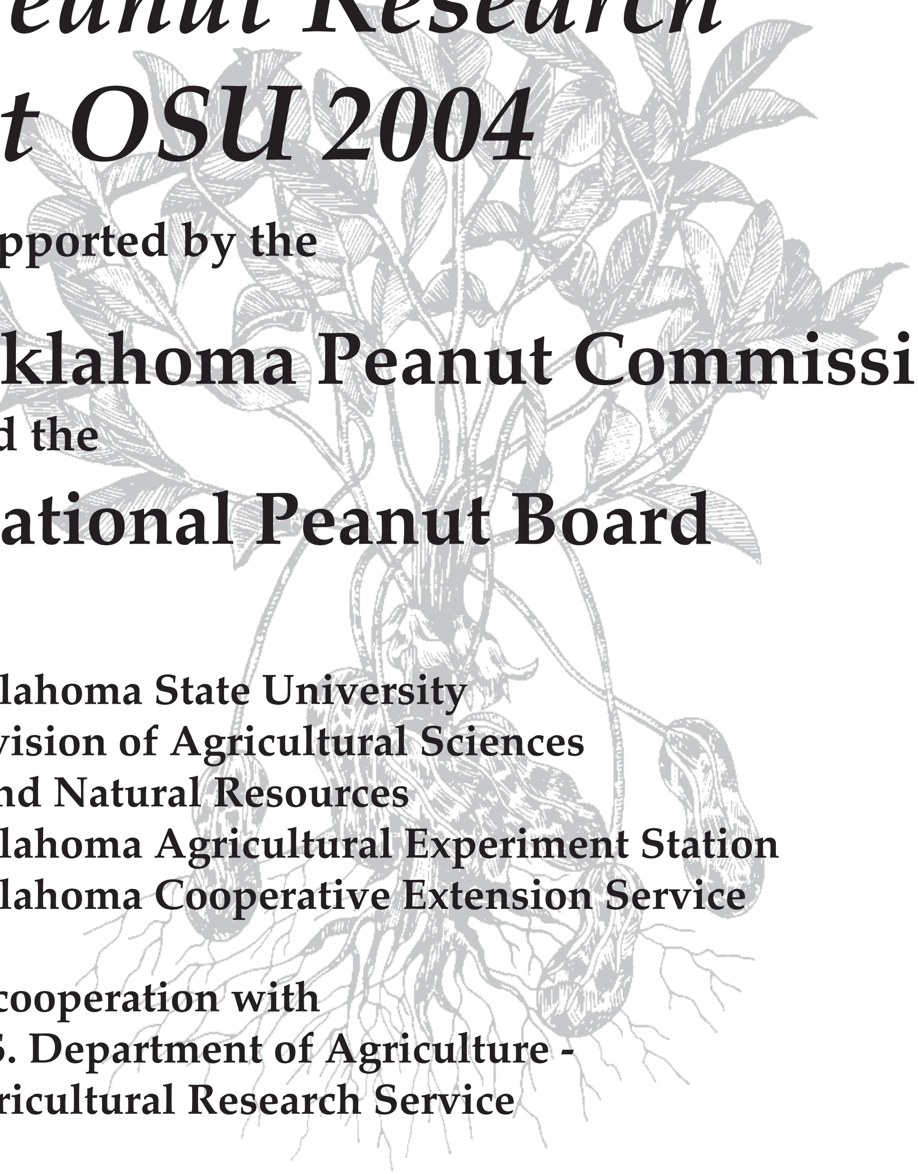
Partners in Progress
PEANUTS

Peanut Research at OSU 2004



Supported by the

Oklahoma Peanut Commission

and the

National Peanut Board

Oklahoma State University
Division of Agricultural Sciences
and Natural Resources
Oklahoma Agricultural Experiment Station
Oklahoma Cooperative Extension Service

In cooperation with
U.S. Department of Agriculture -
Agricultural Research Service

P-1009

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Partners in Progress PEANUTS

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Foreword

This publication is the tenth in a series of annual reports from the Oklahoma State University Division of Agricultural Sciences and Natural Resources summarizing work supported by the Oklahoma Peanut Commission and the National Peanut Board.

In his opening comments, Oklahoma Peanut Commission Executive Secretary, Mike Kubicek, focuses on the production problems facing Oklahoma's peanut producers and how OSU researchers are meeting these challenges to ensure peanuts remain a viable crop in the state.

Our *Partners in Progress* series is intended to highlight the most recent, significant research and extension activities. With all the work accomplished, it is important to keep in mind that additional research and educational activity needs to come in the future if progress is to continue.

In partnership with the Oklahoma Peanut Commission and the National Peanut Board, we strive to conduct research that is directed toward the needs of the state's producers. This report is just one way in which we communicate results to producers as rapidly as possible.

D.C. Coston, Associate Director
Oklahoma Agricultural Experiment Station
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

Oklahoma State University
Division of Agricultural Sciences and Natural Resources
Mission Statement

The Mission of the Oklahoma State University Division of Agricultural Sciences and Natural Resources is to discover, develop, disseminate, and preserve knowledge needed to enhance the productivity, profitability, and sustainability of agriculture; conserve and improve natural resources; improve the health and well-being of all segments of our society; and to instill in its students the intellectual curiosity, discernment, knowledge, and skills needed for their individual development and contribution to society.

Meeting Challenges – A Job Well Done

"Hats off" to Oklahoma State University's Peanut Improvement Team. This dedicated group of investigative scientists remained focused on the production problems facing Oklahoma's peanut producers while they were challenged by limited resources and personnel. The Oklahoma Peanut Commission and the National Peanut Board salute Drs. John Damicone, Phil Mulder, and Case Medlin for their leadership as principal investigators for the 2004 projects funded by producer assessments. And a special acknowledgment to the United States Department of Agriculture – Agricultural Research Service scientists Drs. Hassan Melouk and Kelly Chenualt, for their outstanding efforts as members of the Peanut Improvement Team.

The 2004 *Partners In Progres*s report highlights the results of laboratory, greenhouse, and field plot studies on several projects identified by producers as priorities for investigation. Dr. Medlin's project entitled *Research for Newly Emerging Weed Control Problems in Oklahoma Peanut Producing Regions* seeks out remedies for herbicide resistant weeds that have become a challenge to control in many areas of the state. Drs. Melouk and Damicone teamed up to lead the investigations on two projects entitled *Research on Peanut Disease Resistance to Soilborne Pathogens in Oklahoma*; and *Management of Sclerotinia and Southern Blights in Oklahoma Peanuts*; both long-term collaborative efforts to solve Oklahoma's most devastating peanut disease problems. Dr. Mulder led a comprehensive study of *Management of Arthropods and Other Pests in Peanuts*.

Two projects allowed producers a 'hands on' approach via field days and turn-row meetings. Dr. Damicone's *Field Studies for Control of Peanut Diseases*, and Dr. Medlin's *General Extension and Weed Control Research on Peanuts*, took the classroom to the producers at multiple locations throughout the state.

These and other related studies are available to all interested parties as part of the partnership among Oklahoma State University, USDA, the Oklahoma Peanut Commission, and the National Peanut Board. Of course, this partnership would not be complete without the input and support of Oklahoma's peanut producers.

Though challenged by weeds, weather, and disease, the 2004 Oklahoma peanut crop was an outstanding one. As for the weather in 2005 – we better leave that to someone else. But for weeds and disease, and the other perils facing producers, rest assured your Peanut Improvement Team will be focused for the challenge, and for that we are grateful.

Mike Kubicek
Executive Secretary
Oklahoma Peanut Commission

Management of Arthropods and Other Pests in Peanuts

P.G. Mulder, J.P. Damicone, C.R. Medlin, J.K. Nickels, and S.K. Seuhs
Department of Entomology and Plant Pathology

Partners in Progress PEANUTS

2004 progress made possible through OPC and NPB support

- Studies conducted under three variations in tillage practices showed significantly fewer thrips populations were recovered from peanuts grown under conventional tillage systems than in those grown in no-till or strip-till.
- Between tillage systems, no differences were detected in yield or grade in trials conducted at Ft.Cobb, Oklahoma; however, numerically higher yields paralleled the lower infection rates of sclerotinia recorded under no-till systems.
- A study conducted on runner type peanuts to assess the effects of various insecticides, found a significant advantage to using Mustang-Max® for early season thrips control. Poor performance was obtained from Novaluron®.
- Few significant differences in yields were recovered between any of the peanuts treated with insecticides or the untreated plants. Yields from peanuts treated with Novaluron® were significantly lower than those treated with GF-968 (middle rate). All treated peanuts yielded numerically greater than untreated peanuts.

The Effects of Reduced Tillage Practices on Peanut Production and Pest Management

Support provided by the Oklahoma Peanut Commission and the National Peanut Board

Since the advent of the new peanut farm program, it has become imperative to find avenues of reducing inputs into the peanut ecosystem. Rising production costs and reduced returns have resulted in a shift in management practices to offset costs and increase profit margins. Many Oklahoma peanut producers have adopted or considered reduced tillage to remain competitive. Reduced tillage requires particular emphasis on planning and management to anticipate problems and costs. The required specialized equipment, cover crop management, and changes in pest complexes further complicate both management and cost. Additional concerns arise suggesting that reduced tillage can impact early leaf spot, effective herbicide placement, insect buildup, volunteer peanut contamination, and make harvest operations more difficult.

In 2004, a long-term systems study was initiated at the Ft. Cobb Research Station to observe changes in disease, insect, and weed complexes over time. The objective of this study is to assist Oklahoma growers in developing more economic management strategies for conventional and conservation tillage. Typically, studies of this nature have been conducted on small plots over several years to ascertain how large-scale changes in the biological ecosystem occur. In the previous two years, Oklahoma State University conducted such trials. Studies initiated in 2004, however, were conducted on a large scale, with plot sizes approaching 80 ft wide by 135 ft long. Information from these large plots should be more indicative of what a grower would experience in adopting reduced tillage practices.

Reducing tillage practices would decrease the cost of land preparation for peanut producers, while conserving soil resources. Results from trials conducted in previous years have shown that some disturbance in the seed zone (ro-till) will increase yields on some fields by approximately 500 lbs/a, when compared to no-till. Detailed sampling conducted by this same team in 2003 revealed few effects on the foliar arthropod populations from various tillage practices. It was hypothesized that the primary area where changes were most likely to occur and ultimately affect peanut production were in the area of soilborne arthropods and diseases. This hypothesis further accentuated the need for increasing plot size to ensure that tillage treatments simulated actual on-farm conditions.

Materials and Methods

General Practices – Late in the fall of 2003, a large sub-section of land was set aside at the Ft. Cobb Research Station for the purpose of examining the effects of tillage practices on peanut production. The sandy loam soil was planted with hard red winter wheat in October 2003. To simulate heavy grazing, the entire field was swathed and baled on 15 and 21 Apr, 2004, respectively. Roundup® herbicide (1 qt/a) was used on 3 May, 2004, to remove winter weeds. In the conventional tillage treatment plots, a disc implement was run over the area once on 17 May, 2004. On that same day, Prowl® (2.4 pts/a) was broadcast over these same plots and incorporated by discing the field in both directions. All remaining tillage systems received a pre-emergent tank-mix treatment of Prowl® (2.4 pts/a) plus Roundup® (1 qt/a) that was watered in (irrigation) but not incorporated. On 17 May, 2004, all peanuts were planted. On 18 May, 2004, all plots received 0.5 in of irrigation. On 15 Jun, 2004, a tank mix of Cadre® (1.44 oz/a) plus Butyrac® 200 (1 pt/a) plus crop oil (1 qt/a) was applied for weed control. No insecticides were applied to any of the plots throughout this trial. Relative to disease control, a program consisting of one application of Headline® (9 oz/a), followed by two separate applications of Folicur® (7.2 oz/a), followed by a final application of Headline® (9 oz/a) was used to reduce the threat from leafspot and/or Southern blight. Peanuts were dug on 8 Nov, 2004, and harvested on 11 Nov, 2004.

Arthropod Monitoring and Weed Populations – Thrips populations were monitored on two separate occasions once damage became apparent. Twenty quadrifoliate leaves were pulled from each plot and placed in 70 percent ethyl alcohol (ETOH) for transportation back to the laboratory. Leaves were carefully separated and rinsed in the ETOH and the liquid strained for thrips larvae and adults. Additional arthropod populations were monitored throughout the season, but no appreciable numbers of organisms raised concern. In fact, this entire plot area consistently had the best looking peanuts on the station. No significant numbers of weeds occurred throughout the test area for the duration of this study.

Disease Evaluation – The effects of tillage on levels of disease was evaluated. Levels of foliar diseases such as leaf spot were very low. Sclerotinia blight became a problem late in the season. The incidence of Sclerotinia blight was assessed by counting the number of 6-in row segments with symptoms and/or signs of the disease in the middle four rows of each plot on 20 Sep.

The plot design was a randomized complete block design with four replications of each treatment. An analysis of variance was conducted on the data and a least significant difference (LSD) (P=0.05) was generated to determine if significant differences were observed between the three tillage treatments in reference to insect and disease pressure, as well as yield and grade.

Results and Discussion

Information found in Table 1 presents results from monitoring insect populations encountered in the tillage test at Ft. Cobb. Thrips were the only noticeable insect problem throughout the season. Populations of defoliating caterpillars, leafhoppers, and grasshoppers were monitored occasionally; however, numbers of these insects and/or their effects on the peanuts were negligible. No insecticides were applied throughout this test. No significant differences were observed in thrips populations captured in peanuts grown under strip-tillage practices versus those grown in no-tillage systems. Interestingly, during the initial sampling period, there were significantly fewer thrips recovered in peanuts grown under a conventionally planted system than in those planted in strip-till. During the second sample period, fewer thrips were recovered in peanuts grown under conventionally planted systems than in no-till. No other differences in arthropod populations were observed.

Table 2 reflects the results of counts to assess infection by Sclerotinia blight. In addition, Table 2 depicts yield and grade analyses. There were trends for reduced levels of Sclerotinia blight and increased yield and grade for the no-till treatment compared to conventional and strip-till treatments. However, variability was high and there were no statistically significant differences in disease level or yield among the tillage treatments. While the no-till system had a large numerical (850 lbs/a) advantage yield, little confidence can be placed on the superiority of this tillage treatment over the others because of the high plot-to-plot variability. The high grades (averaging around 76 percent total sound mature kernels (TSMK)) reflect the fact that the crop was uniformly set.

Peanut yields and quality were very good the first year. The test was established in a location as free from diseases, insects, and weeds as possible; however, a great deal of variability occurred among treatments. The objective of the first-year practices and harvest associated with this trial was to remove as much variability

Table 1. Total adult and larval thrips recovered from 20 quadrifoliate leaves in each tillage system – Ft. Cobb, Oklahoma, 2004.

Treatment	*16 Jun Mean no. larvae/20 leaves*	*16 Jun Mean total thrips/20 leaves*	*23 Jun Mean no. larvae/20 leaves*	*23 Jun Mean total thrips/20 leaves*
Strip-till	43.0 a*	50.8 a	9.3 ab	18.0 a
No-till	37.3 ab	49.3 ab	17.3 a	25.0 a
Conventional till	19.3 b	19.8 b	7.5 b	13.5 a

* Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD; P=0.05).

Table 2. Sclerotinia blight, yield, and grade effects from the various tillage systems – Ft. Cobb, Oklahoma, 2004.

Treatment	*Sclerotinia blight 23 Sep Mean no. of 6 in hits/row (Mean of center 4 rows on 4 replications)*	*Yield (lbs/a)*	*Grade (% TSMK)*
Strip-till	50.3 a*	3622 a	75
No-till	22.5 a	4490 a	77
Conventional till	63.2 a	3612 a	76

* Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD; P=0.05).

among tillage systems as possible. Long-term changes in the soil profile and its permeability will likely affect both soilborne insects and diseases over the course of several years. Information that can be gained in subsequent years of this study will contribute immensely to our knowledge about how these traits will change and their effects on the overall ecosystem.

