Partners in Progress
PEANUTS

Peanut Research at OSU 2006

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

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Foreword

We have had a long standing partnership with the Oklahoma Peanut Commission and the peanut producers of this state. There have been good times and bad times in terms of state budget restraints, shifts in peanut production locations in the state, and changes in the federal peanut program. Together, we have survived and are looking forward to a brighter future.

Our *Partners in Progress* Peanut Report serves as a means to highlight significant accomplishments in research and Extension programs that have been supported in partnership with the Oklahoma Peanut Commission and the National Peanut Board. With all of the work that has been accomplished, it is important to recognize that much more research and Extension programming needs to be done to keep our peanut producers competitive and in business. Therefore, our work must be focused to solve meaningful issue-based problems facing the peanut producers in the state.

This report is one means of being accountable for the funds we have received and communicating the latest results of our programs to peanut producers as rapidly as possible.

Clarence Watson,
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.

When you come to a fork in the road... take it

Made famous by baseball's Yogi Berra, this yogi-ism pretty much sums up the decisions currently facing Oklahoma's peanut producer. The roadmap to success is much more difficult to read these days. At every turn (production decision) the journey's outcome (potential for profit) is at risk. And in this era of loan-priced peanuts, no U-turns are allowed.

Producer concerns for profit potential in 2006 resulted in a 1/3 nationwide reduction of planted acres. In Oklahoma the cut-back resulted in the lowest planted acreage since 1927, at 22,000 acres. USDA projects an average yield in the state of 3,000 pounds; this 33,000 ton crop would be the smallest since 1956.

With one eye on the rear-view mirror and one eye on the road; producers are now making decisions for the 2007 crop. This year's version of the Peanut Partners in Progress Peanut Report will hopefully serve as an atlas.

Contained within are the results of the on-going peanut research and extension efforts in the areas of breeding and variety development, reduced tillage and production practices, weed control and pest management, soil borne pathogens, and disease management.

These scientific efforts are led by the state's Peanut Improvement Team and funded in part by the Oklahoma Peanut Commission in cooperation with the National Peanut Board. Primary investigators are identified in each report and have earned the respect and appreciation from Oklahoma's peanut farmers.

The Oklahoma Peanut Commission salutes the Team's 2006 efforts as well as the investments made by the OSU Division of Agricultural Sciences and Natural Resources, the Oklahoma Agricultural Experiment Station, the Oklahoma Cooperative Extension Service, the USDA/Agricultural Research Service, and Oklahoma's peanut producers.

Mike Kubicek
Executive Secretary
Oklahoma Peanut Commission

Partners in Progress
PEANUTS

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

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Department of Entomology and Plant Pathology

2006 progress made possible through OPC and NPB support

- Studies conducted using three variations in tillage practices showed no significant differences in thrips populations recovered from peanuts grown under all three tillage systems.
- Compared to last year's increase in secondary arthropod pests (white grubs) fewer numbers were identified and no damage was observed.
- Throughout the entire sampling period, foliar arthropod populations were extremely low with no significant differences found across all tillage treatments.
- Greater weed populations were observed in no-till systems, and similarly an incrementally significant difference in the numbers of volunteer peanuts was noted in reduced and no-tillage situations.
- In 2005, no significant difference in nematode populations was observed across the three tillage systems; however, a noticeable trend of increasing populations was evident in reduced tillage systems. Nematode information for 2006 was not available at the time of this reporting.
- In previous years, a significantly greater level of infection by southern blight was seen in peanuts grown under conventional practices as opposed to those grown under reduced or no-tillage situations; however, in 2006 no differences were observed.
- In 2006, significantly lower yields were obtained in peanuts grown under strip tillage systems compared to those in no- or conventional-tillage conditions. In 2006, across all systems, lower grades were observed.

Introduction

In 2006, long-term studies initiated at the Ft. Cobb Research Station to observe changes in disease, insect, and weed complexes over time were continued. The objectives of these studies were to assist Oklahoma growers in developing more economic management strategies for conventional and conservation tillage practices in peanut production. Studies were conducted on large plots approaching 76 ft wide by 130 ft long, to be representative of what growers would experience in adopting reduced tillage practices. Peanuts were planted on

May 18, 2006. No insecticides were applied during this study. Standard practices for disease and weed control were used and are outlined in subsequent sections of this report.

Materials and Methods

A soil test was taken at the beginning of the season. Round-Up® herbicide (1 qt/A) + Rush® (1 pt/100 gal) was applied as a burn down on April 12, 2006, to remove winter weeds. On April 27, 100 lbs of 18-46-0 was applied across the test area. In addition, 8 lbs of zinc and 1 lb of boron was also applied. In the conventional treatment plots, a field cultivator was run over the area once on May 17. On the same day, Prowl® (1 qt/A) + glyphosate (1 qt/A), and crop oil (1 qt/A) was applied over the conventional-tilled plots and incorporated with the field cultivator. All remaining tillage systems received a preemergement tank-mix treatment of Prowl® (1 qt/A).

On May 18, all peanuts were planted using the cultivar Tamrun OL 02. After planting, all plots received 0.75 inches of irrigation. On May 25, Gramaxone® Max 5.4 oz + Induce® 1 pt/100 gal was applied. On June 21, a tank mix of Cadre® (2.33 oz/A) plus Butyrac® 200 (1 pt/A) was applied for weed control. On July 18, Basagran® (1.5 pts/A) was applied. No insecticides were applied to any of the plots throughout this trial. Relative to disease control, a program of Bravo® (1.5 pt/A) (June 30), followed by Folicur® (7.2 oz/A) (July 13), and a final application of Folicur® (7.2 oz/A) (August 8) was applied to reduce the threat of leaf spot and/or southern blight. Peanuts were dug on October 31, and harvested on November 11.

Arthropod monitoring and weed populations

Once damage became apparent, thrips populations were monitored on three separate occasions. Ten quadrifoliate leaves were pulled from each plot and placed in 70 percent ethyl alcohol (ETOH) for transportation to the laboratory. Leaves were carefully separated and rinsed in an ETOH solution and the liquid strained for larvae and adults. In 2005, foliar damage (dieback of terminal growth) was observed and grubs were identified as the causative agent. In 2006, further assessments were made and counts taken to identify differences between treatments and to account for any possible yield loss. Grub counts were made on July 28 by sifting through three, 1 ft wide x 3 ft long x 4 in deep, sections of soil within each plot. In addition to grubs, defoliating caterpillars were also assessed using a standard 15-inch insect sweep net. On August 14 and 21, ten sweeps across ten rows in each plot were taken to monitor for defoliating caterpillars or other pest populations (e.g. grasshoppers, leafhoppers, etc.).

Peanut volunteer plants and weed counts were taken shortly after planting. Volunteer counts were taken on two separate occasions throughout the trial, once before a field implement with sweeps was run through the plots and once afterward by taking an average of five quadrates per plot. Weed counts were also taken twice. Weed assessments were made by taking a total of the number of weeds found in a 90 square foot area within each replication. Weed assessments were made before and after herbicide application.

Disease evaluation

The effects of tillage on levels of disease were evaluated. Levels of foliar disease such as leaf spot were low. Ratings of southern blight incident were taken once. Ratings of Sclerotenia were also taken once during the study. On September 22, Sclerotinia numbers were assessed by counting the number of 6-inch row segments with symptoms and/or signs of disease in the middle four rows of each plot.