Exploring New Chemistries for Arthropod Management in Peanuts

Support provided by Interregional Project-4 funds

Tables 3-5 present the results of varying levels of insecticide management on thrips populations in a conventional tilled peanut field at the Perkins Research Station, Perkins, Oklahoma. The experimental design was a randomized complete block using four replications for each of eight treatments. The objective of this experiment was to explore new chemistries that might provide additional tools for controlling thrips in peanuts. This particular experiment was supported in part by Interregional Project-4 funds. The trial was planted on 10 May, 2004. Each plot consisted of Tamrun 96 peanuts planted four rows wide and 30 ft long. Once peanuts began to emerge, each plot was staked with a bright yellow card in the center to attract and accentuate thrips populations uniformly across the treatment area. Insecticide applications were conducted on 3 Jun, 2004, using a CO_2 wheelbarrow sprayer calibrated to deliver 20 gallons per acre. Monitoring for thrips was conducted by sampling 5 quadrifoliate leaves per plot on the two center rows. Leaves were pulled from each plot and placed in 70 percent ETOH for transportation back to the laboratory. Leaves were carefully separated and rinsed in ETOH and the liquid filtered for thrips larvae and adults. In addition, thrips damage ratings were taken based on a 1-10 scale, where one equals no damage and 10 means the plant is destroyed from thrips damage. Thrips populations and ratings were taken 4, 7, 14, and 20 days after treatment with insecticides. Yield and grade were determined by digging, combining, drying, and weighing peanuts from the two center rows of each plot. Pretreatment counts of thrips, made just prior to treatment, revealed an average of 24 larval and 6 adult thrips/5 quadrifoliate leaves. In some of the treated peanuts, these populations actually increased to levels paralleling the untreated peanuts.

Damage ratings were consistently high for untreated peanuts throughout the trial period. Similar ratings were obtained during each of the readings from peanuts treated with Novaluron® (Table 3). In contrast, during each of the four rating periods, peanuts treated with Mustang-Max® had significantly lower ratings (less damage) than the untreated plants (Table 3). Most of the peanuts treated with other chemistries or rates yielded significantly better ratings than the untreated plants during early readings. Later sampling dates revealed some higher ratings for Tracer® and GF-968 at the lower rate (Table 3). Results of actual thrips counts paralleled those of the rating system, with fewer larval and total thrips numbers recovered from peanuts treated with Mustang-Max® and GF-968 at the

Table 3. Mean thrips damage ratings (1-10 scale) from treated and untreated peanuts – Perkins Research Station, Perkins, Oklahoma, 2004.

		* Mean rating (1-10 scale)			
Treatment/ formulation	*Rate/ lbs a.i./a*	*4DAT** 7 Jun*	*7DAT** 10 Jun*	*14DAT** 17 Jun*	*20DAT** 23 Jun*
Tracer®	0.094	4.5 cd	3.75 b	5.00 ab	4.00 ab
Novaluron®	0.091	5.63 ab	5.25 a	5.25 ab	4.00 ab
Novaluron®	0.058	5.38 abc	5.00 a	5.25 ab	4.38 a
Mustang-Max®	0.02	3.88 d	2.63 c	3.13 d	2.50 c
GF-968	0.09374	4.25 cd	3.50 b	3.63 cd	3.25 bc
GF-968	0.04687	4.88 bcd	3.63 b	3.88 cd	2.75 c
GF-968	0.02343	4.63 bcd	3.75 b	4.25 bc	4.00 ab
Untreated		6.25 a	5.50 a	5.50 a	4.50 a

* Means, within columns, followed by the same letter are not significantly different (ANOVA LSD; P=0.05).
** DAT= Days after treatment. First sample date was four days after threshold treatment.

Table 4. Effects of insecticides on larval thrips populations – Perkins Research Station, Perkins, Oklahoma, 2004.

		* Mean no. larvae/5 quadrifoliate leaves			
Treatment/ formulation	*Rate/ lbs a.i./a*	*4DAT** 7 Jun*	*7DAT** 10 Jun*	*14DAT** 17 Jun*	*20DAT** 23 Jun*
Tracer®	0.094	23.8 bc	29.3 c	8.3 ab	21.3 a
Novaluron®	0.091	72.3 a	49.5 bc	4.8 abc	10.3 a
Novaluron®	0.058	36.8 b	59.0 ab	5.3 abc	16.5 a
Mustang-Max®	0.02	1.0 c	1.8 d	3.5 bc	17.8 a
GF-968	0.09374	5.3 c	26.5 cd	1.8 c	10.0 a
GF-968	0.04687	16.8 bc	26.8 cd	5.3 abc	13.0 a
GF-968	0.02343	14.8 bc	36.8 bc	5.5 abc	15.3 a
Untreated		78.8 a	79.2 a	10.0 a	12.8 a

* Means, within columns, followed by the same letter are not significantly different (ANOVA LSD; P=0.05).
** DAT= Days after treatment. First sample date was four days after threshold treatment.

Table 5. Effects of insecticides on total thrips populations and peanut yield – Perkins Research Station, Perkins, Oklahoma, 2004.

		* Mean total thrips/5 quadrifoliate leaves				
Treatment/ formulation	*Rate/ lbs a.i./a*	*4DAT** 7 Jun*	*7DAT** 10 Jun*	*14DAT** 17 Jun*	*20DAT** 23 Jun*	*Yield * lbs/a*
Tracer®	0.094	31.0 bc	33.3 cd	10.0 a	23.5 a	3206.5 ab
Novaluron®	0.091	79.3 a	56.0 abc	7.0 a	17.3 a	3164.1 ab
Novaluron®	0.058	42.3 ab	66.0 ab	9.0 a	23.3 a	3000.8 b
Mustang-Max®	0.02	2.3 d	5.5 d	9.0 a	24.0 a	3236.7 ab
GF-968	0.09374	12.0 cd	32.0 cd	4.0 a	16.3 a	3085.5 ab
GF-968	0.04687	22.8 bcd	30.3 cd	6.0 a	16.5 a	3442.4 a
GF-968	0.02343	19.8 bcd	43.0 bc	7.0 a	25.5 a	3067.3 b
Untreated		83.3 a	83.2 a	12.0 a	18.8 a	2988.7 b

* Means, within columns, followed by the same letter are not significantly different (ANOVA LSD; P=0.05).
** DAT= Days after treatment. First sample date was four days after threshold treatment.

higher rate (Tables 4 and 5). Similar to results from the rating system, thrips populations in peanuts treated with Novaluron® were consistently similar to those of the untreated plants (Tables 4 and 5). In addition, Mustang-Max® and GF-968 (higher rate) had consistently lower thrips populations, particularly early after application of chemicals (Tables 4 and 5). Typical of what often occurs with peanuts approaching the bloom period, thrips populations cued in on blooms and decreased considerably from seven to 14 days after treatment.

Harvest results revealed the greatest yield in peanuts treated with GF-968 (middle rate); however, no differences were detected between peanuts treated with Novaluron® and those treated with either Mustang-Max® or GF-968 at the high rate (Table 5). The latter two treatments provided the best control of thrips; however, only 453 lbs of peanuts separated the best treatment from the peanuts receiving no insecticide (Table 5). Among the peanuts receiving chemicals for thrips control, those treated with Novaluron® yielded the least (Table 5).

Implications from this trial suggest that more chemistries are available that are efficacious on thrips in peanuts. While Mustang-Max® does not currently have a label on peanuts, it is cleared for use on many row and horticultural crops. Keep in mind, that when evaluating performance of these chemistries, this test represents only one location in one year. Effectively and fairly evaluating the utility of new chemistries often requires several years, under variable growing conditions, to accurately assess the overall performance of these compounds.

Management of Sclerotinia and Southern Blights in Oklahoma Peanuts

H.A. Melouk, USDA-ARS
J.P. Damicone, Department of Entomology and Plant Pathology

2004 progress made possible through OPC and NPB support

- Early leaf spot was the prominent disease on peanuts at field trials in Oklahoma with the runner and Spanish lines.
- Tamrun 96 had the best yields (3719–5073 lbs/a), Okrun had the best grades (70-79), Tamrun OL 01 had the highest percentage of kernels riding the 21/64 screen, and Southwest Runner remained the most resistant runner cultivar to Sclerotinia blight.
- The incidence of Sclerotinia blight in the high oleic breeding lines TX994313 and TX994374 was significantly lower than in the susceptible cultivar Okrun.
- The advanced breeding line TX996784 appears to be a good candidate to become a new improved Spanish cultivar with the high oleic trait.
- Valencia A, Valencia C, and new germplasms exhibited good resistance to Sclerotinia blight, but yields and grades are lower than the standard sclerotinia resistant cultivar Southwest Runner.

Although acreage planted to peanuts in Oklahoma has declined in recent years, the crop remains economically important to those who choose to grow it. A major problem for Oklahoma peanut production is how to grow the crop profitably. Yield limiting factors such as diseases (Sclerotinia blight being the most important), weeds, and insects contribute to lowering peanut culture profitability. The foundation of any successful crop production system is a good cultivar that has high yields, excellent quality, and pest resistance. A productive peanut-breeding program focuses on enhanced yields, enhanced quality, crop adaptation, and pest resistance. The ultimate goal of this research is to develop peanut cultivars that are resistant to Sclerotinia blight and other diseases.

Field trials in 2004 were planted at Liberty Bottom (Bryan County), Erick (Beckham County), Chickasha (Grady County), and two locations at the Caddo Research Station near Ft. Cobb (Caddo County). One of the locations at the Caddo Research Station was located in an area with a high level of *Sclerotinia minor* inoculum (high disease area) and the other location was in an area with a lower level of *S. minor* inoculum (low disease area). Early leaf spot was the prominent disease on peanuts at field trials in Bryan, Beckham, and Grady counties. Field research in 2004 consisted of three studies: 1) evaluation of advanced runner breeding lines; 2) evaluation of advanced Spanish breeding lines; and 3) identification and selection of new resistant sources from peanut germplasms to Sclerotinia blight.

Performance of Advanced Runner Breeding Lines in 2004

The 2004 runner breeding line trials identified four potential peanut breeding lines (TX972505, TX976882, TX994313, and TX994374) for further evaluation to determine if they have any value as new cultivars. The breeding line TX994313 had the highest yield at both the high and low disease locations at the Caddo Research Station. TX994313 had a comparable percent of incidence to Sclerotinia blight as the breeding line TX994374 that was significantly lower than the Sclerotinia blight of the susceptible cultivar, Okrun. However, this percent of incidence to Sclerotinia blight of TX994313 and TX994374 was significantly higher than the Sclerotinia blight resistant cultivar, Southwest Runner. The data indicated that TX994374 appeared to have the best tolerance to early leaf spot disease. A major difference between TX994313 and TX994373 was that TX994313 has better grades that ranged from 69-79, while TX994374 had grades that ranged from 62-76. The other two breeding lines TX972505 and TX976882 had very little resistance to Sclerotinia blight, but both lines had excellent yields in the absence of Sclerotinia blight disease. Poor stand establishment was evident in the two new releases (Tamrun OL 01 and Tamrun OL 02) and three of the breeding lines (TX994313, TX994374, and TX994392). **Data collected from the 2004 the Runner Breeding Line Trials are shown in Tables 1-5.**

Table 1. Comparison of yields on the advanced runner peanut breeding lines at four locations in Oklahoma, 2004.

	Yield lbs/a				
Breeding line	*Caddo high disease*[1]	*Caddo low disease*[1]	*Grady*[2]	*Beckham*[3]	*Average*
Okrun	3122 (10)[4]	4202 (11)	3530 (11)	4193 (3)	3762 (8.75)
SW Runner	3630 (4)	4574 (8)	4020 (6)	4147 (4)	4093 (5.50)
Tamrun 96	3799 (2)	4937 (4)	4719 (1)	4247 (2)	4426 (2.25)
Georgia Green	3376 (8)	4755 (5)	3666 (9)	3739 (11)	3884 (8.25)
Tamrun OL 01	3582 (5)	4601 (7)	4093 (4)	4347 (1)	4156 (4.25)
Tamrun OL 02	2844 (11)	4465 (9)	3648 (10)	3848 (10)	3701 (10.00)
UF 00627	2662 (12)	3730 (12)	3439 (12)	3548 (12)	3345 (12.00)
TX972505	3715 (3)	5109 (3)	4683 (2)	3993 (6)	4375 (3.50)
TX976882	3485 (7)	5118 (1)	4084 (5)	4038 (5)	4181 (4.50)
TX994313	3799 (1)	5118 (1)	4011 (7)	3993 (7)	4230 (4.50)
TX994374	3557 (6)	4447 (10)	4147 (3)	3893 (8)	4011 (6.75)
TX994392	3294 (9)	4683 (6)	4002 (8)	3848 (9)	3957 (8.00)
PR > F	< 0.0001	0.0001	0.3274	0.1173	
LSD 0.05	447	472	NS[5]	NS	

[1] Plots at Caddo County were located at the Caddo Research Station in an area of high Sclerotinia blight pressure and at another area with a low pressure for Sclerotinia blight. An application of Omega® followed by an application of Endura® was made to the peanuts growing in the low disease area to reduce the incidence of Sclerotinia blight.
[2] Grady County plots were located at the Arthur Kell farm near Chickasha, Oklahoma.
[3] Beckham County plots were located at the Gale Thompson farm near Erick, Oklahoma.
[4] Number in parenthesis indicates rank in that column.
[5] NS = Differences in breeding lines not significant.

Table 2. Comparison of percent incidence of Sclerotinia blight among the advanced runner peanut breeding lines – Caddo Research Station, 2004.

	Percent Sclerotinia blight[1]					
	High disease area[2]			*Low disease area*[2]		
Breeding line	*19 Aug*	*31 Aug*	*14 Sep*	*19 Aug*	*31 Aug*	*14 Sep*
Okrun	53	80	83	16	27	32
SW Runner	12	21	20	3	11	9
Tamrun 96	42	65	65	10	13	12
Georgia Green	34	61	56	5	17	16
Tamrun OL 01	44	74	74	13	15	18
Tamrun OL 02	41	57	63	11	26	23
UF 00627	77	84	90	34	51	48
TX972505	43	73	75	15	29	25
TX976882	38	68	71	7	12	8
TX994313	20	51	53	4	7	5
TX994374	25	48	54	5	11	12
TX994392	42	73	71	15	22	17
PR > F	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001
LSD 0.05	14	19	21	7	16	14

[1] Percent Sclerotinia blight was determined by dividing the number of infection loci by the number of potential infection loci and multiplying by 100. An infection locus is defined as an area of disease symptoms equal to 6 inches in length in a standard row.

[2] Plots were located at the Caddo Research Station in an area with high Sclerotinia blight pressure and at another area with a low pressure for Sclerotinia blight.

Table 3. Comparison of percent incidence of early leaf spot and percent defoliation caused by early leaf spot between the advanced runner peanut breeding lines – Bryan, Beckham, and Grady counties, 2004.

	Bryan County		*Beckham County*		*Grady County*	
	Percent leaf spot	*Percent defoliation*	*Percent leaf spot*	*Percent defoliation*	*Percent leaf spot*	*Percent defoliation*
Breeding line	*26 Aug*	*11 Nov*	*2 Sep*	*28 Oct*	*24 Aug*	*19 Oct*
Okrun	34	44	35	14	9	6
SW Runner	56	80	56	56	39	38
Tamrun 96	10	55	25	40	11	26
Georgia Green	18	6	23	9	23	18
Tamrun OL 01	10	61	48	25	20	33
Tamrun OL 02	8	36	36	16	3	16
UF 00627	49	65	50	59	6	10
TX972505	28	49	34	31	7	38
TX976882	9	60	24	15	3	13
TX994313	19	69	31	26	6	22
TX994374	19	3	28	5	8	6
TX994392	14	11	33	15	12	18
PR > F	0.0062	0.0073	<0.0001	<0.0001	0.0009	0.0015
LSD 0.05	26	43	15	14	15	17

Table 4. Comparison of peanut seed quality factors in the advanced runner peanut breeding lines, 2004.

	Average percent								100 Seeds
Breeding line	*> 21/64*[1]	*>18/64*	*>16/64*	*OK*[1]	*DK*[1]	*Hulls*	*TSMK*[1]	*Seeds/oz*	*wt (g)*
Okrun									
Grady Co	26	46	5	2	1	19	79	41.5	58.5
Caddo Co (HD)[1]	30	32	5	4	5	21	70	41.0	57.0
Caddo Co (LD)[1]	35	35	4	3	1	20	76	40.0	59.0
Beckham Co	34	36	3	1	0	20	79	40.0	62.5
SW Runner									
Grady Co	20	43	10	3	0	22	75	48.0	48.0
Caddo Co (HD)	23	39	7	3	3	23	71	45.5	50.5
Caddo Co (LD)	22	42	7	3	1	23	72	43.5	52.5
Beckham Co	27	42	5	1	0	20	79	45.0	52.0
Tamrun 96									
Grady Co	29	43	3	1	1	22	76	42.5	58.0
Caddo Co (HD)	34	28	3	4	6	24	66	40.0	59.0
Caddo Co (LD)	34	28	4	4	4	23	69	39.5	60.5
Beckham Co	34	31	3	1	1	22	76	40.5	61.0
Georgia Green									
Grady Co	13	49	12	3	0	20	76	43.5	52.0
Caddo Co (HD)	27	34	6	4	4	22	70	42.0	53.5
Caddo Co (LD)	24	44	5	3	2	20	75	42.0	55.0
Beckham Co	25	43	3	1	0	21	78	41.5	58.5
Tamrun OL 01									
Grady Co	38	33	3	2	1	22	75	35.0	69.0
Caddo Co (HD)	33	19	4	4	13	25	57	35.0	66.0
Caddo Co (LD)	43	25	3	2	4	22	72	34.0	71.5
Beckham Co	46	22	2	1	1	21	77	34.5	73.0
Tamrun OL 02									
Grady Co	20	49	5	2	1	22	75	38.0	60.5
Caddo Co (HD)	21	31	7	6	6	26	61	38.5	57.0
Caddo Co (LD)	23	37	6	3	5	24	68	38.0	60.5
Beckham Co	26	39	4	1	0	22	77	38.5	62.0
UF 00627									
Grady Co	8	41	19	6	4	20	70	46.5	52.5
Caddo Co (HD)	14	41	13	5	4	21	69	42.0	53.0
Caddo Co (LD)	13	39	13	6	3	22	68	42.0	54.0
Beckham Co	12	44	10	3	2	21	75	43.0	55.5
TX972505									
Grady Co	14	49	9	2	1	20	76	43.5	56.0
Caddo Co (HD)	19	38	6	6	6	23	66	42.0	56.0
Caddo Co (LD)	25	37	6	4	3	22	71	39.0	59.5
Beckham Co	25	44	4	1	1	21	78	41.0	59.5
TX976882									
Grady Co	29	40	5	2	2	21	76	37.0	65.5
Caddo Co (HD)	42	23	3	3	3	23	70	37.0	65.5
Caddo Co (LD)	48	24	2	1	2	21	76	34.5	71.5
Beckham Co	40	27	2	1	1	21	76	37.0	67.0
TX994313									
Grady Co	32	40	5	2	1	19	78	38.0	62.5
Caddo Co (HD)	39	23	4	5	5	22	69	37.5	63.0
Caddo Co (LD)	44	27	3	3	2	20	76	37.5	65.0
Beckham Co	38	31	4	1	1	20	79	38.0	64.5
TX994374									
Grady Co	50	21	1	1	2	24	73	37.5	68.5
Caddo Co (HD)	43	16	2	3	9	26	62	36.5	66.5
Caddo Co (LD)	51	17	2	1	4	24	71	36.5	68.5
Beckham Co	46	21	2	1	1	22	76	36.0	69.0
TX994392									
Grady Co	21	48	5	2	2	21	76	40.5	58.5
Caddo Co (HD)	28	28	7	6	5	23	65	39.0	58.5
Caddo Co (LD)	37	32	3	3	2	21	74	37.5	64.5
Beckham Co	28	36	4	1	1	21	77	40.0	59.5

[1] HD = high disease; LD = low disease; 21/64 = screen size; OK = other kernels; DK = damaged kernels; TSMK = total sound mature kernels plus sound splits (grade).

Table 5. Comparison of percent stand-establishment in the advanced runner peanut breeding lines – Caddo Research Station and Bryan County[1], 2004.

Breeding line	*Caddo LD[2] 7 Jun*	*Bryan 2 Jun*
Okrun	62	60
SW Runner	59	59
Tamrun 96	61	58
Georgia Green	62	54
Tamrun OL 01	45	34
Tamrun OL 02	34	22
UF 00627	60	59
TX972505	61	60
TX976882	56	54
TX994313	52	42
TX994374	41	31
TX994392	45	35
PR > F	<0.0001	<0.0001
LSD 0.05	5	7

[1] Plots in Bryan County were located at the Weger Farm in Liberty Bottom, Oklahoma.
[2] LD = low disease.

Performance of the Advanced Spanish Breeding Lines in 2004

The Spanish cultivar trials were planted at Erick (Beckham County) and at two locations at the Caddo Research Station (Caddo County). One of the locations at the Caddo Research Station was located in an area with a high level of *Sclerotinia minor* incidence, and the other location was in an area with a lower level of *S. minor* incidence. Early leaf spot was the prominent disease on peanuts at the trials in Beckham County. Two fungicide applications were applied after early leaf spot disease onset in Beckham County. Early leaf spot was controlled at the Caddo Research Station by four timely fungicide applications. Southern blight and the other peanut diseases did not develop at the Beckham County location.

The planting date for Beckham County was 12 May and Caddo County was 13 May. In Beckham County the Spanish type peanuts were harvested on 25 Oct (166

Table 6. Comparison of yields on the advanced Spanish peanut breeding lines at three locations in Oklahoma, 2004

Breeding line	*Caddo high disease[1]*	*Caddo low disease[1]*	*Beckham[2]*	*Average*
Spanco	3183 (3)	4773 (1)	2841 (4)	3599 (2.7)
Tamspan 90	3485 (2)	4547 (3)	3022 (2)	3685 (2.3)
Pronto	2432 (5)	3658 (6)	2223 (6)	2771 (5.7)
Olin	3001 (4)	4147 (5)	2886 (3)	3345 (4.0)
TX996612	2299 (6)	4347 (4)	2686 (5)	3111 (5.0)
TX996784	3497 (1)	4738 (2)	3249 (1)	3828 (1.3)
Pr > F	0.0002	0.0007	0.0021	
LSD 0.05	489	444	410	

[1] Plots at Caddo County were located at the Caddo Research Station in an area of high Sclerotinia blight pressure and at another area with a low pressure for Sclerotinia blight.
[2] Beckham County plots were located at the Gale Thompson farm near Erick, Oklahoma.

days after planting). In Caddo County peanuts were harvested on 27 Sep (137 days after planting).

The Spanish trial planted in the low disease area at the Caddo Research Station had excellent yields that ranged from 3700-4800 lbs/a. The advanced Spanish breeding line, TX996784 had the highest overall yield, and its grade was similar to Spanco and Tamspan 90, which is a Sclerotinia blight resistance cultivar. There were no differences in early leaf spot severity among the Spanish entries evaluated. Pronto is an old cultivar that was brought back to be sold as a commercial cultivar. Pronto had the best overall grade and a low percent incidence of Sclerotinia blight similar to Tamspan 90, but had low yields. This could be due to the poor stand establishment that occurred in plots planted to Pronto and TX996612. **Data collected from the 2004 the Spanish Breeding Line Trials are shown in Tables 6-10.**

Table 8. Comparison of percent incidence of early leaf spot and percent defoliation caused by early leaf spot between the advanced Spanish peanut breeding lines – Beckham County, 2004.

Breeding line	*Percent leaf spot 2 Sep*	*Percent defoliation 28 Oct*
Spanco	79	81
Tamspan 90	78	79
Pronto	79	76
Olin	66	54
TX996612	73	63
TX996784	73	63
PR > F	0.7303	0.0703
LSD 0.05	NS[1]	NS

[1] NS = Differences in breeding lines not significant.

Table 7. Comparison of percent incidence of Sclerotinia blight among the advanced Spanish peanut breeding lines – Caddo Research Station, 2004.

	Percent Sclerotinia blight[1]					
	High disease area[2]			*Low disease area[2]*		
Breeding line	*19 Aug*	*31 Aug*	*14 Sep*	*19 Aug*	*31 Aug*	*14 Sep*
Spanco	15	25	28	3	6	6
Tamspan 90	5	10	15	3	4	6
Pronto	4	7	12	3	4	5
Olin	15	34	38	8	8	11
TX996612	7	9	11	4	4	4
TX996784	4	7	8	3	4	5
PR > F	0.018	<0.0001	0.0003	0.0234	0.2032	0.0140
LSD 0.05	8	10	12	3	NS[3]	4

[1] Percent Sclerotinia blight was determined by dividing the number of infection loci by the number of potential infection loci and multiplying by 100. An infection locus is defined as an area of disease symptoms equal to 6 inches in length in a standard row.

[2] Plots were located at the Caddo Research Station in an area with high Sclerotinia blight pressure and at another area with a low pressure for Sclerotinia blight. An application of Omega® followed by an application of Endura® was made to the peanuts growing at the location with the low level of *S. minor* incidence to reduce the severity of Sclerotinia blight.

[3] NS = Differences in breeding lines not significant.

Table 9. Comparison of peanut seed quality factors between the advanced Spanish peanut breeding lines, 2004.

	Average percent								
Breeding line	*> 19/64*[1]	*>17/64*	*>15/64*	*OK*[1]	*DK*[1]	*Hulls*	*TSMK*[1]	*Number Seeds/oz*	*100 Seeds wt (g)*
Spanco									
Caddo Co (HD)[1]	32	27	7	3	2	24	70	53.5	45.5
Caddo Co (LD)[1]	32	29	12	6	1	25	69	54.0	42.0
Beckham Co	38	24	3	1	0	22	76	48.0	51.5
Tamspan 90									
Caddo Co (HD)	36	24	8	3	2	24	70	56.0	43.5
Caddo Co (LD)	24	28	15	5	1	24	71	57.5	40.5
Beckham Co	43	24	4	1	1	22	76	50.5	50.0
Pronto									
Caddo Co (HD)	27	28	10	4	3	24	69	55.5	42.5
Caddo Co (LD)	26	29	13	4	1	23	73	52.0	43.0
Beckham Co	44	20	4	1	0	21	77	48.5	52.0
Olin									
Caddo Co (HD)	39	20	5	4	5	25	66	53.0	44.5
Caddo Co (LD)	39	22	6	4	1	23	71	54.0	44.0
Beckham Co	52	15	2	1	1	22	77	49.5	53.0
TX996612									
Caddo Co (HD)	37	23	5	2	2	28	67	57.0	43.5
Caddo Co (LD)	36	23	8	3	1	28	68	57.0	43.0
Beckham Co	41	23	4	1	1	25	74	52.0	47.5
TX996784									
Caddo Co (HD)	39	22	5	2	5	25	67	54.0	46.5
Caddo Co (LD)	39	24	7	2	1	25	72	52.0	47.5
Beckham Co	41	27	3	1	0	23	76	50.5	52.0

[1] HD = high disease; LD = low disease; 19/64 = screen size; OK = other kernels; DK = damaged kernels; TSMK = total sound mature kernels plus sound splits (grade).

Performance of Peanut Germplasm in 2004

The peanut germplasm trial was planted in the high Sclerotinia blight disease area at the Caddo Research Station near Ft. Cobb, Oklahoma. These plots were treated similarly as previously described for the Spanish Advance Breeding Lines Trial. All of the germplasm entries had a Sclerotinia blight incidence numerically or statistically less than the resistant runner cultivar, Southwest Runner. The germplasm entries R-88, R-93, and R-189, had the lowest incidence of Sclerotinia blight but also the lowest yields in the trials in 2003 and 2004. Southwest Runner had the

Table 10. Comparison of percent stand establishment on the advanced Spanish peanut breeding lines – Caddo Research Station, 2004.

Breeding line	*Percent stand establishment 7 Jun*
Spanco	58
Tamspan 90	60
Pronto	33
Olin	59
TX996612	34
TX996784	60
PR > F	<0.0001
LSD 0.05	4

Table 11. Comparison of Sclerotinia blight on several valencia and Spanish breeding lines – Caddo Research Station, Ft. Cobb, Oklahoma, 2004.

	Percent Sclerotinia blight[1]			
Entry	*19 Aug*	*31 Aug*	*14 Sep*	*Yield lbs/acre*
R-88	3	8	12	2360 (15)[2]
R-93	3	6	8	2081 (18)
R-98	8	15	18	2674 (9)
R-101	8	17	18	2590 (10)
R-116	14	28	26	2263 (16)
R-124	15	20	20	2481 (13)
R-137	8	15	17	2444 (14)
R-140	16	27	30	2880 (5)
R-152	13	18	19	2687 (7)
R-179	13	18	20	2686 (8)
R-189	7	11	13	2021 (20)
R-213	6	10	13	2952 (4)
R-228	8	14	18	2505 (12)
R-268	5	5	8	2529 (11)
Okrun	54	79	83	2831 (6)
SW Runner	10	18	23	3872 (1)
Valencia A	4	10	18	2142 (17)
TX994374	25	51	48	3049 (3)
Valencia C	4	9	9	2033 (19)
TX994392	40	59	59	3110 (2)
Pr > F	0.0001	0.0001	0.0001	0.0001
LSD 0.05	11	12	11	324

[1] Percent Sclerotinia blight was determined by dividing the number of infection loci by the number of potential infection loci and multiplying by 100. An infection locus is defined as an area of disease symptoms equal to or less than 6 inches in a standard row.
[2] Number in parenthesis indicates rank in that column.

highest yield of 3900 lbs/a, statistically greater than all the entries, including the runner peanut type entries of Okrun, TX994392, and TX994374. The best yield from a germplasm entry was 1000 lbs/a less than Southwest Runner in 2004, and 700 lbs/a less in 2003. In 2003 and 2004 the best yields from germplasm entries were R-140, R-152, R-179, and R-213. The cultivars Valencia A and Valencia C were resistant to Sclerotinia blight, but had yields of approximately a ton per acre and ranked near the bottom of the study. Grades of the entries in this study were in the high 50s to low 60s; except for the cultivars Southwest Runner (70), Okrun (68), and the germplasm entry of R-213 (70). In 2003, R-213 had the greatest grade in a study that included various runner cultivars and breeding lines. **Data collected from the 2004 the germoplasm trials are shown in Tables 11 and 12.**

Table 12. Comparison of peanut seed quality factors of the valencia type genotypes – Caddo Research Station, Ft. Cobb, Oklahoma, 2004.

	Average percent								100
Breeding line	*> 19/64*[1]	*>17/64*	*>15/64*	*OK*[1]	*DK*[1]	*Hulls*	*TSMK*[1]	*Seeds/oz*	*Seeds wt (g)*
R-88	39	17	6	3	4	30	63	55.5	44.5
R-93	47	7	3	2	8	32	58	43.5	48.0
R-98	39	15	4	2	5	32	60	53.5	46.0
R-101	33	21	5	3	1	35	60	49.5	50.0
R-116	46	13	3	3	4	30	64	52.5	48.0
R-124	28	25	10	4	0	33	63	54.5	44.0
R-137	29	24	7	4	1	34	60	51.0	46.0
R-140	32	22	6	3	1	34	61	51.0	48.0
R-152	39	17	4	2	1	36	60	46.0	55.0
R-179	35	19	5	4	1	36	59	50.0	50.5
R-189	52	6	2	1	9	30	60	41.0	62.5
R-213	48	16	4	2	1	27	70	52.0	49.0
R-228	37	19	4	3	4	30	63	55.0	45.0
R-268	41	15	7	3	4	29	64	55.0	45.5
Okrun	21	36	7	6	3	23	68	43.5	53.0
SW Runner	20	37	10	5	1	24	70	48.5	47.5
Valencia A	27	26	9	4	9	25	63	54.5	43.5
TX994374	32	22	4	4	7	29	60	39.5	58.5
Valencia C	28	25	11	3	7	26	63	57.0	42.0
TX994392	16	38	10	6	3	25	65	42.0	54.5

[1] 19/64 = screen size; OK = other kernels; DK = damaged kernels; TSMK = total sound mature kernels plus sound splits (grade).