Plot design and analysis

The plot design was a complete randomized block with four replications of each treatment. An analysis of variance was conducted on the data and a least significant difference (LSD) (P=0.05) test was generated to determine differences 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 insects populations encountered in the tillage test at Ft. Cobb. Thrips were the main problem noticed throughout the season. Populations of defoliating caterpillars, leafhoppers, and grasshoppers were monitored; however, numbers of these insects and their effects on the peanuts were negligible. Table 1 also depicts yield and grade analyses. To reiterate, no insecticides were applied throughout this test. During the early sampling period, low numbers of thrips were seen across all treatments. On the second sampling date, thrips populations increased slightly; however, no significant difference was identified between thrips numbers across all tillage treatments. After a slight decline, no differences in thrips populations were observed during the final sampling period. Significant differences at harvest were identified between treatments, with peanuts planted in strip-till experiencing significantly lower yields than those grown under no-till conditions. However, no significant differences in yield were identified between peanuts grown under no-till and conventional tillage systems. Grades averaged around 66 percent total sound mature kernels (TSMK). While overall grades were down from previous years, no significant differences were observed within the three tillage systems.

Table 2 presents results from an assessment made of white grub, *Phyllophaga* spp. damage across the study site. No visible plant damage was observed across the test site; therefore, no damage readings were taken. No significant differences in grub numbers or defoliators were found across the treatments during the sample date. To assess additional arthropod populations (e.g. leafhoppers, threecornered alfalfa hoppers, defoliators), sweep net samples were taken on August 14 and 21. Results from this sampling revealed extremely low populations and no significant differences between any of the tillage systems.

Information in Table 3 presents results from agronomic evaluations on volunteer and weed presence. No statistical analysis was run for the weed counts; however, no-till had the highest numbers of weeds. Nutsedge, spurge, and carpetweed were the primary plants identified. Similar to the weed counts, volunteer numbers were higher in peanuts grown under no-tillage

Table 1. Mean number of thrips recovered from tillage study at the Caddo Research Station – Ft. Cobb, 2006.

Treatment	Mean Number of Thrips/10 Quadrifoliate Leaves							
	June 2		June 8		June 15		Yield	Grade
	Mean Total Larvae	Mean Total Thrips	Mean Total Larvae	Mean Total Thrips	Mean Total Larvae	Mean Total Thrips	lbs/A	%TSMK[1]
Strip-Till	0.5 a[2]	27.5 a	5.8 a	37.8 a	4.8 a	26.8 a	1657.1 b	66.7 a
No-Till	1.8 a	24.0 a	3.5 a	35.3 a	3.5 a	25.5 a	2107.7 a	66.2 a
Conv. Till	1.5 a	30.8 a	7.8 a	44.5 a	10.3 a	13.5 a	1963.6 ab	65.1 a

[1] TSMK = Total sound mature kernels.
[2] Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD: P=0.05).

Table 2. Mean grub damage and numbers recovered from tillage study at the Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

Treatment	Mean Grub Damage Assessment and Defoliators		
	2006	June 28	June 28
	Mean Total Plant Damage	Mean Total Grubs Recovered	Mean Total Defoliators Recovered
Strip-Till	*	0.5 a[1]	0.0 a
No-Till	*	0.3 a	0.8 a
Conv. Till	*	1.3 a	1.3 a

* No assessments taken.

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

Table 3. Agronomic evaluations on weeds and volunteer peanuts at the tillage study Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

Treatment	Volunteers 22.5 sq ft[1]	Volunteers 22.5 sq ft[2]	Number Weeds/ 90 sq ft[3]	Number Weeds/ 90 sq ft[3]
	June 12	June 27	June 12	June 27
Strip-Till	15.3 b[4]	1.5 a	49.0	3.0
No-Till	26.3 a	1.5 a	160.0	7.0
Conv. Till	4.3 c	1.3 a	12.0	1.0

1 Average of five quadrates, before sweeps (vegetative).

2 Average of five quadrates, after sweeps (flower).

3 Readings were taken in each rep, then added together for the total per treatment.
Readings taken on June 27, were post Cadre® application.
Evaluations were made on all weeds, with the most commonly occurring identified as nutsedge, spurge, and carpetweed.

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

conditions and significant differences in populations across all three treatments were observed early in the study. Once the postemergent application of Cadre® was applied, no differences were observed in weed populations across the three tillage systems.

Information in Table 4 presents results from nematode counts and disease ratings. Nematode samples were taken on separate occasions; however, counts and statistical results were not available at the time of this publication. Disease ratings for Sclerotinia and southern blight were taken once. The average percent damage per treatment for Sclerotinia was determined. While no-till ratings were slightly lower, no significant differences of Sclerotinia or southern blight infection across all treatments were observed.

While certain trends appear to be evident from year to year that may relate to tillage effects on arthropods, weeds, and diseases, no consistent differences in arthropod populations, disease incidence or severity seem evident. The trend in volunteers and weeds seem consistent from year to year, with greater populations being observed in reduced tillage situations.

Table 4. Disease ratings of nematodes, southern blight, and Sclerotinia blight at the tillage study, Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

Treatment	Nematodes		September 22	
	Total #/100cc 2006	Total #/100cc 2006	Avg % SCL[1]	Avg % SBL[2]
Strip-Till	-	-	18.9 a[3]	1.7 a
No-Till	-	-	12.8 a	2.0 a
Conv. Till	-	-	18.2 a	3.1 a

1 SCL = Sclerotinia blight.
2 SBL = Southern blight.
3 Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD: P=0.05).

Management of Sclerotinia and Southern Blights in Oklahoma Peanuts

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

2006 progress made possible through OPC and NPB support

- Pending satisfactory results of quality factors, a decision will be made to release ARSOK-R1 as a high oleic runner-type Sclerotinia-resistant peanut cultivar.
- A moderate level of severity of Sclerotinia blight disease occurred in 2006 due to a late infection and unfavorable environmental conditions that resulted in pod yields that were not significantly different among genotypes tested.
- Overall, grades were low in 2006 with most grades in the 60s with a few in the 50s. The crop was immature with a high percent of other kernels and damaged kernels.
- Georgia Hi OL had the highest yield but also had the highest percent of damaged kernels.
- Percent damaged kernels in all three peanut market types were higher in 2006 than normal.
- Southwest Runner, Georgia 02C, Georgia 03L, and Georgia 04S were the runner types with less than 4 percent damaged kernels.
- On the evaluation date of Oct. 13, with the exception of Tamrun 96 and Tamrun OL 02, all the other runner type cultivars had significantly less Sclerotinia blight disease than the susceptible cultivar Okrun.
- At harvest, all the Georgia cultivars had a statistically similar incidence of Sclerotinia blight as the Sclerotinia blight resistant cultivar Southwest Runner.
- The runner type cultivars and breeding lines had statistically higher yields than the germplasm entries.
- All germplasm entries had a low incidence of Sclerotinia blight with all but two entries with a lower percent incidence than Southwest Runner.
- The two-germplasm entries (R-140 and R-213) had significantly higher pod yields than the other germplasm entries, but a significantly lower pod yield than the runner cultivars and breeding lines.
- Results from the Virginia cultivar trial showed that all four cultivars tested were equally susceptible to Sclerotinia blight and southern blight that resulted in much reduced pod yields. These cultivars should not be planted in a field with a history of soilborne diseases.