Research on Peanut Disease Resistance to Soilborne Pathogens in Oklahoma

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2004 progress made possible through OPC and NPB support

- Production of Endo-polygalacturonase (Endo-PG) by the Southern blight fungus is inductive; i.e. its production is stimulated by the presence of a suitable carbon source.
- Activity of Endo-PG was highest in a medium containing sodium polypectate as a carbon source.
- Endo-PG production was greater by the peanut isolate of the Southern blight fungus than that of the wheat isolate.
- The peanut isolate of the Southern blight fungus caused considerable damage to both peanuts and wheat.
- The wheat isolate was mildly pathogenic on wheat and non-pathogenic on peanuts.

Background

Soilborne diseases limit yield and increase peanut production cost to Oklahoma growers. Southern blight, caused by the fungus *Sclerotium sclerotiorum*, is economically important in the peanut producing areas throughout the United States. Also, this fungus attacks wheat under greenhouse conditions. The Southern blight fungus produces cell wall degrading enzymes (pectolytic and polygalacturonases) in infected plants and culture media. The cell wall degrading enzymes cause plant tissue maceration and breakdown.

Research in 2004 focused on determining the production and activity of polygalacturonase by various isolates of the Southern blight fungus obtained from diseased peanuts and wheat. This research is designed to provide an understanding of the mechanisms of pathogenesis of *Sclerotium rolfsii*. This investigation is a part of the thesis research of Oklahoma State University doctoral student, Vijay Choppakatla. Dr. Robert Hunger, Department of Entomology and Plant Pathology, is a co-advisor to Choppakatla.

Research Description and Progress in 2004

Production of Endo-polygalacturonase (Endo-PG) can be critical for the infection process by *S. rolfsii*. Endo-PG activity can be determined in vitro by growing the fungus on a basal medium that is fortified with a good inducer of the enzyme. Sodium polypectate is the most commonly used inducer for Endo-PG production, but the use of plant materials as inducers is not well known. Also, the activity of Endo-PG produced by different sclerotium isolates can vary, which in turn determines the pathogenicity of that particular isolate. Hence, studies were initiated with the following objectives:

1. To determine the efficacy of using plant material as an inducer for Endo-PG production in culture.
2. To study the production of Endo-PG by isolates of *S. rolfsii* in culture and its significance in pathogenesis.

In Objective 1: Two isolates of *S. rolfsii* were used in this study: isolate Melouk obtained from peanut; and isolate Wheat obtained from winter wheat (courtesy of Dr. Hunger). Enzyme activity was determined in a liquid basal medium supplemented by the inducers listed in Table 1.

Control included cultures that consisted of a basal medium without any inducer. Media were inoculated with mycelial plugs and incubated on a rotary shaker at room temperature. Culture filtrates were collected seven days after inoculation by filtration through a glass microfibre filter.

Endo-PG activity in the culture filtrate was determined by a viscosity reduction method, using a 300 Cannon-Fenske type viscometer, and a 2 percent sodium polypectate in 0.05 M citrate buffer (pH 4.5) as a substrate. Each treatment (isolate x inducer) had two replications and an enzyme assay was conducted on three samples collected from each replication.

Relative activity of the enzyme was expressed as the reciprocal value of incubation time (min) required to reduce the initial viscosity of the reaction mixture at 30° C by 50 percent and multiplied by 100 (i.e. 1/t x 100).

In Objective 2: Production of Endo-PG by *S. rolfsii* isolates (Melouk and Wheat) was studied over a seven-day period in a culture using a liquid basal medium supplemented with 0.5 percent sodium polypectate. Enzyme activity of the culture filtrate was determined on 3, 5, and 7 days after inoculation by a viscosity reduction method previously described in Objective 1.

Results of Objective 1: Data from Table 2 suggests that production of Endo-PG from *S. rolfsii* is inductive; i.e., its production is stimulated by presence of some material that has a suitable carbon source, as seen by the control that has zero activity of the enzyme. Endo-PG activity was detected in very small amounts in filtrates of glucose medium (potato dextrose broth) as expected. Glucose is a readily available source for carbon. Enzyme activity was exceedingly higher in preparations from sodium polypectate (NaPP) than in preparations from other materials (Table 2). Enzyme activity was surprisingly higher in cultures supplemented with fresh plant material compared to dried plant material. Two percent of dried plant material was presumed to have more amounts of pectic substances that can stimulate high enzyme production. Except for NaPP, no significant differences in enzyme activity were observed between the two isolates in presence of other materials. Hence, these

Table 1. Materials used as inducers for Endo-PG production.

Inducer	*Amount (% w/v)*[1]
Control (No inducer)	0.0
Potato dextrose broth (PDB)	0.5
Sodium polypectate (NaPP)	0.5
Fresh peanut stems (FP)	2.0
Fresh wheat pseudo stems (FW)	2.0
Oven dried, ground peanut stems (ODP)	2.0
Oven dried, ground wheat stems (ODW)	2.0
Freeze dried, ground peanut stems (FDP)	2.0
Freeze dried, ground wheat psuedo-stems (FDW)	2.0

[1] w/v = weight by volume

Table 2. Relative activity of Endo-PG produced by *S. rolfsii* in culture supplemented with different inducers.

	Relative activity of Endo-PG	
Inducer	*Melouk*	*Wheat*
Control	0.0	0.0
PDB	4.9	5.0
NaPP	70.0	41.8
FP	31.1	29.6
FW	21.9	21.8
ODP	15.3	15.2
ODW	10.6	14.6
FDP	12.3	22.1
FDP	11.8	15.7

results suggest that the activity of Endo-PG in culture varies with the type of material used for its induction.

Results of Objective 2: Preliminary experiments with Endo-PG suggested that activity of the enzyme remained unchanged in culture ages older than seven days; therefore, studies were restricted to a seven-day period. Endo-PG activity found in cultures of *S. rolfsii* as determined by viscosity reduction assay, is shown in Table 3. A progressive increase in the enzyme activity was observed for both the isolates when compared to the control. Endo-PG production differed greatly between the two isolates of *S. rolfsii*. Isolate Melouk consistently showed high Endo-PG activities starting from day three when compared to the isolate Wheat. The difference in activities between the two isolates was narrowed with increasing culture age. When pathogenicity tests were conducted on several peanut and wheat cultivars, isolate Melouk caused considerable damage to both peanuts and wheat. In contrast, isolate Wheat was non-pathogenic on both these crops (data not presented). When the activity of Endo-PG of these two isolates was correlated with their corresponding disease severity readings on peanuts and wheat, high correlation coefficients were found (Table 4). Previous studies with the production of oxalic acid (OA) showed that although isolate Wheat was non-pathogenic, it produced higher levels of OA in vitro than other isolates that are considerably pathogenic. It was shown that OA is not the sole factor that determines the pathogenicity. Results from the study (Objective 2) suggest that Endo-PG activity could be a crucial factor in determining the pathogenicity of these two isolates, Melouk and Wheat.

Table 3. Endo-PG activities produced by *S. rolfsii* in culture.

Culture	*Relative activity of Endo-PG*		
age	*Control*	*Melouk*	*Wheat*
3	0.0	17.5	2.2
5	0.0	48.8	25.6
7	0.0	75.7	45.8

Research is currently underway to validate the results from the viscosity reduction assay using a spectrophotometric method. This assayer is based on hydrolytic release of reducing groups from the sodium polypectate in the enzyme-sodium polypectate reaction mixture and spectrophotometrically quantifying the reducing carbohydrate in the reaction mixture using 2-cyanoacetamide procedure.

Table 4. Correlation coefficients of Endo-PG activity of isolates of *S. rolfsii* in culture with their corresponding disease severity on peanuts and winter wheat.

Factor	*Disease severity on peanuts*	*Disease severity on winter wheat*
Relative activity of Endo-PG (Melouk)	0.88	0.99
Relative activity of Endo-PG (Wheat)	-	0.98

Field Studies for Control of Peanut Diseases

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2004 progress made possible through OPC and NPB support

- Unlike previous years, fungicide programs for Sclerotinia blight with Endura® and Omega® increased yields of Tamrun 96, Tamrun OL 01, and Georgia Green sufficiently to offset fungicide costs.
- The Sclerotinia blight resistance of entries selected from the USDA-ARS Core Collection of peanut germplasm was verified by the lack of a yield response to high rates of the fungicide Omega®.
- Core collection entries 103, 128, and 562 had yielded greater than 3000 lbs/a in a problem field without fungicide for control of Sclerotinia blight.
- The experimental fungicides JAU 6476 and USF 2010 provided good control of early leaf spot. The addition of a surfactant to USF 2010, which is slated to replace Stratego®, improved its performance.
- Reduced fungicide programs consisting of three to four applications timed according to the calendar or the Early Leaf Spot Advisory Program were as effective as full-season programs for control of early leaf spot at several locations.

Seven field trials were completed in 2004 that addressed the management of important peanut diseases in Oklahoma. The management strategies that were evaluated included chemical control, disease-resistant varieties, and biological control. Efforts were made to develop and demonstrate a range of input levels for the fungicide programs. The diseases studied included early leaf spot, web blotch, Southern blight, Sclerotinia blight, and limb rot. Cooperation in these studies was provided by Dr. Hassan Melouk and Ken Jackson, USDA-ARS in Stillwater; and Jerald Nickels and Bruce Greenhagen, Department of Plant and Soil Sciences. Appreciation is expressed to Gale Thompson (Beckham County) and Allan Gant (Tillman County) who provided time and resources as on-farm cooperators for the trials at Erick and Davidson, respectively. Bobby Weidenmaier, Jerry Howell, and Mike Brantes at the Caddo Research Station; and Rocky Walker and Brian Heid at the Plant Pathology Farm in Stillwater also are acknowledged for their valuable support and cooperation that made the trials at the research stations a success.

The field studies in 2004 served several purposes. The first was to identify and refine better strategies for managing diseases. The second was to use the trial sites as demonstrations to show growers firsthand the benefits of disease management in peanut production. Trial sites at the Caddo Research Station and Beckham County were showcased during annual fall field tours. Results from 2004 are summarized in this report. In interpreting the results, small differences in treatment values should not be overemphasized. Least significant difference (LSD) values are shown at the bottom of most tables. Unless two values differ by at least the LSD value shown, little confidence can be placed in the superiority of one treatment or variety over another.

In 2004, weather was generally favorable for the development of the crop and diseases. Warm temperatures and dry conditions in May favored rapid stand establishment. Rainfall levels were generally good and temperatures were below normal from June through August. Extended periods of cloudy weather with light rains occurred in June and July. As a result, diseases got started early in the season. Leaf spot became a problem in June and Sclerotinia blight became a problem by mid-July. Dry weather during September limited late-season disease development. Yield losses from Sclerotinia blight and leaf spot occurred in most trials in which these diseases were targeted. However, the below-normal temperatures during mid-season apparently limited the development of Southern blight, which was not a problem for growers in 2004. Rains during October and November made the harvest season difficult, but all trials were taken to yield. Yields and grades were high at most locations.

Sclerotinia Blight

Sclerotinia blight remains a destructive disease in Oklahoma. It occurs in all areas of the state except in far southwestern production areas. Trials on management of Sclerotinia blight were conducted at the Caddo Research Station. The trials were focused on evaluating variety response to fungicide programs and identifying new sources of resistance, which may be useful in breeding programs for variety improvement.

Variety response to fungicide programs: Two fungicides are now registered for use on peanuts that are highly effective in the control of Sclerotinia blight. However, the high cost of both Omega® and Endura® has limited their usage. Previous research has shown that the value of a typical yield response to Omega® exceeds the cost of the fungicide program for the susceptible variety Okrun, but not for the resistant variety Tamspan 90. The objective of this study was to evaluate fungicide programs on popular runner cultivars that often show moderate resistance to Sclerotinia blight. The cultivars were treated with low, moderate, and high levels of fungicide input.

Fungicide programs consisted of 1, 2, and 3 applications of Endura®; a single application of Omega® at 1.5 and 2 pts/a; two applications of Omega® at 1 and 1.5 pts/a; and one application of Endura® followed by an application of Omega®. Fungicide programs were applied to Georgia Green, Tamrun 96, and Tamrun OL 01.

Sclerotinia blight was present in the field at the time of the first application. Pressure from Sclerotinia blight occurred relatively early in the season compared to previous trials at this site. However, infection levels only reached 50-60 percent in untreated plots at harvest (Table 1). The varieties responded similarly to fungicide programs for both disease control and yield. All fungicide programs reduced levels of Sclerotinia blight compared to the untreated check plots. The single application of Omega® at 2 pts/a provided the best disease control. Generally, the Omega® programs provided better disease control than the Endura® programs, although differences were not always statistically significant. In previous trials, Endura® performed better when it was applied before the first appearance of disease. Differences among varieties were small, but Tamrun OL 01 had more disease than either Georgia Green or Tamrun 96.

Yields were high in this trial and exceeded 3000 lbs/a in untreated check plots (Table 1). All fungicide programs increased yields compared to the check plots. Yield increases ranged from 821 lbs/a for the Endura®/Omega® program to 1500 lbs/a for Omega® at 1 pt/a applied twice. Averaged over treatments, yields of both Tamrun OL 01 and Tamrun 96 were greater than for

Table 1. Control of Sclerotinia blight on runner peanut varieties with fungicide programs – Caddo Research Station, 2004.

Treatment and rate/a (timing)[1]	*Tamrun 96*	*Tamrun OL 01*	*Georgia Green*	*Mean*[2]
		Sclerotinia blight (%)		
Omega® 4F 1.5 pts (1,3)	15.7	22.0	19.2	19.0 de[3]
Omega® 4F 1 pt (1,3)	28.2	35.0	24.5	29.2 bcd
Omega® 4F 1 pt (1,3)	27.0	27.7	23.2	26.0 bcde
Omega® 4F 1.5 pts (1)	20.0	23.5	20.0	21.2 cde
Omega® 4F 2 pts (1)	15.7	18.0	17.7	17.2 e
Endura® 70WG 9.1 oz (1,2)	35.0	34.7	32.7	34.2 b
Endura® 70WG 9.1 oz (1,2,3)	29.5	32.5	28.2	30.1 bcd
Endura® 70WG 9.1 oz (1)	33.7	38.2	37.7	36.6 b
Endura® 70WG 9.1 oz (1)				
Omega® 4F 1 pt (3)	29.2	33.2	31.7	31.4 bc
Check	49.2	58.2	52.7	53.4 a
Mean[4]	28.3 b[5]	32.3 a	28.8 b	
		Yield (lbs/a)		
Omega® 4F 1.5 pts (1,3)	4581	4588	4081	4416 b
Omega® 4F 1 pt (1,3)	4828	4755	4066	4550 b
Omega® 4F 1 pt (1,3)	4959	5525	4596	5026 a
Omega® 4F 1.5 pts (1)	4733	5053	4298	4695 ab
Omega® 4F 2 pts (1)	4821	4777	4494	4697 ab
Endura® 70WG 9.1 oz (1,2)	4654	4755	4022	4475 b
Endura® 70WG 9.1 oz (1,2,3)	4654	4748	4189	4622 ab
Endura® 70WG 9.1 oz (1)	4254	5024	4167	4337 b
Endura® 70WG 9.1 oz (1)				
Omega® 4F 1 pt (3)	4581	4588	3928	4390 b
Check	3507	3659	3383	3516 c
Mean	4557 a	4738 a	4122 b	
		Crop value ($/a)[6]		
Omega® 4F 1.5 pts (1,3)	807	824	763	798 ab
Omega® 4F 1 pt (1,3)	850	854	760	821 ab
Omega® 4F 1 pt (1,3)	873	992	859	908 a
Omega® 4F 1.5 pts (1)	833	907	803	848 ab
Omega® 4F 2 pts (1)	849	858	840	849 ab
Endura® 70WG 9.1 oz (1,2)	819	853	752	808 ab
Endura® 70WG 9.1 oz (1,2,3)	819	902	783	835 ab
Endura® 70WG 9.1 oz (1)	749	824	779	784 b
Endura® 70WG 9.1 oz (1)				
Omega® 4F 1 pt (3)	807	837	734	793 ab
Check	617	657	632	636 c
Mean	802 b	851 a	770 c	

1 Numbers (1-3) correspond to the application dates of 1=29 Jul, 2=17 Aug, and 3=30 Aug.
2 Treatment average.
3 Values in a column followed by the same letter are not statistically different at P=0.05 according to Fisher's Least Significant Difference Test.
4 Variety average.
5 Values in a row followed by the same letter are not statistically different at P=0.05 according to Fisher's Least Significant Difference Test.
6 Loan rate value based a grade of 71 for Tamrun 96, 73 for Tamrun OL 01, and 76 for Georgia Green.