- Pronto had the highest grades in the Spanish cultivar trial, but the lowest yield, which is consistent with previous results.
- ARSOK-S1, a Spanish peanut breeding line with moderately elevated oleic content, had similar pod yields, grades, and seed size as Spanco, the standard Spanish cultivar.
- ARSOK-S1 had a similar percent incidence of Sclerotinia blight as Tamspan 90, a resistant Spanish type cultivar.
- OLin, the only commercial Spanish cultivar with a high oleic trait, had similar pod yields as the other Spanish cultivars, but had significantly more Sclerotinia blight disease.
- OLin ranked first in the number of seeds that rode the 19/64 screen among the Spanish cultivars indicating that it has a high percentage of large seeds.
- Southwest Runner, ARSOK-R1, and ARSOK-R2 had the lowest incidence of Sclerotinia blight and had the highest yields at the Stillwater location.

Peanut acreage in Oklahoma has declined in recent years; however, peanuts remain an important economic crop for certain growers. Yield limiting factors such as diseases, adverse weather conditions, weeds, and insects contribute to low yield. Managing irrigation, chemical applications, and tillage practices are some of the avenues used to mitigate these yield-limiting factors, but often become cost prohibitive. Our peanut breeding efforts are focusing on enhancing yield, quality, and disease resistance.

The major emphasis of this research project was to develop high oleic peanut cultivars possessing resistance to Sclerotinia blight disease. The second objective was to identify peanut germplasm with resistance to Sclerotinia blight. The advanced breeding lines and cultivar studies consisted of eleven runner type entries, six Spanish type entries, and four Virginia type cultivars. These studies were conducted at the Caddo Research Station near Ft. Cobb (Caddo County), and at Stillwater (Payne County).

At the Caddo Research Station a herbicide protocol was implemented and a leaf spot fungicide advisory program was used to manage foliar diseases. All plots were irrigated as needed to ensure optimum moisture with a pivot system, except the Stillwater location where a wheel line move was used. All plots at the Caddo Research Station were planted on May 15. The Stillwater plots were planted on May 22. Plot harvest at the Caddo Research Station started on October 4 and concluded on October 14, 2006. The Stillwater plots were harvested October 21. Sclerotinia blight disease readings were made as indicated in Tables 1, 3, 4, 5, and 7.

This project was divided into four parts: 1) evaluation of advanced runner breeding lines and cultivars to their reaction to Sclerotinia blight; 2) evaluation of advanced Spanish breeding lines and cultivars to their reaction to Sclerotinia blight; 3) evaluation of the reaction of Virginia type cultivars to Sclerotinia blight; and 4) identify and select new resistant sources from peanut germplasm to Sclerotinia blight for use in the peanut breeding program at Stillwater. Also, yield and quality of all entries in the tests were determined under the prevailing environmental conditions in Oklahoma in 2006.

Performance of Advanced Runner Breeding Lines and Cultivars in 2006

Data from the advanced runner breeding line and cultivar study at the Caddo Research Station showed that ARSOK-R1, a breeding line with the high oleic trait had significantly lower incidence of Sclerotinia blight at the end of the season reading (October 13) than the susceptible Okrun (Table 1). There was no significant difference of the Sclerotinia blight incidence on October 13 between ARSOK-R1 and the other runner entries tested with the exception of Okrun and Tamrun OL 02. All runner peanut entries at the Caddo Station had similar yields under medium Sclerotinia blight pressure (Table 1). ARSOK-R1 had a higher grade, fewer seeds per ounce, higher 100 seed weight, and a higher percent of seeds riding the 21/64 screen than the standard cultivar Okrun (Table 2). The cultivars Georgia Hi OL and Tamrun OL 01 had the highest weight of 100 seeds (Table 2).

A limited number of advanced runner breeding lines and cultivars were tested in 2006 at Stillwater, for their reaction to Sclerotinia and southern blights as well as their potential pod yield. ARSOK-R1 and ARSOK-R2, two advanced breeding lines, did not significantly (P=0.05) differ from the runner cultivars (Okrun, Southwest Runner, Tamrun OL 01, and Tamrun OL 02) to their reaction to both Sclerotinia and southern blights as well as to their pod yield (Table 3).

Performance of Peanut Germplasm Lines in 2006

The peanut germplasm lines trial in 2006 was located in the high Sclerotinia blight disease area at the Caddo Research Station near Ft. Cobb. ARSOK-R1, a breeding line with the high oleic trait, and all other lines tested had significantly (P=0.05) lower incidence of Sclerotinia blight disease than Okrun on the reading date of September 26 (Table 4). A blight disease of an undetermined etiology caused considerable damage in Valencia C, R-98, R-116, R-228, and R-268 (Table 4). Pod yields of ARSOK-R1, ARSOK-R2, Southwest Runner, and Okrun were not significantly (P=0.05) different (Table 4). One of the

Table 1. Pod yield and incidence of Sclerotinia blight of the advanced runner peanut breeding lines and cultivars, Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

	Sclerotinia Blight[1]			
Entry	Sept. 19	Sept. 26	Oct. 13	Yield lb/A
Okrun	33	52	73	3497
Tamrun 96	24	45	60*	3969
SW Runner	13*[1]	25*	41*	3775
Georgia Green	23	43	50*	3606
Tamrun OL 01	17*	25*	55*	3920
Tamrun OL 02	35	48	70	3896
ARSOK-R1	21	44	57*	3666
Georgia Hi OL	16*	35*	48*	4114
Georgia 02C	23	40	53*	3509
Georgia 03L	18*	32*	53*	4477
Georgia 04S	32	50	50*	3848
PR > F	0.0135	0.0033	0.0003	0.1416
LSD 0.05	13	14	12	NS[2]

1 * indicates that entry had a significantly lower percent incidence of Sclerotinia blight than Okrun.
2 NS indicates that all entries had statistically similar pod yields at the P=0.05 level.

Table 2. Peanut seed quality factors in the advanced runner breeding lines and cultivar study, Caddo Research Station – 2006.

Breeding Line	Average Percent							Seeds/oz[2]	100 Seeds wt (g)
	> 21/64[1]	>18/64	>16/64	OK[1]	DK[1]	Hulls	**TSMK[1]**		
Okrun	19	30	7	7	6	27	**60**	44	54
Tamrun 96	25	22	8	9	6	28	**57**	41	55
SW Runner	14	37	10	7	2	26	**64**	48	47
Georgia Green	18	39	6	4	4	24	**68**	44	53
Tamrun OL 01	29	23	5	6	5	28	**61**	36	67
Tamrun OL 02	18	32	5	9	4	28	**59**	40	59
ARSOK-R1	27	23	9	10	3	24	**63**	39	56
Georgia Hi OL	31	21	3	3	13	26	**58**	35	67
Georgia 02C	29	30	6	5	2	26	**67**	43	54
Georgia 03L	26	34	7	3	0	28	**69**	42	59
Georgia 04S	5	32	18	9	2	27	**63**	56	37

1 21/64, 19/64, and 16/64=screen sizes; OK=other kernels; DK=damaged kernels; TSMK=total sound mature kernels plus sound splits (grade) and is in bold numbers.

2 Seeds per oz was determined by number of seeds riding the 21/64 screen.

Table 3. Pod yield and incidence of Sclerotinia blight of the advanced runner peanut breeding lines and cultivars – Stillwater, Oklahoma, 2006.