Georgia Green. Crop value per acre was also increased for all treatments compared to check plots, and was highest for the variety Tamrun OL 01. Fungicide costs of $45/pt for Omega® and $6/oz for Endura® were used to calculate partial economic returns (crop value minus chemical costs) for each treatment. Partial economic returns exceed the untreated check for each fungicide program. The highest economic return ($213/a) was for the single application of Omega® at 2 pts/a.

Results for this trial were different compared to those reported in recent years. Despite the early appearance of disease and the favorable weather for rapid disease increase during mid-season, yields for the untreated check plots were good. Georgia Green also performed better relative to Tamrun 96 than in previous trials. Yield responses to fungicide programs for Tamrun 96 have been breakeven in previous trials. Better disease control with Endura® may have been achieved had the first application of this fungicide been applied preventively, before the first appearance of disease.

New sources of resistance to Sclerotinia blight: In the hope of identifying new sources of resistance to Sclerotinia blight, the core collection, a subset of the USDA peanut germplasm collection comprised of 745 entries, was obtained from Corley Holbrook, USDA-ARS at Tifton, Georgia. In 2001, the entries were planted in two-row, non-replicated plots at the Caddo Research Station in a field with a history of Sclerotinia blight. From that initial screening, 60-72 promising entries were evaluated in replicated plots from 2002 and 2003. Ten entries with the best combinations of resistance and plant characteristics were selected for further testing in 2004 (Table 2). The objective of this study was to verify

Table 2. Plant characteristics and disease reactions (2001-2003) of selected entries from the core collection and reference varieties evaluated in 2004.

Entry	*Maturity (1-6)*[1]	*Plant type (1-6)*[2]	*Sclerotinia blight*	*Pepper spot*	*Web blotch*
92	3	5	R[3]	R	R
103	4	5	R	R	R
128	3	4	MR	R	R
184	2	5	R	S	MR
208	3	3	MR	R	MR
273	3	4	R	MR	S
426	2	5	R	S	MR
562	2	5	R	S	MR
582	3	3	MR	R	MR
804	3	4	R	R	R
Okrun	4	2	S	R	R
Southwest Runner	4	2	R	S	S
Tamspan 90	2	5	R	S	S
Tamrun 96	4	2	MS	R	S
Georgia Green	4	2	S	MR	MR
Tamrun OL 01	4	2	MS	?[4]	MR
Tamrun OL 02	4	2	MS	?	MR

[1] 1=early, 5=late
[2] 1=very flat, 6=very erect
[3] R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.
[4] ?=unknown

the resistance of these entries using the fungicide Omega® as a tool for measuring yield loss to Sclerotinia blight. Entries and reference varieties were grown in four-row replicated plots at the Caddo Research Station. Within each plot, two rows received two applications of the fungicide Omega® at 1.5 pts/a while the other two rows were left untreated.

Sclerotinia blight reached moderately severe levels in this trial. The fungicide Omega® reduced Sclerotinia blight compared to the untreated check plots for all of the reference cultivars except Tamspan 90 and Southwest Runner (Table 3). Omega® provided excellent disease control on the reference varieties. For the core entries, Omega® reduced levels of the disease for only two of the entries (128 and 804). Entries 103, 184, 273, 426, and 562 showed good resistance (<5 percent disease). Omega® increased yields of all reference cultivars except Tamspan 90 and Southwest Runner. Yield responses ranged from 1403 lbs/a for Georgia Green to 2142 lbs/a for Okrun. Omega® did not increase yields of any of the core entries except for 804, and its yield response was only 230 lbs/a. Yields for entries 103, 128, and 562 exceeded 3000 lbs/a in untreated plots.

The fungicide Omega® was used at maximum rate as a tool to measure yield loss due to Sclerotinia blight in core entries selected for resistance to this disease. The resistance to Sclerotinia blight in the core entries was verified by the lack of a statistically significant yield response for all but one of the entries. In comparison, yield

Table 3. Disease and yield responses of selected entries from the core collection and reference varieties to Omega®.

Entry	*Sclerotinia blight (%)*		*Yield (lbs/a)*		*Grade (%TSMK)*	
	Check[1]	*Omega®*[2]	*Check*	*Omega®*	*Check*	*Omega®*
92	12.1	4.6	2868	2952	71	70
103	3.3	5.4	3824	3811	70	72
128	16.7	3.3*[3]	3037	3436	70	73
184	0.8	0.4	2130	2263	66	69
208	18.3	2.9*	2686	2819	70	68
273	4.2	2.9	2759	2783	72	74
426	0.0	1.2	1561	2009	65	64
562	5.0	3.7	3098	3352	75	73
582	15.0	8.3	2238	2117	68	68
804	32.9	5.8*	2722	2952*	70	71
Okrun	59.2	8.3*	2541	4683*	73	76
Southwest Runner	12.5	6.2*	4150	4368	72	74
Georgia Green	48.3	2.9*	3001	4404*	75	75
Tamrun 96	50.8	7.5*	2880	4465*	73	76
Tamrun OL 01	45.0	17.5*	3545	5106*	76	78
Tamrun OL 02	59.6	8.7*	3279	5009*	73	75
Tamspan 90	4.2	4.2	3376	3630	75	74
LSD (P=0.05)[4]	11.5	5.9	471	417		

1 Sub-plots not treated with fungicide for Sclerotinia blight.
2 Sub-plots treated with Omega® at 1.5 pts/a on 29 Jul and 30 Aug.
3 (*) indicated a statistical difference between the untreated check plots and Omega® treatment.
4 Least significant difference.

responses to Omega® in most of the reference varieties were large. Tamspan 90 and Southwest Runner continued to show good resistance. Tamrun 96 had more disease and a greater yield response to Omega® than in previous trials.

Southern Blight and Limb Rot

Southern blight and limb rot are damaging soilborne diseases that occur statewide. A moderate level of resistance may be present in Tamspan 90 and Tamrun 96, but effective management relies on the use of fungicide. Fungicide programs are recommended in fields with a history of damage from Southern blight and/or limb rot. Folicur®, Abound®, and Moncut® have provided good to excellent control of these diseases. Headline® also is registered for use on Southern blight and limb rot. Control of Southern blight has not been comparable to the other products, and data on limb rot control with Headline® has not been developed. Except for Moncut®, which must be tank-mixed with another fungicide, these fungicides also are effective against foliar diseases. Research is needed to evaluate the effectiveness of reduced-input programs using these fungicides and new experimental fungicides for control of Southern blight and limb rot.

Evaluation of full-season and reduced fungicide programs: Full-season fungicide programs utilizing Folicur®, Abound®, Headline®, and JAU 6476 applied in sequence with Bravo® and totaling six applications were evaluated in Tillman County in a field with a history of Southern blight and limb rot. JAU 6476 is an experimental fungicide similar to Folicur® that was evaluated in a 4-spray block program with Bravo®. Reduced (4 applications) programs utilizing the same fungicides (Bravo®, Moncut®, Artisan®, and NAI-301) also were evaluated. The reduced sequence was achieved by eliminating the first and last application of Bravo® made for leaf spot. Artisan® is a pre-mixture of Moncut® and Tilt® while NAI-301 is an experimental pre-mixture of Moncut® and Bravo®.

Southern blight and limb rot did not develop at this location. Early leaf spot became established by early September in untreated check plots. All of the fungicide programs provided nearly complete foliar disease control through September. Harvest was delayed by rain until early November following a light frost. Defoliation from early leaf spot was evaluated at harvest when untreated check plots were 95 percent defoliated. All treatments provided good control of leaf spot by harvest. Full-season and reduced programs with Headline® had the lowest levels of defoliation (<10 percent). Yields and grade (77 percent TSMK) were high in this trial, but considerable variation in the field occurred and resulted in a large LSD value for yield. Yields for treatments ranged 4712-6650 lbs/a for the treatments compared to 4777 lbs/a for the untreated check plots. However, because of field variability, none of the treatments resulted in a statistically greater yield than the untreated check plots.

Foliar Diseases

Foliar diseases are widespread across all production areas of Oklahoma and can be damaging when severe. Where early leaf spot is not controlled, yield losses have averaged 500-700 lbs/a. However, losses exceeding 1000 lbs/a are possible in years when weather favors severe disease development and vines become completely defoliated. Foliar diseases can be effectively controlled where a full-season fungicide program that consists of 6 sprays/season is used. However, reduced fungicide programs that are effective and utilize fewer sprays per season are needed to reduce the costs of peanut production. The objective of this research on foliar diseases was to identify new chemistries for controlling foliar diseases and to develop effective reduced application programs.

Evaluation of full-season and reduced spray programs: Fungicide programs were evaluated for control of early leaf spot on Tamspan 90 at the Agronomy Research Station in Perkins, Oklahoma. New fungicides evaluated were JAU 6476 and USF 2010. JAU 6476 is similar to Folicur® and USF 2010 is slated to replace Stratego®. Full-season programs consisted of six applications made on 14-day intervals. A standard treatment of Bravo® was compared to treatments consisting of Abound®/Bravo®, Headline®/Bravo®, Folicur®/ Bravo®, Stratego®, JAU 6476/Bravo®, and USF 2010. Reduced fungicide programs were scheduled either by leaving out the first and last application of a Headline®/Tilt®-Bravo® alternation, or by alternating the same two fungicides when recommended by the Early Leaf Spot Advisory Program available at http://agweather.mesonet.org the Oklahoma Agweather Web site.

Pressure from early leaf spot was severe at this location. The disease became established during July and it was sometimes not possible to make timely applications because wet conditions prevented entry into the field during July and August. All spray programs reduced leaf spot compared to untreated check plots (Table 4). However, levels of leaf spot were unusually high for spray programs such as the full-season Bravo® program, that normally provides excellent leaf spot control. For the full-season programs, the Headline®/Bravo®, JAU 6476/Bravo®, and

Table 4. Comparison of full and reduced fungicide programs for control of early leaf spot on the variety Tamspan 90 – Agronomy Research Station, Perkins, Oklahoma, 2004.

Treatment and rate/a (timing)[1]	*Early leaf spot (%)*		*Defoliation (%)*	
	15 Sep	*30 Sep*	*30 Sep*	*Yield (lbs/a)*
Check plots	91.6 a[2]	95.8 a	84.2 a	2018 d
USF 2010 4.17F 3.5 fl oz (1-6)	73.3 b	72.1 bc	42.9 bcd	2280 bcd
Stratego® 2.08E 7 fl oz (1-6)	60.8 cd	69.6 bcde	38.3 cde	2664 a
USF2010 4.17F 3.5 fl oz + Induce® 0.125% (1-6)	56.7 d	60.8 de	28.3 e	2672 a
Bravo® Ultrex 82.5DF 1.4 lb (1-6)	67.5 bcd	70.8 bcd	45.4 bc	2149 cd
Bravo® Ultrex 82.5DF 1.4 lb (1,6) Folicur® 3.6F 7.2 fl oz (2-5)	72.1 bc	73.7 b	53.3 b	2352 abcd
Bravo® Ultrex 82.5DF 1.4 lb (1,6) JAU 6476 4F 5.7fl oz (2-5)	60.8 cd	63.3 bcde	30.4 de	2476 abc
Bravo® Ultrex 82.5DF 1.4 lb (1,3,5) Headline® 2.08E 6.0 fl oz (2,4,6)	58.3 d	59.6 e	32.1 de	2650 ab
Headline® 2.08E 9.0 fl oz (2,4) Tilt®-Bravo® 18 fl oz (3,5)	59.1 d	69.6 bcde	42.5 bcd	2635 ab
Headline® 2.08E 9.0 fl oz (A1, A3) Tilt®-Bravo® 18 fl oz (A2)	37.5 e	62.5 cde	14.2 f	2708 a
LSD (P=0.05)[3]	11.4	11.0	13.2	379

1 Application numbers (1-6) correspond to the application dates for the 14-day calendar program of 29 Jun, 14 Jul, 2 Aug, 16 Aug, 30 Aug, and 13 Sep. A1 to A3 correspond to the application dates for the Early Leaf Spot Advisory Program of 29 Jun, 26 Jul, and 12 Aug.
2 Values in a column followed by the same letter are not statistically different.
3 Least significant difference.

USF 2010/Induce® programs had lower levels of defoliation by the end of the season compared to Bravo® alone. The addition of the surfactant Induce® resulted in improved disease control for USF 2010. For the reduced spray programs, the Headline®/Tilt-Bravo® program applied according to the Early Leaf Spot Advisory Program provided better disease control than the reduced (4-spray) calendar program using the same fungicides.

Yields were low in this trial, and grade (66 percent TSMK) was lower than for any of the trials conducted in 2004. All of the fungicide programs except for the full-season USF 2010 and Bravo® programs increased yield compared to the untreated check plots (Table 4). Yield increases ranged from 400 lbs/a for the JAU 2476/Bravo® program to 700 lbs/a for the Early Leaf Spot Advisory Program. Resulting increases in crop value ranged from $60-$110/a over the untreated check plots. As a result of the modest increases in crop value, the reduced calendar program and the Early Leaf Spot Advisory Program were the most profitable spray programs.

Response of runner and Spanish varieties to full-season and reduced spray programs: The same spray programs evaluated at Perkins were tested at the Caddo Research Station. Fungicide programs were applied to Tamspan 90 and Tamrun OL 02. Sclerotinia blight was controlled on Tamrun OL 02 with Omega®. Foliar disease pressure was low at this location. On Tamspan 90, which only had 40 percent leaf spot in the untreated check plots, all of the fungicide programs provided excellent control of early leaf spot. Web blotch also developed at about 18 percent in check plots of Tamspan 90. All fungicide programs reduced web blotch to low levels except for the Folicur®/Bravo® program. Leaf spot development was even lower on Tamrun OL 02. Because of the low pressure from foliar diseases, yields did not differ among treatments. Yields of Tamspan 90 ranged from 3100-3500 lbs/a while yields of Tamrun OL 02 ranged from 4900-5600 lbs/a. Grades of 73 and 75 percent TSMK were achieved for Tamspan 90 and Tamrun OL 02, respectively.

Evaluation of reduced fungicide programs in the far southwestern production area: Peanuts in the newer production areas of southwestern Oklahoma have not experienced much pressure from soilborne diseases. Sclerotinia blight has not become established in Beckham, Greer, and Jackson counties. While Southern blight and limb rot have been observed, the use of fungicide programs in previous trials for these diseases has not resulted in significant yield responses. However, early leaf spot has been a problem in fields where peanuts are cropped continuously. In 2003, excellent control of early leaf spot followed a reduced calendar program consisting of three applications, made on 14-day intervals, beginning on 1 Aug. The objective of this study was to verify the effectiveness of the reduced calendar program in comparison with applications made when recommended by the Early Leaf Spot Advisory Program.

The trial was conducted in a field of Okrun peanuts near Erick, Oklahoma. Fungicide programs applied according to the reduced calendar and advisory programs consisted of Tilt®/Bravo® applied alone, or alternated with Headline®, and USF 2010 combined the surfactant Induce. An alternation of Folicur®/Induce® and Headline® was also evaluated on the advisory schedule. Folicur® was applied at a lower rate (4 fl oz) than normally used for foliar and soilborne disease control (7.2 fl oz). In addition, the new fungicides JAU 6476 and USF 2010, along with Stratego® were applied on the reduced calendar schedule. JAU 6476 and USF 2010 are new experimental fungicides. JAU 6476 is similar to Folicur® and USF 2010 is slated to replace Stratego®.