Entry	Percent Southern Blight[1]	Percent Sclerotinia Blight[1]	Yield (lb/A)
	Sept. 6	Oct. 4	
Okrun	21	57	2481
SW Runner	16	34	2965
Tamrun OL 01	23	54	2747
Tamrun OL 02	12	47	2698
ARSOK-R2	9	36	3001
ARSOK-R1	17	40	2904
PR > F	0.6891	0.0645	0.2064
LSD 0.05	NS[2]	NS[2]	NS[2]

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 six inches long in a standard row.

2 No statistical difference at the five percent level.

Table 4. Incidence of Sclerotinia blight and pod yield of peanut germplasm at the Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

	Sclerotinia Blight[1] (%)		Unknown Blight[2] (%)	
Entry	Sept. 19	Sept. 26	Sept. 26	Yield (lb/A)
R-88	2	14	13	1730
R-93	1	6	9	1827
R-98	0	8	15	1851
R-101	3	7	1	1646
R-116	3	13	14	1682
R-124	1	6	3	1742
R-137	2	8	2	1730
R-140	5	20	9	2577
R-152	3	9	4	1779
R-179	3	12	6	1965
R-189	1	7	8	1658
R-213	1	10	5	2723
R-228	1	13	17	1694
R-268	1	18	15	1609
Okrun	17	48	0	3412
SW Runner	10	28	2	3352
Valencia A	0	9	8	1682
ARSOK-R2	17	33	1	3715
Valencia C	0	12	19	1646
ARSOK-R1	15	30	0	3739
Pr>F	0.0001	0.0001	0.0063	0.0001
LSD 0.05	4	11	11	414

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 six inches long in a standard row.
2 Percent blighted plants of unknown cause.

germplasm lines, R-213, was used in a breeding program to boost the Sclerotinia blight resistance of ARSOK-R1 and ARSOK-R2. The germplasm entry R-213 was chosen in the crossing program because of its consistent resistance to Sclerotinia blight and its consistent acceptable pod yield in 2003, 2004, 2005, and 2006 (Table 4). In summary, all of the germplasm entries and the Valencia entries have resistance to Sclerotinia blight, but yields and grades that were lower than the standard cultivars (Table 4).

Performance of the Advanced Spanish Breeding Lines and Cultivars in 2006

The 2006 Advanced Spanish Breeding Lines Study was located at the Caddo Research Station near Ft. Cobb. Pod yield of the six entries tested was not significantly (P=0.05) different (Table 5). OLin, a high oleic Spanish cultivar, had significantly (P=0.05) higher Sclerotinia blight disease incidence than Pronto, Tamspan 90, AT 98-99-14, and ARSOK-S1, a medium oleic Spanish breeding line, on October 13 (Table 5). Seed quality factors of the advanced Spanish lines and cultivars are presented in Table 6.

Table 5. Pod yield and incidence of Sclerotinia blight and southern blight of the advanced Spanish peanut breeding lines and cultivars, Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

	Southern Blight (%)	Sclerotinia Blight (%)		
Entry	Aug. 29	Sept. 26	Oct. 13	Yield (lb/A)
Pronto	3	0	8	2698
Spanco	5	1	10	3243
Tamspan 90	0	0	3	3364
OLin	0	4*[1]	16*	3061
AT 98-99-14	2	1	8	3303
ARSOK-S1	0	0	5	3207
PR > F	0.5754	0.0355	0.0218	0.1076
LSD 0.05	NS[2]	3	7	NS[2]

[1] * indicates that entry had a significantly higher percent incidence of Sclerotinia blight than Tamspan 90.
[2] NS indicates that all entries had statistically similar pod yields at the P=0.05 level.

Table 6. Peanut seed quality factors of the advanced spanish breeding lines and cultivar study, Caddo Research Station – 2006.

	Percent								100 Seeds
Breeding Line	> 19/64[1]	>17/64	>15/64	OK[1]	DK[1]	Hulls	**TSMK[1]**	Seeds/oz[2]	wt (g)
Pronto	33	23	6	5	2	27	**66**	54	45
Spanco	29	20	8	5	5	28	**62**	54	44
Tamspan 90	25	23	10	7	1	31	**61**	59	40
OLin	36	15	8	6	2	31	**61**	54	43
AT-98-99-14	28	22	9	5	3	28	**63**	56	41
ARSOK-S1	27	23	8	5	1	33	**61**	57	44

[1] 19/64, 17/64, and 15/64=screen sizes; OK=other kernels; DK=damaged kernels; TSMK=total sound mature kernels plus sound splits (grade) and is in bold numbers.
[2] Seeds per oz was determined by number of seeds riding the 19/64 screen.

Performance of the Virginia Peanut Type Cultivars in 2006

All the Virginia-type cultivars tested in 2006 at the Caddo Research Station, near Ft. Cobb, did not significantly (P=0.05) differ in their reaction to Sclerotinia blight as well as in their pod yield (Table 7). Also, the peanut seed quality factors among the Virginia-type cultivars tested in 2006 at the Caddo Research Station, near Ft. Cobb were similar except the cultivar Virugard had the least 100 seed weight and the least percentage of kernels riding the 21/64 screen (Table 8).

Anticipated Release of ARSOK-R1, a High Oleic Runner-type Peanut Breeding Line

Seed increase of this breeding line in 2006 was carried out at three locations in Oklahoma (Stillwater, Ft. Cobb, and Colony). Seed of ARSOK-R1 from six lots along with Okrun and Tamrun OL 02 are currently being evaluated for seed quality, chemical composition, and roasting characteristics. These tests should conclude by the end of February 2007. Pending satisfactory results of the quality factors, a decision will be made to release ARSOK-R1 as a high oleic runner-type Sclerotinia resistant peanut cultivar.

Cooperation in these studies was provided by Doug Glasgow, Ken Jackson, and Lisa Myers, USDA-ARS and Jerald Nickels and Bruce Greenhagen, Plant and Soil Science. Bobby Weidenmaier and Mike Brantes of the Oklahoma Agricutlural Experiment Station provided support and cooperation at the Caddo Research Station at Ft. Cobb.

Table 7. Pod yield and incidence of Sclerotinia blight and southern blight of Virginia-type peanut cultivars, Caddo Research Station – Ft. Cobb, Oklahoma, 2006.

	Southern Blight (%)	Sclerotinia Blight (%)		
Entry	Aug. 29	Sept. 26	Oct. 13	Yield (lb/A)
Brantley	8	30	48	2493
Jupiter	5	24	45	2819
Perry	2	31	48	3013
Viruguard	3	27	45	2710
PR > F	0.6123	0.7751	0.8744	0.3956
LSD 0.05	NS[1]	NS[1]	NS[1]	NS[1]

[1] NS indicates that all entries had statically similar data at the P=0.05 level.

Table 8. Peanut seed quality factors of the Virginia-type cultivar trial, Caddo Research Station – 2006.

	Average Percent								100 Seeds
Cultivar	> 21/64[1]	>18/64	>16/64	OK[1]	DK[1]	Hulls	**TSMK[1]**	Seeds/oz[2]	wt (g)
Brantley	42	7	3	4	8	27	**62**	29	82
Jupiter	35	18	4	4	7	26	**63**	33	71
Perry	43	14	5	5	5	26	**61**	30	75
Virugard	23	28	6	7	7	25	**61**	40	57

[1] 21/64, 19/64, and 16/64=screen sizes; OK=other kernels; DK=damaged kernels; TSMK=total sound mature kernels plus sound splits (grade) and is in bold numbers.
[2] Seeds per oz was determined by number of seeds riding the 21/64 screen.