Early leaf spot developed, but was more severe in other trials at this location. Four applications were made according to the Early Leaf Spot Advisory Program, compared to the three made for the reduced calendar program. By the end of September, check plots that had 60 percent leaf spot were 25 percent defoliated. All of the fungicide programs reduced leaf spot and defoliation compared to the untreated check plots (Table 5). By harvest on 25 Oct, defoliation levels increased in the untreated check plots, but were less than 20 percent for all of the spray programs. Spray programs that included Headline® had the lowest defoliation levels. Yields and crop values were generally increased by the fungicide programs. Increases in crop values for the treatments were sufficient to offset the costs of the spray programs.

Seedling Diseases

Evaluation of fungicide seed treatments and in-furrow application of Abound® for stand establishment: Seedling disease is usually not a problem in peanut production because fungicide seed treatments such as Vitavax® PC and Tops® PC are applied to commercial seed and provide effective disease control and stand establishment. A trial was conducted at the Agronomy Research Station in Perkins, Oklahoma, on the variety Tamspan 90 in which the experimental seed treatment

Table 5. Effect of reduced fungicide programs on control of early leaf spot on the peanut cultivar Okrun – Erick, Oklahoma, 2004.

Treatment and rate/a (timing)[1]	*Early leaf spot (%) 28 Sep*	*Defoliation (%) 28 Sep*	*Defoliation (%) 25 Oct*	*Yield (lbs/a)*	*Crop value ($/a)*[3]
Tilt®/Bravo® 18 fl oz (A1-A4)	4.7 cde[2]	0.0 b	15.0 bc	4552 cd	840 cd
USF 2010 4.17F 3.5 fl oz + Induce® 0.125% (A1-A4)	6.1 cde	0.4 b	13.7 bc	4828 cd	890 cd
Tilt®/Bravo® 18 fl oz (A1, A3) Headline® 2.08E 9 fl oz (A2, A4)	2.6 de	0.0 b	7.1 bc	5743 a	1059 a
Folicur® 3.6F 4 fl oz + Induce® 0.125% (A1, A3) Headline® 2.08E 6 fl oz (A2, A4)	4.1 cde	0.0 b	5.8 c	5104 bc	941 bc
Tilt®/Bravo® 18 fl oz (1-3)	8.1 bc	0.4 b	17.5 b	4792 cd	884 cd
Tilt®/Bravo® 18 fl oz (1,3) Headline® 2.08E 6 fl oz (2)	6.4 cd	0.0 b	8.8 bc	5067 bc	934 bc
Bravo® Ultrex 82.5DF 1.4 lb (1-3)	11.8 b	0.0 b	17.5 b	5133 bc	947 bc
USF 2010 4.17F 3.5 fl oz + Induce® 0.125% (1-3)	8.4 bc	0.0 b	10.3 bc	5075 bc	936 bc
Stratego® 2.08E 7.0 fl oz (1-3)	11.6 b	1.2 b	17.1 b	4966 bc	916 bc
JAU 6476 4F 5.7 fl oz (1-3)	1.6 e	0.0 b	12.1 bc	4668 cd	861 cd
Check plots	62.5 a	25.0 a	73.7 a	4262 d	786 d
LSD (P=0.05)[4]	4.6	1.6	11.1	585	108

1 Application numbers A1 to A4 correspond to the spray dates for the Early Leaf Spot Advisory Program of 8 Jul, 30 Jul, 17 Jul, and 1 Sep. Application numbers 1-3 correspond to the spray dates for the reduced 14-day calendar program of 30 Jul, 17 Aug, and 1 Sep.
2 Values in a column followed by the same letter are not statistically different at P=0.05 according to Fisher's Least Significant Difference Test.
3 Loan rate value based on a grade of 75 % TSMK.
4 Least significant difference.

Dynasty® PD was compared to Vitavax® PC for control of seedling disease. Plots were seeded at a rate of 5 seeds/ft. Both Dynasty® PD and Vitavax® PC were used with and without an in-furrow application of Abound® at 6 fl oz/a.

All of the seed treatments improved plant stand compared to untreated seed. However, increases were not as large as in previous years. Warm and dry conditions after planting during May apparently promoted rapid seedling emergence and limited seedling disease development. The addition of an in-furrow application of Abound® did not increase stand establishment compared to seed treatment alone. Plant stands for the treatments ranged from 3-4 plants/ft, compared to 2.5 plants/ft for untreated seed. Yields were increased for all seed treatments compared to untreated seed. Yield increases ranged from 300-700 lbs/a. The addition of an in-furrow treatment with Abound® did not increase yields compared to seed treatment alone. Dynasty® PD appears to be a viable alternative to Vitavax® PC for treatment of peanut seed.

Evaluation of biological products applied at planting for stand establishment and yield: Two biological products, Bio-M® and EndoRoots®, were evaluated on the cultivar Tamspan 90 at the Agronomy Research Station in Perkins, Oklahoma. Bio-M® is a biological preparation of bacterial strains reported to have fungicidal and plant growth stimulation properties. Bio-M® was applied in-furrow on crops at planting with foliar application and without foliar applications after planting. EndoRoots® is a formulation of various species of mycorrhizal fungi that form symbiotic relationships with plant roots and may increase plant nutrient uptake in certain soils. EndoRoots® was applied pre-plant and incorporated either alone or in combination with foliar applications of Bio-M®. Commercially treated seed was planted at a rate of 5 seeds/ft.

Emergence ranged from 2.6-2.9 plants/ft and did not differ among any of the treatments and the untreated check plots. Likewise, yields did not differ among treatments. Results indicate that peanuts do not respond to soil inoculation with mycorrhizal fungi where adequate levels of soil nutrients are present. The biological fungicide was not effective in increasing plant stand or yield when seed treated with a commercial seed treatment was used.

General Extension and Weed Control Research on Peanuts

J.K. Nickels and C.R. Medlin; Department of Plant and Soil Sciences

2004 progress made possible through OPC and NPB support

- Since the introduction of Tamrun 96 and Georgia Green, the commercial runner varieties have out yielded Spanish varieties by 901 lbs/a and 3.2 percent TSMK. In three advanced line variety tests during 2004, Tamrun 96 was the top performer.
- The new high oleic peanut varieties response to new commercially available herbicides indicated that none of the herbicides reduced yield or quality. New varieties Tamrun OL 01 and Tamrun OL 02 demonstrated good tolerance to these herbicides.
- New peanut inoculants are continually being developed and tested due to the very fragile nature of the rhizobium used for peanut inoculant. Although inoculated plots typically have higher yields, this was not true for the 2004 inoculant trial. Grades are seldom affected by peanut inoculation.
- In a peanut following peanut (successive) reduced tillage program, volunteer peanuts become a major weed problem. The best control that could be obtained with Roundup® was 35-45 percent when it was applied at burndown or just prior to planting.

1. Variety Test

In 1982, a variety testing program was initiated to evaluate the performance of new varieties and to compare that performance to varieties currently available. An extensive performance database has been established both for research and demonstration purposes. Variety comparisons of yield and grade have been very consistent through the years even with the variations of weather patterns (Tables 1 and 2).

In 2004, advanced peanut lines were included in the variety test so that Oklahoma growers could observe some of the new breeding lines and compare them with familiar commercial varieties. Advanced lines were tested in Caddo, Grady, Beckham, and Bryan counties. Sclerotinia blight was a major problem early in the 2004 growing season in Caddo County. Disease comparisons between advanced lines and commercial varieties are discussed in the section about peanut breeding.

Yields and quality were very good in Caddo, Grady, and Beckham counties in 2004 (Table 3). The field in Bryan County was not harvested due to weather and wild hog damage.

The following varieties have demonstrated the best potential for being planted in Oklahoma:

Tamrun 96 – This variety was developed by Texas A&M University and released in 1996. It continues to be the top performing variety in Oklahoma tests. It has resistance to tomato spotted wilt virus, a disease that to date has resulted in relatively small losses in Oklahoma. However, this disease is causing severe losses in the southeastern U.S. and in some areas of Texas.

Since the introduction of Tamrun 96 and Georgia Green, eight years ago (37 tests), Tamrun 96 has out yielded Okrun by 365 lbs/a and Georgia Green by 279 lbs/a (Table 1). Tamrun 96 has been consistantly 1-3 points lower in grade than either Okrun or Georgia Green.

Georgia Green – This variety was released by the University of Georgia and first tested in Oklahoma in 1997. The variety has performed well at all locations. Georgia Green tends to mature a little earlier than Tamrun 96 or Okrun. It has an average yield (4071 lbs/a) and grade (72 percent TSMK) that is very similar to Okrun (3985 lbs/a and 72 percent TSMK) since its introduction into the Oklahoma variety testing program (Table 1).

Tamrun OL 01, Tamrun OL 02, and OLin – These are high oleic varieties developed and evaluated by the Southwest High Oleic Peanut Program that is funded by the Texas Peanut Producers Board and the Oklahoma Peanut Commission. Runner varieties Tamrun OL 01 and Tamrun OL 02 perform very well at all locations. The high oleic acid trait extends the shelf life and also has some very beneficial health effects for consumers. The peanut processing industry prefers high oleic acid peanuts for most of their products and they are in much demand for today's market.

Over the past three years (9-10 tests) the high oleic runners out preformed the Spanish variety OLin by 1600-1800 lbs/a and with a 1-3 percent higher TSMK (Table 2).

Tamrun OL 01 was the top yielding variety over the past three-years (Table 2). It had 138 lbs/a yield and a 1 percent TSMK increase over Tamrun 96, the next highest in yield.

The two runner-type high oleic varieties averaged 4714 lbs/a and 72 percent TSMK. The average for the other commercial runners (Tamrun 96, Okrun, and Georgia Green) was 4410 lbs/a and 73.6 percent TSMK. This is 304 lbs/a lower in yield but 1.6 percent higher TSMK in grade than the high oleic varieties. Tamrun OL 01 averaged 229 lbs more per acre and 2 percent higher TSMK than Tamrun OL 02. Tamrun OL 01 also is less susceptible to early leaf spot disease than either Tamrun 96 or Tamrun OL 02.

Jupiter – This is a Virginia-type peanut variety developed by Oklahoma

Table 1. Selected peanut variety test results, 1997-2004.

Variety	*Market type*	*No. tests*[1]	*Yield (lbs/a)*[2]	*Grade (% TSMK)*[2,3]
Spanco	Sp	35	3331	68
Tamspan 90	Sp	35	3136	69
Okrun	Ru	37	3985	72
Tamrun 96	Ru	37	4350	71
Georgia Green	Ru	37	4071	72
Jupiter	Va	22	4058	70

[1] Spanish varieties were not planted at two of the locations. Jupiter, a Virginia type, was first planted in 1998.
[2] Spanish average - 3234 lbs/a, 68.5 % TSMK. Runner average - 4135 lbs/a, 71.7 % TSMK.
[3] % TSMK = Percent total sound mature kernels.

Table 2. Selected peanut variety test results, 2002-2004.

Variety	*Market type*	*No. tests*[1]	*Yield (lbs/a)*[2]	*Grade (% TSMK)*[2,3]
Spanco	Sp	8	3541	69
Tamspan 90	Sp	8	3144	70
OLin[4]	Sp	9	2981	70
Okrun	Ru	10	4296	75
Tamrun 96	Ru	10	4690	72
Georgia Green	Ru	10	4244	74
Tamrun OL 01[4]	Ru	9	4828	73
Tamrun OL 02[4]	Ru	10	4599	71
Jupiter	Va	8	4110	71

[1] The Spanish varieties, Tamrun OL 01, and Jupiter were not planted at all locations.
[2] Spanish average - 3222 lbs/a, % TSMK 69.7. Runner average - 4531 lbs/a, % TSMK 73. High oleic acid runner average - 4714 lbs/a, % TSMK 72.
[3] % TSMK = Percent total sound mature kernels.
[4] High oleic varieties.

State University that was introduced in 1998. Jupiter has been one of the best performers of the tested Virginia types. Pod rot has been one of the major problems of Virginia types in Oklahoma. Jupiter has shown more resistance to pod rot than other Virginia types.

Jupiter has an average yield of 4058 lbs/a and 70 percent TSMK over seven years and 22 tests (Table 1). The commercial runners Tamrun 96, Okrun, and Georgia Green averaged 4135 lbs/a and 71.7 percent TSMK. Jupiter performed very similar to the commercial runners at all locations; however, the quality (grade, pod size, and pod brightness) is much better on sandy/ coarser Oklahoma soils. Virginia-type peanuts are rapidly becoming more popular in today's marketplace.

Advanced Lines – Top performing advanced lines in 2004 were TX972505, TX976882, and TX994313 (Table 3). The three lines averaged 4461 lbs/a and 76 percent TSMK, 173 lbs/a less than Tamrun 96, but 2 percent higher TSMK. All three of these advanced lines performed very well at each of the three locations.

Tamrun 96 (4634 lbs/a and 74 percent TSMK) was still the highest producer over the three locations. The best performance from a commercial high oleic was Tamrun OL 01 with 4347 lbs/a and 75 percent TSMK (287 lbs/a less than Tamrun 96, 1 percent higher TSMK). Jupiter averaged 4061 lbs/a and 74 percent TSMK (573 lbs/a less than Tamrun 96, same percent TSMK).

Table 3. Peanut advanced lines and variety test results, 2004[1].

	Market type	*Yield (lbs/a)[2]*	*Grade (% TSMK)[2,3]*
Line			
TX996784	Sp	3993	74
Spanco	Sp	3807	73
Tamspan 90	Sp	3784	73
TX996612	Sp	3517	70
Olin	Sp	3517	74
Pronto	Sp	2940	75
LSD 0.05		1209	4
Tamrun 96	Ru	4634	74
TX972505	Ru	4595	75
TX976882	Ru	4414	76
TX994313	Ru	4374	78
Tamrun OL 01	Ru	4347	75
B-4 94-46	Va	4315	74
SW Runner	Ru	4247	75
TX994392	Ru	4178	76
TX994374	Ru	4162	73
B-4 94-29	Va	4102	75
Jupiter	Va	4061	74
Georgia Green	Ru	4054	76
Tamrun OL 02	Ru	3987	73
Okrun	Ru	3975	78
924400-94-16	Ru	3934	76
UF 00627	Ru	3573	71
LSD 0.05		560	3

[1] Average of three counties (12 observations) on runner type – Caddo, Grady, and Beckham. Spanish were planted at two counties (8 obs.) – Caddo and Beckham.

[2] Spanish average - 3593 lbs/a. Runner average - 4194 lbs/a.

[3] % TSMK = Percent total sound mature kernels.

2. Variety X Herbicide Test

Three of the newer peanut herbicides, - Strongarm®, Valor®, and Cadre®, were tested on two new commercial high oleic peanut varieties, Tamrun OL 01 and Tamrun OL 02 (Table 4). The purpose of the test was to continue the evaluation of recently registered peanut herbicides on newly released peanut varieties.

Both Tamrun OL 01 and Tamrun OL 02 had good tolerance to these herbicides and herbicide treatments produced no variety response in yield or grade. Visual observation indicated very little injury on these two varieties.

Some Oklahoma peanut fields suffered heavy damage from Valor® in 2001. Damage occurred when a preemergence application of Valor® was followed by heavy rainfall during or immediately after peanut cracking. The injury was attributed to splashing of the herbicide onto the peanut plants. Valor has both preemergence and contact activity.

Table 4. Peanut variety by herbicide test – Ft. Cobb Research Station, 2004.

Tillage system	*Herbicide[1]*	*Yield (lbs/a)*	*Grade (%TSMK)[2]*
Tamrun OL 01			
	Strongarm®	5300	76
	Valor®	5345	77
	Cadre®	4528	76
	Weed Free	4601	72
	Average	**4944**	**75**
Tamrun OL 02			
	Strongarm®	5463	76
	Valor®	5100	76
	Cadre®	4810	77
	Weed Free	4465	68
	Average	**4960**	**74**
LSD 0.05		NS[3]	5

1 Standard labeled herbicide rates and application methods were applied.
2 % TSMK = Percent total sound mature kernels.
3 Not significant.

3. Peanut Inoculation Test

The peanut inoculation test (Table 5) was conducted on land in a sorghum followed by peanut rotation system. Milo was planted in 2003 and no fertilizer was applied in 2004 prior to test initiation. All treatments with the exception of the untreated control were in-furrow applications. Disease, insect, and weed incidences were kept to a minimum throughout the growing season with a pesticide management program.

Yields ranged from 4728-5309 lbs/a, however, differences were not statistically significant. Inoculant treatments have consistently improved peanut yields in past years by 200-300 lbs/a however, in 2004 peanut yields across the trial were variable and differences could not be detected. Similarly, grades were not affected by the inoculant treatments.

The testing of peanut inoculation in Oklahoma has consistently provided a 200-300 lbs/a increase in yield.

Table 5. Peanut inoculation test – Ft. Cobb Research Station, 2004[1].

Treatment[2]	*Rate*	*Yield (lbs/a)[3]*	*Grade (% TSMK)[4]*
Untreated Control	15 oz/a	4728	76
HiStick L®	15 oz/a	5000	75
Urbana® - HiStick L® + Subtilex®	15 oz/a	5064	76
BU-LQBS®	15 oz/a	4737	76
RhizoFlo®	5.5 lbs/a	5091	77
Lift®	---	5309	76
LSD 0.05		NS[5]	NS

1 Planting date: 13 May. Digging date: 15 Oct. Growing season: 155 days.
2 All treatments were applied in-furrow. RhizoFlo® is a granular formulation.
3 Average Yield - 4988 lbs/a. Untreated - 4728 lbs/a. Treated - 5040 lbs/a (312 lbs/a increase).
4 % TSMK = Percent total sound mature kernels.
5 Not significant.

4. Volunteer Peanut Control

Volunteer peanuts have become a major obstacle in a consecutive peanut reduced tillage program. Early development of diseases, insects, weeds, and contamination (volunteer peanuts), as well as changes in equipment, cultural practices, and harvest can also be serious obstacles.

A test was designed to evaluate the effects of mixing order of additives and water pH with Roundup® on volunteer peanut control (Table 6). The best control obtained with Roundup® was 35-45 percent. The addition of nitrogen additives increased the activity of Roundup® by 15-25 percent. Higher pH (7.9) water increased activity 10 percent above the more acidic pH (5.5).

The effect that mixing order has on weed control may not be well represented in this test. The mixing and application techniques used were not representative of actual mixing procedures. Roundup® plus nitrogen additive or vice versa was mixed in small containers, shaken in a 3 lt bottle and sprayed immediately after mixing using a small bicycle sprayer. The short amount of time from mixing to application more than likely could have affected the results. Time in the sprayer container may not have been long enough for any precipitation of Roundup® with calcium molecules in the water to occur. A larger trial with tractor and sprayer would be more representative for this type of experiment.

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Table 6. Volunteer peanut control test – Ft. Cobb Research Station, 2004.

		Percent control		
Treatment	*Rate*	*pH 7.9*	*pH 5.5*	*Percent difference*
Roundup® Ultra Max	1 lb/a	25	14	11
AMS + Roundup® Ultra Max	17 lbs/a + 1 lb/a	42	30	12
Roundup® Ultra Max + AMS	1 lb/ac + 17 lbs/ac	54	36	18
UAN (28%) + Roundup® Ultra Max	1 qt/a + 1 lb/a	44	35	9
Roundup® Ultra Max + UAN (28%)	1 lb/ac + 1 qt/ac	38	29	9
Valor® + COC	3 oz/ac + 1 qt/ac	6	0	6

Research for Newly Emerging Weed Control Problems in Oklahoma Peanut Producing Regions

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2004 progress made possible through OPC and NPB support

- Better utilization of currently labeled herbicides is essential for weed management in fields containing Palmer amaranth (*Amaranthus palmeri*) resistant to acetolactate synthase (ALS) inhibiting herbicides (e.g. Cadre®, Pursuit®, etc.). Practices that should be closely scrutinized include herbicide incorporation techniques, herbicide application timings, and tank-mix options.
- Oklahoma State University's recommendations for managing Palmer amaranth resistant to ALS inhibiting herbicides include adequate mechanical preplant incorporation of a seedling root inhibiting herbicide (such as pendimethalin/Prowl®) in the top 2 in of soil. Producers should consider an at-cracking application of metolachlor (Dual II Magnum®, Cinch®, etc.) or dimethenamid (Outlook®). If weeds have emerged by the at-cracking application, producers will need to include a postemergence herbicide to control these emerged weeds. Producers should also consider a layby application of metolachlor (Dual II Magnum®, Cinch®, etc.) or dimethenamid (Outlook®) if late emerging weeds have been problematic in the past. This weed is easier to manage prior to its establishment than once it has become established.
- Lactofen (Cobra®) herbicide was labeled for use in peanuts in November 2004. This product should provide adequate control of small actively growing Palmer amaranth, however, some crop injury will most likely occur. Other postemergence control options that should be considered when needed include 2,4-DB®, paraquat (Gramoxone Max®) plus 2,4-DB®, and acifluorfen plus bentazon (Storm®).

Many producers in the Caddo County peanut producing area witnessed poor control of Palmer amaranth (Figure 1) in the 2003 production season. Palmer amaranth (also known as Palmer pigweed and careless weed) is a broadleaf weed common to most peanut fields in southwestern Oklahoma. Control of the weed is typically achieved with preplant incorporated or preemergence applications of trifluralin (Treflan®), pendimethalin (Prowl®), metolachlor (Dual II Magnum® or Cinch®), flumioxazin (Valor®), imazethapyr (Pursuit®), or diclosulam (Strongarm®). Postemergence control is usually achieved with imazapic (Cadre®). Biotypes of Palmer amaranth resistant to ALS inhibiting herbicides have been documented across the United States. Of the products previously mentioned, Pursuit®, Cadre®, and Strongarm® are ALS inhibiting products. Repeated usage of these products for the past 4-10 years may have caused the selection of a herbicide

(a) (b) (c)

Figure 1. (a) Palmer amaranth newly emerging seedlings, (b) a 6-leaf plant, and (c) a mature plant.

resistant biotype in many Caddo County area fields. Although this seems fast for the development of a herbicide resistant weed population, similar development of resistance to this herbicide mode of action has occurred in different weed species in other regions of the United States, just as quickly. Alternative management strategies for the weed are being devised for the 2005 growing season in order to limit the spread and severity of the problem.

To address this developing weed problem, plots were established in Caddo County on a field with a known infestation of Palmer amaranth resistant to ALS inhibiting herbicides. All plots received pendimethalin (Prowl®) applied through chemigation in a no-till peanut production tillage system. Due to certain chemical properties of pendimethalin (i.e. low water solubility and strong affinity for clay particles and soil organic matter) it is extremely difficult to move this herbicide into the soil profile through irrigation or chemigation. This is a very important factor to consider since pigweed and other species germinate as deep as 1-2 in under ideal conditions. Poor Palmer amaranth control resulted from this application and was most likely due to lack of mechanical incorporation into the top 1-2 in of soil.

Additional chemical treatments evaluated for control of the herbicide resistant Palmer amaranth included combinations of flumioxazin (Valor®) applied preemergence, diclosulam (Strongarm®) applied preemergence, dimethenamid (Outlook®) applied at-cracking, and 2,4-DB® and/or imazapic (Cadre®) applied postemergence alone or tank-mixed with metolachlor (Dual II Magnum®) or pendimethalin (Prowl®). As anticipated, treatment regimes based on diclosulam (Strongarm®) and/or imazapic (Cadre®) did not control the resistant Palmer amaranth. Herbicide combinations involving flumioxazin (Valor®) were also unsuccessful in controlling this weed, but will be evaluated further. The best Palmer amaranth control (approximately 98 percent control) was achieved by following the preemergence application of pendimethalin with dimethenamid (Outlook®) applied at-cracking and a tank-mix application of 2,4-DB plus metolachlor (Dual II Magnum®) applied at layby approximately eight weeks after planting. A layby treatment of metolachlor (Dual II Magnum® or Cinch®) or dimethenamid (Outlook®) should be strongly considered for fields with significant Palmer amaranth infestations. These layby herbicides should be tank-mixed with 2,4-DB®, lactofen (Cobra®), paraquat (Gramoxone Max®) plus 2,4-DB®, or other postemergence herbicides if weeds are emerged at the time of application. Other herbicides that are currently not labeled for peanut production were evaluated, but will not be discussed at this time.

Peanut Breeding

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The major objectives of the peanut breeding project have been to develop high yielding, early maturing peanut cultivars with resistance to Sclerotinia blight and improved post harvest characters for Oklahoma. Emphasis is on the development of runner and Spanish market types.

Beginning in 2002, the new peanut program reduced the price that Oklahoma producers received for their peanut crop. Thus, there is an urgent need to find ways to reduce the cost of peanut production.

Improving disease resistance is the major area where the peanut breeding project will be able to reduce the cost of production. This will reduce the cost related to the purchase and application of fungicides to control diseases. A very aggressive research effort is being conducted to identify new breeding lines with higher levels of resistance to Sclerotinia blight and early leaf spot.

Peanut quality continues to be a high priority for the breeding project. The major emphasis is on developing varieties with the high oleic acid trait. This trait gives roasted peanut products a much longer shelf life and also some additional health benefits for consumers when compared to peanuts that do not have the high oleic acid trait. There are indications from the peanut processing industry that they prefer high oleic acid peanuts for most of their products.

During the 2004 growing season, several peanut breeding trials were conducted at the Caddo Research Station near Ft. Cobb, Oklahoma, and the most important results from these trials are presented here.

All of the breeding lines in this report that begin with "TX" and the recently released varieties Tamrun OL 01, Tamrun OL 02, and OLin were developed and evaluated by the Southwest High Oleic Peanut Program (SWHOPP), which is funded by the Texas Peanut Producers Board and the Oklahoma Peanut Commission. The organizations that conduct the research for SWHOPP are the Texas Agricultural Experiment Station, Oklahoma Agricultural Experiment Station, and the United States Department of Agriculture-Agricultural Research Service.

The Uniform Peanut Performance Test had 13 breeding lines and five cultivars developed by the major peanut breeding projects in the United States. A randomized complete block design with four replications was used. This trial was irrigated (Figure 1) and had fungicide sprays to control the foliar diseases and Sclerotinia blight. Ten of the entries in this trial were runners and eight were Virginia type. Tamrun 96, which is the most popular variety planted by farmers in Oklahoma, had pod yield of 3843 lbs/a and 75.6 percent total sound mature kernels. Seven breeding lines yielded more, but not significantly more, than Tamrun 96. These were from the Florida and Georgia State breeding projects and from the USDA-ARS Regional Plant Introduction Station in Griffin, Georgia.

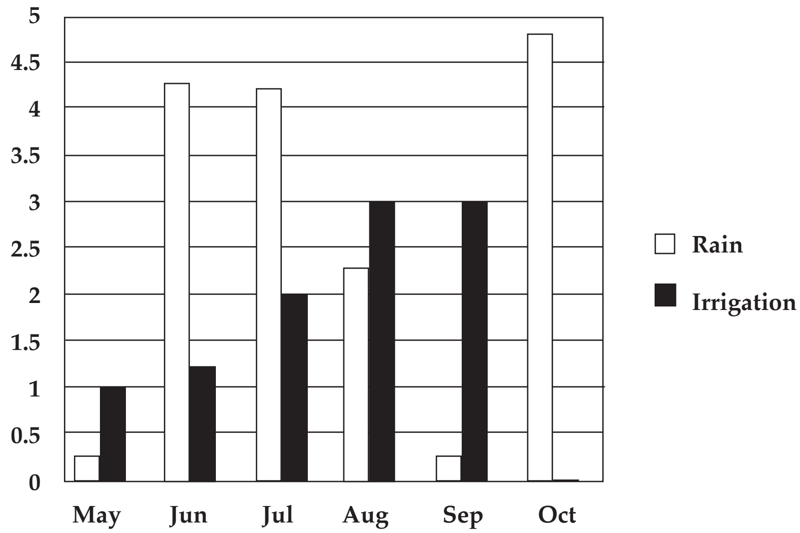

Figure 1. Total of rain and irrigation for each month – Caddo Research Station, 2004.

There were three advanced trials (Advanced Runner Irrigated, Advanced Spanish Irrigated, and Advanced Virginia Irrigated) conducted during 2004 at the Caddo Research Station. Each of these trials was irrigated and had a split-plot design with the fungicide treatment being the main plot and varieties the sub-plot. There were four replications and three different fungicide treatments as described in Table 1.

In the Advanced Runner Irrigated Trial the effect of the fungicide treatments (Table 2) was as expected for the disease ratings. When fungicides were applied to control only sclerotinia there was very little sclerotinia and very little defoliation caused by leaf spot. When no fungicides were applied both sclerotinia and leaf spot were severe. The yields increased by more than 1700 lbs/a when fungicides were applied to control sclerotinia.

TX977035 was the top yielding line in the Advanced Runner Irrigated Trial and it had a significantly higher yield than Tamrun 96 (Table 3). Tamrun OL 01 continues to be among the highest yielding entries. Okrun, Southwest Runner, and Tamrun 96 are the only entries in this trial that do not have the high oleic trait.

In the Advanced Spanish Irrigated Trial the effect of the fungicide treatments (Table 4) was as expected for the disease ratings. Pronto and TX996784 yielded significantly higher than Tamspan 90, which has been the most popular Spanish variety in Oklahoma for several years. Pronto, Tamspan 90, and Spanco are the only entries in this trial that do not have the high oleic trait.

The advanced Virginia Irrigated Trial had three breeding lines (Mammoth, N00090ol(7), and Magnum) that yielded significantly higher than Jupiter (Table 6). Mammoth, Magnum, and Macho seeds were provided by Dr. Donald Banks and N0009ol(7) seeds came from the USDA-ARS Regional Plant Introduction Station at Griffin, Georgia.

Table 1. Fugicide spray treatments – Ft. Cobb, 2004.

- No disease control – no fungicides
  + SCLEROTINIA*
- Control leaf spot – Headline® and Folicur® block program
  + SCLEROTINIA
- Control sclerotinia – Omega®

* Sclerotinia inoculum was applied to encourage the spread of Sclerotinia blight.

Table 2. Summary of fungicide treatments in the Advanced Runner Irrigated Peanut Performance Trial – Caddo County, 2004.

Treatment name	*Yield (lbs/a)*	*Leaf spot (%)*	*Total defoliation*	*Sclerotinia incidence (0-60)*	*Sclerotinia intensity (1-5)*
Control sclerotinia	3792	37	25	11	1.0
No disease control	2055	77	72	60	3.2
LSD 0.05	47	1	2	1	0.4

Table 3. Summary of yield and disease ratings, averaged across the two fungicide treatments, for the entries in the Advanced Runner Irrigated Peanut Performance Trial – Caddo County, 2004.

Entry name	*Yield (lbs/a)*	*Leaf spot %*	*Total defoliation*	*Sclerotinia incidence (0-60)*	*Sclerotinia intensity (1-5)*
TX977035	3443	51	51	34	2.3
Tamrun OL 01	3403	57	53	34	1.9
TX994374	3303	51	31	35	2.0
TX976882	3287	51	41	34	2.1
Tamrun 96	3179	57	41	36	1.9
Tamrun OL 02	3157	56	48	35	2.0
TX972505	3150	58	51	37	1.9
TX994371	3070	44	36	34	2.0
TX972506	3067	63	48	37	2.0
Sunoleic	2941	54	44	35	2.3
TX994313	2937	65	53	34	2.1
Okrun	2930	47	32	37	2.1
TX994336	2928	63	60	36	2.3
UF 98604	2731	51	41	35	2.1
TX966151	2678	53	44	35	2.1
SW Runner	2635	71	66	30	1.6
UF 00627	2344	70	58	38	2.6
UF 00620	2327	51	56	36	2.4
UF 99621	2028	71	64	38	2.6
LSD 0.05	262	10	8	2	0.4

Table 4. Summary of yield and disease ratings for entries in the Advanced Spanish Irrigated Peanut Performance Trial – Caddo County, 2004.