Peanut Variety Test and Uniform Peanut Performance Test Results for Oklahoma

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2006 progress made possible through OPC and NPB support

- Runner variety ARSOK-R1 (advance breeding line) was in the top group for yield at all three locations and two-year yield and grades have also been at or near the top.
- Spanish variety AT 98-99-14 was at or near the top in regards to yield at all locations.
- No consistent yield or grade differences were observed in the Virginia test.

Oklahoma Variety Tests

Numerous peanut lines and varieties were evaluated in performance tests during 2006. Varieties that did not perform well in previous years or were not high oleic varieties were eliminated from the 2006 trials. As in 2005, advanced peanut lines were included in the tests so Oklahoma producers can compare the new breeding lines with familiar commercial varieties. Yields and grades for 2006 are presented in Tables 1 to 3 and the two-year averages for yield and grade are presented in Tables 4 and 5. Results from the Uniform Peanut Performance Test are given in Table 6. The Uniform Peanut Performance Test is a trial set up to screen advanced breeding lines in several growing environments.

2006 peanut crop overview

The 2006 peanut production season in Oklahoma was characterized as extremely hot and dry. For many areas in Oklahoma this past growing season will go down among the driest in recorded history. Planted acreage of this year's peanut crop was measured at 23,000 acres and an estimated 22,000 acres were harvested. Average yield at the time of this report was estimated at 3,000 lbs per acre. Although poor growing conditions were encountered across much of Oklahoma, a few locations received timely rain and cooler temperatures during peak flowering to help save their peanut crops. Summer temperatures in excess of 100°F for an extended period of time resulted in a large number of flowers to abort and pod set in general was late compared to an average year. Delayed pod set resulted in maturity problems for some of the runners, we simply ran out of daylight to fully mature some fields of peanuts. As a result, grades have been a little lower than normal.

Pest problems

For the most part no major widespread pest problems were observed during the 2006 growing season. Plant disease pressure was lower than normal during the 2006 growing season, mainly due to the dry growing conditions that most of the state observed.

Methods

Test locations were located in Major, Beckham, and Caddo counties. Test plots were planted using two 36-inch rows that were 21 feet long. The exception to this was at Major County where rows were 30 inches. Plots were seeded at a rate of four to five seeds per row foot. Tests were conducted using randomized complete block design with four replications. All locations were irrigated. The locations in Major and Beckham counties were strip-tilled prior to planting, while the Caddo County location was conventionally tilled. All variety tests were conducted under an extensive pest management program. The objective was to prevent as much outside influence from pest (weed, disease, and insect) pressures on yield and grade as possible.

Interpreting data

Details of establishment and management of each test are listed in footnotes below the tables. Least significant differences (LSD) are listed at the bottom of all but the Performance Summary tables. Differences between varieties are significant only if they are equal to or greater than the LSD value. If a given variety out yields another variety by as much or more than the LSD value, then we are 95 percent sure that the yield difference is real, with only a 5 percent probability that the difference is due to chance alone. For example, if variety X is 500 lbs/acre higher in yield than variety Y, then this difference is statistically significant if the LSD is 500 or less. If the LSD is 500 or greater, then we are less confident that variety X really is higher yielding than variety Y under the conditions of the test.

Results reported here should be representative of what might occur throughout the state but would be most applicable under environmental and management conditions similar to those of the tests. The relative yields of all peanut varieties are affected by crop management and by environmental factors including soil type, summer conditions, soil moisture conditions, diseases, and insects.

Uniform Peanut Performance Test

The Uniform Peanut Performance Test is composed of runner and Virginia-type advanced lines with the potential to become variety releases from plant breeders in the United States. Commercial check varieties are included for comparison purposes (Table 6).

Appreciation is expressed for the cooperation and tremendous assistance from:

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Mike Brantes, Field Foreman
Kyle Scaggs, Field Assistant

Mark DeLeon, Beckham County
Howard Reimer, Major County

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Table 1. Peanut variety and advanced lines test results – Beckham County, 2006.

Variety or line	Yield (lb/A)[2]	Grade (% TSMK)[2,3]
Runner[1]		
Tamrun OL 02	5322	68
Tamrun OL 01	5286	71
ARSOK-R1	5273	75
Tamrun 96	5250	71
Okrun	4910	71
GA Hi OL	4687	72
Georgia Green	4379	73
SW Runner	4238	69
GA 03L	4179	69
GA 04S	3639	65
GA 02C	3584	71
LSD 0.05	417	4
Spanish[1]		
Spanco	3930	72
AT 98-99-14	3843	71
OLin	3612	69
Tamspan 90	3526	70
ARSOK-S1	3421	69
Pronto	3326	72
LSD 0.05	416	ns
Virginia[1,4]		
Brantley	4456	72
Jupiter	4147	73
Perry	4102	72
LSD 0.05	ns	ns

1 Market type.
2 Runner average – 4613 lb/A, 70% TSMK; Spanish average – 3610 lb/A, 70% TSMK; Virginia average – 4235 lb/A, 72% TSMK.
3 % TSMK = Percent total sound mature kernels.
4 % Virginia pods: Brantley – 98%, Jupiter – 86%, Perry – 93%; LSD 0.05 – 4%; average – 92%.

Table 2. Peanut variety and advanced lines test results – Caddo County, 2006.

Variety or line	Yield (lb/A)[2]	Grade (% TSMK)[2,3]
Runner[1]		
GA HI OL	4764	73
ARSOK-R1	4737	69
Tamrun OL 01	4333	70
Georgia Green	4324	72
GA 03L	4292	69
Tamrun OL 02	4283	67
Tamrun 96	4125	70
SW Runner	4097	67
GA 04S	4007	64
GA 02C	3957	70
Okrun	3766	68
LSD 0.05	406	3
Spanish[1]		
AT 98-99-14	4061	63
Spanco	3979	67
Tamspan 90	3889	66
OLin	3802	66
ARSOK-S1	3771	66
Pronto	3653	67
LSD 0.05	ns	2
Virginia[1,4]		
Jupiter	4111	67
Brantley	4057	68
Perry	4029	70
LSD 0.05	ns	1

1 Market type.
2 Runner average – 4244 lb/A, 69% TSMK; Spanish average – 3859 lb/A, 66% TSMK; Virginia average – 4066 lb/A, 68% TSMK.
3 % TSMK = Percent total sound mature kernels.
4 % Virginia pods: Brantley – 95%, Jupiter – 89%, Perry – 91%; LSD 0.05 – ns; average – 92%.

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Table 3. Peanut variety and advanced lines test results – Major County, 2006.