Main plot name	*Yield (lbs/a)*	*Leaf spot %*	*Total defoliation*	*Sclerotinia incidence (0-60)*	*Sclerotinia intensity (1-5)*
Control leaf spot	3780	11	0	14	1.1
No control	2894	96	56	7	1.1
LSD 0.05	711	4	5	4	NS[1]

[1] Not significant.

Table 5. Summary of yield and disease ratings, averaged across the two fungicide treatments, for the entries in the Advanced Spanish Irrigated Peanut Performance Trial – Caddo County, 2004.

Variety name	*Yield (lbs/a)*	*Leaf spot %*	*Total defoliation*	*Sclerotinia incidence (0-60)*	*Sclerotinia intensity (1-5)*
TX996784	3761	55	26	9	1.0
Pronto	3616	55	25	8	1.0
TX974614	3482	53	28	11	1.0
TX996612	3384	51	30	11	1.1
TX996670	3383	53	26	12	1.0
TX987117	3283	51	40	10	1.1
Tamspan 90	3262	52	20	8	1.0
OLin	2999	52	27	15	1.3
Spanco	2936	56	28	11	1.3
LSD 0.05	268	NS[1]	7	2	NS

[1] Not significant.

Table 6. Summary of yield and disease ratings, averaged across the two fungicide treatments, for the entries in the Advanced Virginia Irrigated Peanut Performance Trial – Caddo County, 2004.

Variety name	*Yield (lbs/a)*	*Leaf spot %*	*Total defoliation*	*Sclerotinia incidence (0-60)*	*Sclerotinia intensity (1-5)*
Mammoth	2426	69	66	33	2.4
N00090ol(7)	2341	37	53	37	2.4
Magnum	2302	65	63	34	2.4
B-4 94-46	2066	69	68	33	2.3
NC 7	2060	76	68	33	2.4
Jupiter	2035	68	60	34	2.1
CB 38-2-01LP	1897	64	64	32	2.3
B-4 94-29	1871	69	71	32	2.4
924400-94-16	1687	76	73	33	2.5
Macho	719	96	86	45	3.5
LSD 0.05	243	8	9	7	0.6

Partners in Progress PEANUTS

Maximizing Profits of the New High Oleic Acid Peanut Varieties with the Efficient use of Fungicides and Irrigation

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There is an urgent need to develop varieties and production systems that will reduce the cost of peanut production in Oklahoma. Two of the major inputs are irrigation and fungicides.

The purchase and application of fungicides can cost Oklahoma peanut producers up to $150/a. The cost of applying one acre-inch of water is variable from farm to farm. All producers agree that the cost of pumping the water is high and increasing. Also, the availability and quality of water for agriculture use is decreasing in many areas.

It is clear that irrigation and fungicide use increases peanut yields in Oklahoma. As the production environment becomes more wet (more irrigation water) and humid, the disease pressure increases and this increases the need for disease control practices such as fungicide applications. When the amount of water applied is reduced then the disease pressure and number of fungicide applications can be reduced.

Variety trials conducted during 2001 and 2002 identified some breeding lines that have high oleic acid, good yields under rain fed and/or irrigated conditions, and/or some resistance to leaf spot and Sclerotinia blight. Also, with the new irrigation system at the Caddo County Research Station, trials can be conducted to test different irrigation rates.

The objective of this trial was to develop a combination or combinations of varieties, fungicide spray schedules, and irrigation rates that would maximize the net return to Oklahoma peanut producers.

Three runner cultivars (Tamrun 96, Tamrun OL 01, and Tamrun OL 02) and three runner breeding lines (UF 00620, UF 00627, and UF 98604) were tested during 2004. Tamrun 96 was the only entry that did not have the high oleic acid trait. In a separate trial, two Spanish cultivars (Spanco and Tamspan 90) and four Spanish breeding lines with the high oleic acid trait (TX996784, TX996670, TX996612, and TX974614) were tested. OLin was not included because it had poor yields during the past three years. These varieties were tested under three different irrigation schedules – full, half, and minimum – in a field with low Sclerotinia blight pressure (Figures 1 and 2). These same varieties were tested in a field with high Sclerotinia blight pressure under three different irrigation schedules – full, three-quarter, and half (Figures 3 and 4). In the field with low Sclerotinia blight pressure each of these variety X irrigation treatment combinations (total of 36 combinations) were then evaluated with no fungicides or one 15 oz spray of Headline® and one 15 oz spray of Folicur® to control foliar diseases. No fungicides were applied to control soilborne diseases such as Sclerotinia blight. Each plot had three replications. In another trial with three replications about 50 yards away, these same varieties were tested with no irrigation. The total water available (rain plus irrigation) to each treatment and total irrigation applied for each month are presented in Figures 1 and 2. The full, half, minimum, and none irrigation treatments received approximately 11 in, 5.5 in, 2.6 in, and 0 in respectively, of irrigation for the entire season.

In the field with high Sclerotinia blight pressure each of the runner variety X irrigation treatment combinations were evaluated with one 7.2 oz application of Folicur®, one 1.5 pt application of Omega®, and one 15 oz application of Headline® or with one 9 oz application of Headline®, one 7.2 oz application of Folicur®, two 1.5 pts applications of Omega®, and one 15 oz application of Headline®. Each plot had three replications. In another trial with three replications about 50 yards away, (the same trial referred to in the previous paragraph) these same varieties were tested with no irrigation. The full, three-quarters, minimum, and none irrigation treatments received approximately 9.5 in, 5.5 in, 3.5 in, and 0 in respectively, of irrigation for the entire season.

In this report emphasis will be given to the varieties and irrigation treatments as further analysis is needed on the different fungicide treatments.

The yields for the runner varieties in the fields with high and low Sclerotinia blight pressures were reduced as less irrigation water was applied (Figures 5 and 6) for most varieties, but then increased when no irrigation was applied. The increase in yeilds when no irrigation was applied was not expected, but the main reason that this occured was because the field where there was no irrigation was about 50 yards away from the irrigated field. There must be some soil or micro-enviromental factors that caused the unexpected results.

The yields for the Spanish varieties do not show a clear trend as the amount of irrigation water applied is changed (Figures 7 and 8).

The results of the Irrigation X Fungicide X Variety Trials conducted at Ft. Cobb during 2003 and 2004 provide no clear results that can be used to make recomendations for peanut producers in Oklahoma. They need to be analyzed in more detail and used to help plan for appropriate Irrigation X Fungicide X Variety Trials to be conducted in 2005.

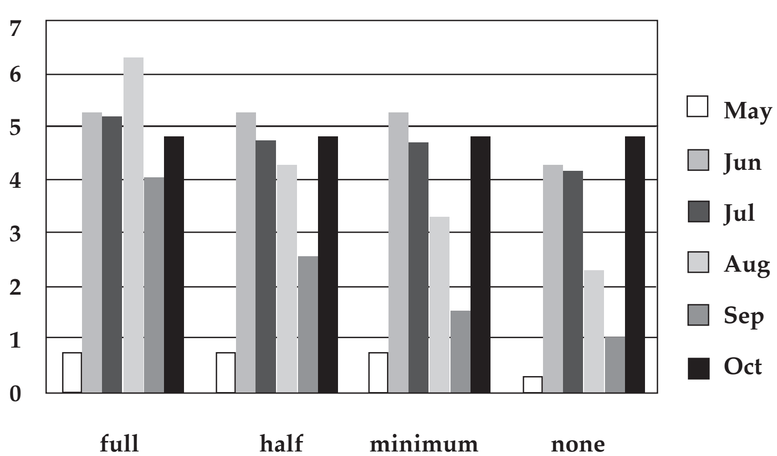

Figure 1. Total of rain and irrigation (in) in the Irrigation X Fungicide X Variety Trials in a field with high Sclerotinia blight pressure – Caddo Research Station, 2004.

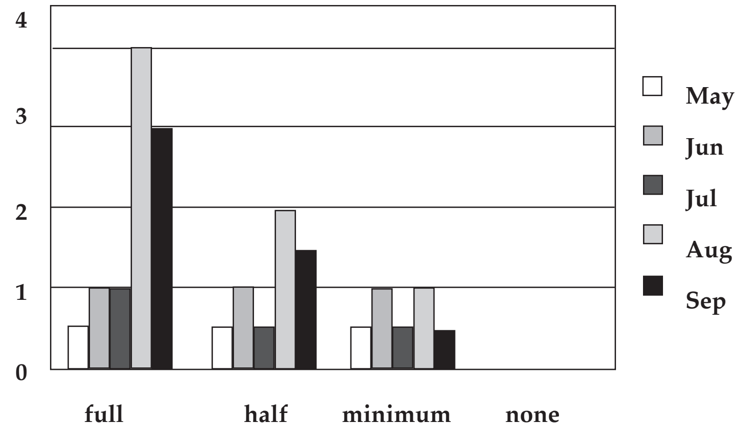

Figure 2. Total irrigation (in) in the Irrigation X Fungicide X Variety Trials in a field with high Sclerotinia blight pressure – Caddo Research Station, 2004.

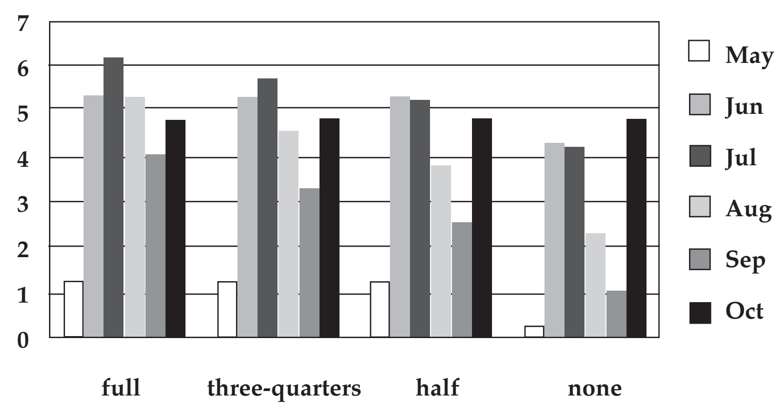

Figure 3. Total rain and irrigation (in) in the Irrigation X Fungicide X Variety Trials in a field with low Sclerotinia blight pressure – Caddo Research Station, 2004.

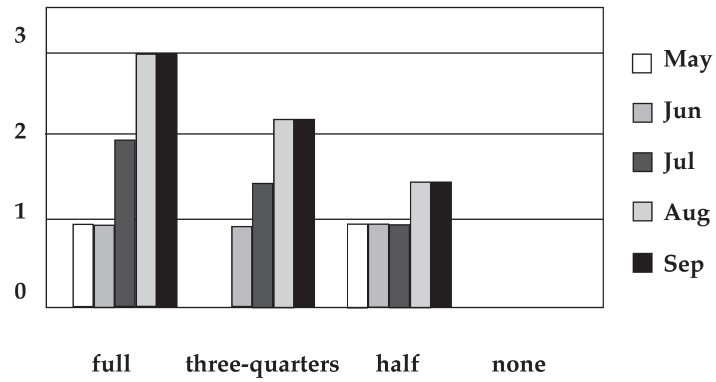

Figure 4. Total irrigation (in) in the Irrigation X Fungicide X Variety Trials in a field with low Sclerotinia blight pressure – Caddo Research Station, 2004.

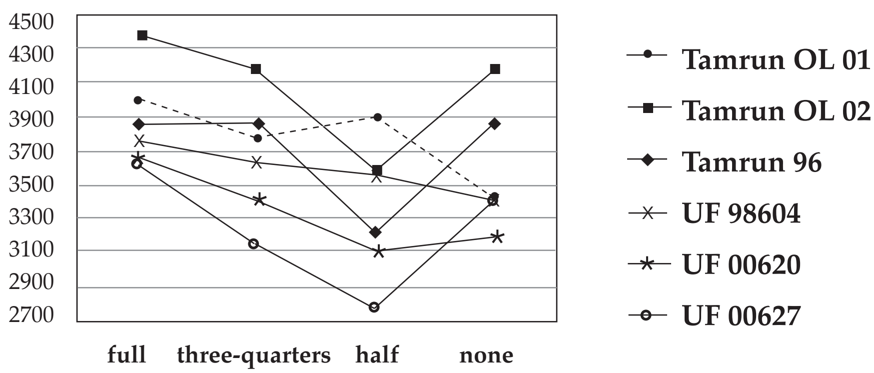

Figure 5. Yield (lbs/a) in the Irrigation X Fungicide X Runner Variety Trial in a field with high Sclerotinia blight pressure – Caddo Research Station, 2004.

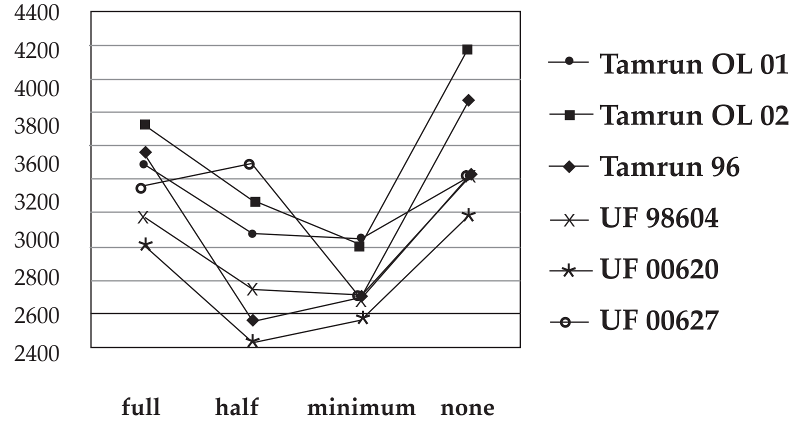

Figure 6. Yield (lbs/a) in the Irrigation X Fungicide X Runner Variety Trial in a field with low Sclerotinia blight pressure – Caddo Research Station, 2004.

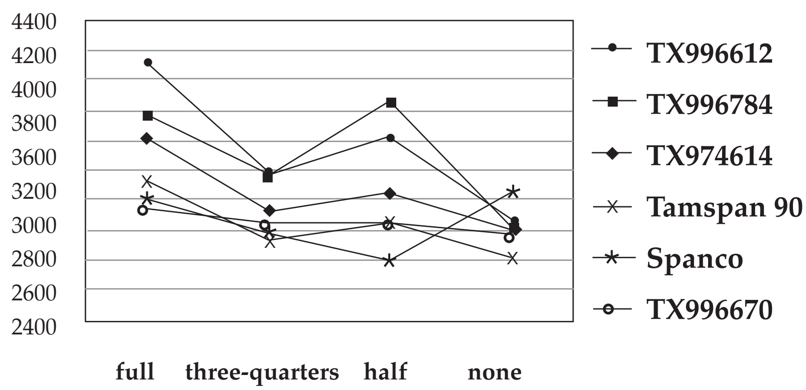

Figure 7. Yield (lbs/a) in the Irrigation X Fungicide X Spanish Variety Trial in a field with high Sclerotinia blight pressure – Caddo Research Station, 2004.

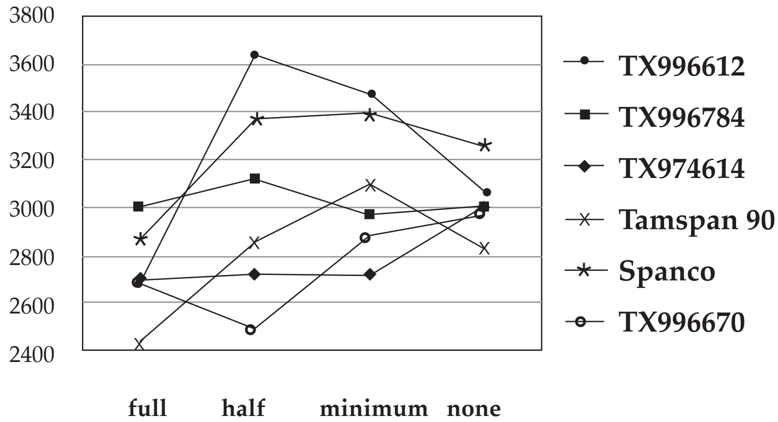

Figure 8. Yield (lbs/a) in the Irrigation X Fungicide X Spanish Variety Trial in a field with low Sclerotinia blight pressure – Caddo Research Station, 2004.

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