Variety or line	Yield (lb/A)[2]	Grade (% TSMK)[2,3]
Runner[1]		
Tamrun 96	5490	74
Georgia Green	5400	74
Tamrun OL 02	5372	72
Tamrun OL 01	5064	76
GA 03L	4987	72
GA 02C	4773	74
GA 04S	4773	70
GA Hi OL	4760	75
ARSOK-R1	4728	78
Okrun	4669	73
SW Runner	4193	73
LSD 0.05	ns	2
Spanish[1]		
Tamspan 90	5177	68
AT 98-99-14	5173	68
ARSOK-S1	5073	69
OLin	5028	70
Spanco	4773	71
Pronto	4420	74
LSD 0.05	ns	3
Virginia[1,4]		
Brantley	5457	72
Perry	4822	72
Jupiter	4102	73
LSD 0.05	ns	ns

[1] Market type.
[2] Runner average – 4928 lb/A, 74% TSMK; Spanish average – 4941 lb/A, 70% TSMK; Virginia average – 4794 lb/A, 72% TSMK.
[3] % TSMK = Percent total sound mature kernels.
[4] % Virginia pods: Brantley – 99%, Jupiter – 95%, Perry – 98%; LSD 0.05 – 2%; average – 97%.

Table 4. Peanut variety and advanced lines test results – Beckham County, 2005-2006.

Variety or line	Yield (lb/A)[2]	Grade (% TSMK)[2,3]
Runner[1]		
ARSOK-R1	4456	74
Tamrun OL 02	4218	70
Tamrun 96	4190	72
Tamrun OL 01	4072	72
Okrun	4011	70
GA Hi OL	3723	73
Georgia Green	3582	73
GA 03L	3183	67
GA 04S	3049	65
SW Runner	3008	69
GA 02C	2795	72
LSD 0.05	1155	2
Spanish[1]		
AT 98-99-14	2902	72
Spanco	2854	73
OLin	2754	71
Tamspan 90	2666	72
ARSOK-S1	2654	71
Pronto	2534	73
LSD 0.05	ns	ns
Virginia[1,4]		
Brantley	3907	71
Perry	3421	71
Jupiter	3403	71
LSD 0.05	ns	ns

[1] Market type.
[2] Runner average – 3663 lb/A, 71% TSMK; Spanish average – 2727 lb/A, 72% TSMK; Virginia average – 3577 lb/A, 71% TSMK.
[3] % TSMK = Percent total sound mature kernels.
[4] % Virginia pods: Brantley – 96%, Jupiter – 85%, Perry – 94%; LSD 0.05 – 3%; average – 92%.

Table 5. Peanut variety and advanced lines test results – Caddo County, 2005-2006.

Variety or line	Yield (lb/A)[2]	Grade (% TSMK)[2,3]
Runner[1]		
ARSOK-R1	3952	70
Tamrun OL 02	3930	68
GA 02C	3830	73
Tamrun 96	3700	71
GA Hi OL	3675	73
Okrun	3675	69
GA 03L	3621	70
Tamrun OL 01	3619	70
SW Runner	3596	67
GA 04S	3351	68
Georgia Green	3337	72
LSD 0.05	ns	3
Spanish[1]		
AT 98-99-14	3224	67
Tamspan 90	3192	69
ARSOK-S1	3147	69
Spanco	3061	69
OLin	2999	67
Pronto	2761	69
LSD 0.05	ns	ns
Virginia[1,4]		
Perry	3766	72
Jupiter	3648	70
Brantley	3508	70
LSD 0.05	ns	ns

[1] Market type.
[2] Runner average – 3662 lb/A, 70% TSMK; Spanish average – 3064 lb/A, 68% TSMK; Virginia average – 3641 lb/A, 71% TSMK.
[3] % TSMK = Percent total sound mature kernels.
[4] % Virginia pods: Brantley – 94%, Jupiter – 82%, Perry – 89%; LSD 0.05 – 7%; average – 88%.

Table 6. Uniform Peanut Performance Test results – Ft. Cobb Research Station, 2006.

Variety or line	Market Type[1]	Yield (lb/A)	Grade (% TSMK)	Seed Weight (g/100 seeds)	Percent Virginia Pods
ARSOK-R1	Ru.	5058	72.1	62.0	56.9
UF 06304	Lg. Ru.	5003	68.3	69.5	80.8
GA 012535	Va.	4798	71.6	87.5	94.1
UF 05309	Lg. Ru.	4398	71.5	65.1	82.4
Florunner[2]	Ru.	4271	68.6	54.9	33.9
N01013T	Va.	4096	70.8	85.0	90.0
CRSP925	Lg. Ru.	4066	70.1	65.2	78.6
N03091T	Va.	4029	70.7	89.0	89.1
VT 976133	Va.	4023	71.9	88.6	89.9
GA 012519	Va.	3975	75.7	67.2	71.3
UF 03514	Lg. Ru.	3963	72.9	65.2	71.3
NC 7[3]	Va.	3908	71.9	79.8	88.4
N03089T	Va.	3860	73.6	89.1	90.5
GA 012517	Ru.	3805	76.3	56.2	47.7
CRSP648	Lg. Ru.	3606	69.3	66.2	89.1
LSD 0.05		533	2.0	8.4	6.7

[1] Market type as proposed by participating breeder. Va. = Virginia, Ru. = Runner, Lg. Ru. = Large Runner.
[2] Check for Runner lines.
[3] Check for Virginia lines.

Field Studies for Control of Peanut Diseases

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2006 progress made possible through OPC and NPB support

- Fungicide programs for soilborne diseases did not control Pythium pod rot. Planting resistant varieties is a better approach for pod rot control.
- Fungicide programs for Scleotinia blight increased yields of all varieties currently available. However, Virginia varieties did not yield well under Sclerotinia blight pressure regardless of the fungicide program.
- The breeding line ARSOK-R1 had slightly better resistance to Sclerotinia blight than Tamrun OL 02, but yielded less regardless of the fungicide program.
- Reduced fungicide programs consisting of two to three applications timed according to the calendar or the Early Leaf Spot Advisory Program continued to be effective in western production areas.
- Fungicide programs for leaf spot that include Headline® continue to provide superior disease control.

Seven field trials were completed in 2006 that addressed the management of important peanut diseases in Oklahoma. The management strategies evaluated included chemical control and disease-resistant varieties. Efforts were made to develop and demonstrate a range of input levels for the fungicide programs. The diseases studied included early leaf spot, southern blight, Sclerotinia blight, and Pythium pod rot. Cooperation in these studies was provided by Hassan Melouk and Ken Jackson, USDA-ARS in Stillwater and Jerald Nickels, Bruce Greenhagen, and Chad Godsey, Department of Plant and Soil Sciences. Appreciation is expressed to Mark DeLeon (Beckham County) who provided time and resources as a cooperator for the trials at Erick. Bobby Weidenmaier, Jerry Howell, and Mike Brantes at the Caddo Research Station; Rick Matheson at the Agronomy Research Station in Perkins; and Rocky Walker and Brian Heid at the Plant Pathology Farm in Stillwater also are acknowledged for their support and cooperation that made the trials at the research stations a success.

The field studies in 2006 served several purposes. The first was to identify and refine better strategies for managing diseases. The second was to use the trials 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 2006 are summarized in this report. In interpreting the results, small differences in treatment values should not be overemphasized. Least significant differences (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 2006, weather was not particularly favorable for crops in general and peanuts in particular. Hot and dry conditions prevailed in May and June, which favored rapid stand establishment. However, pre-irrigation was necessary for planting at most locations. Rainfall was near normal for July and August at the various locations, but temperatures were above normal. There were about 30 days over 100°F. As result of the hot weather, pod set was delayed. Below normal temperatures in September further delayed crop development. Leaf spot developed at most locations but did not reach damaging levels. Southern blight became a problem in late August and was a problem statewide. Sclerotinia blight appeared in late August, a month later than normal, but still reached damaging levels. Pythium pod rot was severe in the trials at Erick.

Yields and grades were below those experienced in 2005, particularly at Perkins where insufficient water was applied.

Sclerotinia Blight

Sclerotinia blight remains a destructive disease in Oklahoma. It occurs in all areas of the state except in far southwestern production areas. Industry preferences have resulted in the loss of Tamrun 96 and Tamrun OL 01 as high yielding runner varieties with moderate resistance to Sclerotinia blight. Trials on management of Sclerotinia blight were conducted at the Caddo Research Station. The trials focused on evaluating fungicide programs, and determining the response of primarily high oleic:linoleic (O/L) varieties and a promising breeding line (ARSOK-R1) to fungicide programs.

Evaluation of fungicide programs

The objective of this study was to evaluate the disease and yield responses of Tamrun OL 02 peanuts to low, moderate, and high levels of the fungicides Omega® and Endura® for control of Sclerotinia blight. The fungicides were also compared using preventive (before disease appeared) and demand (at the first appearance of disease or 90 days after planting, whichever came first) application timings.

Southern blight appeared in mid August. The demand applications were made 90 days after planting, before Sclerotinia blight appeared. Sclerotinia appeared in mid September and increased to moderate levels by harvest (Table 1). Fungicides had little effect on southern blight as little appeared in the untreated check plots. However, the disease was severe in some plots. All of the fungicide programs reduced Sclerotinia blight compared to the untreated check. All of the fungicide programs statistically increased yields compared to the check except for Omega® programs using 1 pt (1 or 2 applications), a single application of Omega® at 1.5 pt, and the single application of Endura® applied on the first demand timing. The same rate (10 oz) of Endura® was more effective when applied on the second demand timing. Endura®/Omega® programs were effective and there was no difference in the order of applying the two products. When Endura® was applied twice preventively, there was no difference in the 8 and 10 oz rate in yield. The best results were achieved when single applications were made that exceeded the amount allowed per application, but were less that the seasonal amount allowed (Omega® 2.0 pt, Endura® 14.4 oz). Given the cost of the treatments ($4/oz for Endura® and $40 pt of Omega®), net returns (crop value less chemicals costs) were increased above the untreated check for all fungicide programs except for Omega® at 1 pt/A applied twice preventively.

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. Peanut cultivars

Table 1. Effect of fungicide programs on control of Sclerotinia blight and southern blight on Tamrun OL 02 peanuts at the Caddo Research Station – Ft. Cobb, 2006.

Treatment and rate/A (timing)[1]	Southern blight (%)	Sclerotinia blight (%)	Yield (lb/A)	Crop value ($/A)[2]
Omega® 4F 1.5 pt (P1,P2)	0.0	25.2	4022	651
Omega® 4F 1 pt (P1,P2)	3.7	26.7	3601	583
Endura® 70WG 10 oz (P1,P2)	7.2	17.7	3826	619
Endura® 70WG 8 oz (P1,P2)	1.2	28.5	3935	637
Endura® 70WG 10 oz (P1) Omega® 4F 1.5 pt (P2)	5.2	16.2	4022	651
Omega® 4F 1.5 pt (P1) Endura® 70WG 10 oz (P2)	0.0	19.5	4044	654
Omega® 4F 1 pt (D1)	3.7	34.0	3507	567
Omega® 4F 1.5 pt (D1)	0.7	38.2	3659	592
Omega® 4F 2.0 pt (D1)	0.0	14.5	4029	652
Endura® 70WG 10 oz (D1)	5.7	29.0	3448	558
Endura® 70WG 10 oz (D2)	8.7	12.7	3906	632
Endura® 70WG 14.4 oz (P1)	0.0	13.0	4487	726
Check	1.7	54.5	3122	505
LSD (P=0.05)[3]	4.9	11.1	658	106

1 Preventive timings (P) correspond to the application dates of P1=July 20 and P2=Aug. 17. Demand timings (D) correspond to the application dates of D1=Aug. 17 and D2=Sept. 7.
2 Crop value based on an average grade of 64% TSMK.
3 Fisher's least significant difference (LSD).

have different reactions to Sclerotinia blight and may require specific levels of fungicide input for optimum control of Sclerotinia blight. Previous research has shown that economic returns from Omega® are generally positive for susceptible varieties such as Okrun and breakeven for moderately resistant cultivars such as Tamrun 96 and Tamrun OL 01. Economic returns are almost always negative for Omega® when used on resistant varieties such as Tamspan 90 and Southwest Runner. However, Tamrun 96 and Tamrun OL 01 are no longer available. Runner varieties available to be planted in Oklahoma now consist of entirely high O/L types. The objective of this study was to evaluate the disease and yield responses of high O/L runner varieties (Tamrun OL 02 and Flavor Runner 458), a promising breeding line (ARSOK-R1), and Virginia varieties (Jupiter and Brantley) available in Oklahoma to low, moderate, and high levels of the fungicides Omega® and Endura® for control of Sclerotinia blight.

Fungicide programs consisted of two preventive applications of Omega® at 1.5 pt/A. This treatment is excessively expensive ($120/A), but was included to measure yield loss to Sclerotinia blight. The other treatments were single demand applications of Omega® at 1.5 pt ($60/A) and 2 pt ($80/A) and Endura® at 10 oz/A ($40). Fungicide programs were applied to Georgia Green, Tamrun 96, and Tamrun OL 02.

Southern blight appeared in late August and was more severe on the Virginia varieties than on the runner varieties (data not shown). Sclerotinia blight was first observed in early September and increased to moderate levels by harvest. In untreated plots, ARSOK-R1 had the lowest level of disease while Brantley was most susceptible (Table 2). However, none of the varieties showed good resistance. All of the fungicide programs reduced Sclerotinia blight compared to the untreated check except for Endura® on FR 458. Fungicide programs performed similarly and reduced disease by about 50 percent. Yields were lower than those achieved in 2005. In untreated plots, yields were below 3000 lb/A for all varieties. Fungicide programs increased yields of all varieties. Averaged over varieties, yield increases were greatest for the two application program of Omega® (1200 lb/A) and the single application of Omega® at 2 pt/A (1000 lb/A). Averaged over treatments, yields were highest for Tamrun OL 02, intermediate for ARSOK-R1 and FR 458, and lowest for the Virginia varieties. Grades were low and combined with the low yields resulted in low crop values. Treatments and variety effects on crop value were similar to those for yield. Despite the low yields and grades, net returns (crop value minus treatment costs) were greater than the check for all varieties. The most profitable management program tested was to use 2 pt/A or more of Omega® on Tamrun OL 02.

Southern Blight, Limb Rot, and Pod Rot

Southern blight, limb rot, and pod rot are damaging soilborne diseases that can occur statewide. Southern blight appears to be declining in importance as acreage along the Red River in southern Oklahoma declines. A moderate level of resistance to these diseases occurs in Tamspan 90, but on runner and Virginia varieties, effective management relies on the use of fungicide. Fungicide programs are recommended in fields with a history of damage from southern blight and limb rot. Folicur®, Abound®, and Moncut® have provided good to excellent control of these diseases. Headline® is also registered for use on southern blight and limb rot, but control of southern blight has not been comparable to the other products and data on limb rot control in Oklahoma with Headline® has not been developed. Except for Moncut®, which must be tank-mixed with another fungicide, these fungicides are also effective against foliar diseases. Pod rot can be caused by *Rhizoctonia*, which also causes limb rot, Pythium, or both fungi in combination. Pod rot control has relied on planting partially resistant varieties and avoiding highly susceptible varieties such as Florunner, AT-1, and NC-7. OSU data on pod rot control with fungicides has been inconclusive. However, Abound® is being used by many growers to control this disease. Research is still needed to assess the benefits and economic returns from using these fungicides. The objective of this study was to evaluate fungicide programs with various registered and experimental fungicides on control of soilborne diseases (southern blight, limb rot, and pod rot) and foliar diseases on a Virginia-type variety in western Oklahoma.

Evaluation of fungicide programs

Fungicide programs consisting of five applications on a 14-day schedule were compared to an untreated check and a full-season Bravo® program to control only leaf spot. Programs designed to control soilborne diseases included Folicur® alternated with either Abound® or Headline® at 12 and 15 fl oz, a single application of Abound®, and two applications of Provost, an experimental fungicide slated to replace Folicur®.

Early leaf spot was severe in this trial and soilborne diseases were not evident until after digging when it became apparent that Pythium pod rot was a severe problem. All of the fungicide programs provided good leaf spot control (less than 10 percent defoliation), although leaf spot levels were higher in the two-application Abound® treatment compared to other fungicide

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Table 2. Responses of peanut varieties to fungicide programs for control of Sclerotinia blight at the Caddo Research Station, 2006.

Treatment and rate/A (timing)[1]	Tamrun OL 02	FR 458	ARSOK-R1	Jupiter	Brantley	mean[2]
	Sclerotinia blight (%)					
Omega® 4F 1.5 pt (P1, P2)	26 b[3]	26 b	25 b	35 b	23 c	27
Omega® 4F 1.5 pt (D1)	26 b	41 b	28 b	41 b	38 b	35
Omega® 4F 2 pt (D1)	24 b	33 b	19 b	35 b	25 c	28
Endura® 70WG 10 oz (D1)	31 b	44 ab	25 b	45 b	30 bc	35
Check	52 a	63 a	48 a	66 a	80 a	62
mean[4]	32	42	29	45	39	
LSD (P=0.05)[5]	12	21	13	13	10	
	Yield (lb/A)					
Omega® 4F 1.5 pt (P1, P2)	4501	3463	3477	3136	2998	3515 a
Omega® 4F 1.5 pt (D1)	3536	2875	3129	2280	2555	2875 c
Omega® 4F 2 pt (D1)	4145	3260	3572	2722	3064	3353 ab
Endura® 70WG 10 oz (D1)	3311	3093	3136	2577	3049	3033 bc
Check	2875	2323	2555	2127	1822	2341 d
mean[6]	3674 a	3003 b	3174 b	2569 c	2698 c	
LSD (P=0.05)[5]						357
	Crop value ($/A)[7]					
Omega® 4F 1.5 pt (P1, P2)	709	548	575	507	488	566 a
Omega® 4F 1.5 pt (D1)	557	455	517	369	416	463 c
Omega® 4F 2 pt (D1)	653	516	590	440	499	540 ab
Endura® 70WG 10 oz (D1)	522	490	518	417	496	489 bc
Check	453	368	422	344	297	377 d
mean[8]	579 a	475 c	525 b	416 d	439 cd	
LSD (P=0.05)[5]						57

1 Preventive timings (P) correspond to the application dates of P1= July 20 and P2= Aug. 17. The demand timing (D) corresponds to the application date of D1=Aug. 17.
2 Averaged over varieties. Values in a column followed by the same letter are not statistically different at P=0.05.
3 Values in a column followed by the same letter are not statistically different at P=0.05.
4 Averaged over treatments.
5 Fisher's least significant difference (LSD).
6 Averaged over treatments. LSD for varieties=259.
7 Based on an average grade (%TSMK) of 62 for Tamrun OL 02, 62 for FR 458, 66 for ARSOK-R1, 64 for Jupiter, and 65 for Brantley.
8 Averaged over treatments. LSD for varieties=42.

programs (Table 3). Pod rot occurrence was not uniformly distributed across the trial and while there were trends for reduced pod rot with some treatments, the effect of treatment on pod rot was not statistically significant. The two-application program with Abound® had the lowest pod rot. Yields were high in this trial but were variable. While some fungicide programs had 1000 lb/A higher yields than the untreated check, the differences also were not statistically significant. Control of leaf spot appeared to account for the higher yields as the full-season Bravo® program was among the highest yielding programs. The good grades and high yields in this

Table 3. Effect of fungicide programs on control of Pythium pod rot and foliar disease of Jupiter peanuts at the DeLeon Farm – Erick, 2006.

Treatment and rate/A (timing)[1]	Early leaf spot (%)[2]	Defoliation (%)[3]	Pod Rot (%)	Yield (lb/A)	Crop Value ($/A)[4]
Check	94	72.5	27	4682	813
Bravo® 720 1.5 pt (1-5)	27	1.7	18	5245	911
Absolute® 4.17F 3.5 fl oz (1,4) Provost 3.6F 8 fl oz (2,3) Echo® 6F 1.5 pt (5)	22	1.3	24	5544	963
Bravo® 6F 1.5 pt (1,3,4,5) Abound® 2.08F 18.4 fl oz (2)	21	2.1	17	5454	947
Headline® 2.08E 15 fl oz (1,3) Folicur® 3.6F 7.2 fl oz (2,4) Bravo® 6F 1.5 pt (5)	9	0.0	27	5345	928
Abound® 2.08F 18.4 fl oz (1,3) Folicur® 3.6F 7.2 fl oz (2,4) Bravo® 6F 1.5 pt (5)	55	9.2	10	5517	958
Headline® 2.08E 12 fl oz (1,3) Folicur® 3.6F 7.2 fl oz (2,4) Bravo® 6F 1.5 pt (5)	18	0.0	20	5608	974
LSD (P=0.05)[5]	11	16.9	NS	NS	NS

1 Application numbers 1-5 correspond to spray dates for the calendar programs of 1=July 5, 2=July 19, 3=Aug. 2, 4=Aug. 16, and 5=Aug. 30. The adjuvant Induce® was added at 0.25 percent of the total spray mixture to V-10116 applications, and at 0.06 percent of the total spray to Absolute® and Folicur® applications.

2 Percentage of leaflets with symptoms (including defoliation) on Oct. 9.

3 Percentage of leaflets defoliated on Oct. 9.

4 Crop value based on an average grade of 70% TSMK.

5 Fisher's least significant difference (LSD), NS=treatment effect not significant at $P \leq 0.05$.

study resulted in crop values of more than $900/A for all of the fungicide programs. Increases in crop value for the fungicide programs, while not statistically significant, generally offset the costs of the fungicide programs.

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 from 500 to 700 lb/A. However, losses exceeding 1000 lb/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 six sprays per 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 the research on foliar diseases is to identify new chemistries for control of foliar diseases and to develop effective reduced application programs.

Evaluation of fungicide programs

Fungicide programs were evaluated for control of early leaf spot on Tamspan 90 at the Agronomy Research Station in Perkins. Experimental fungicides evaluated were Provost and V-10116. Provost is slated to replace Folicur®. A reduced fungicide program consisting of Headline® and Tilt®/Bravo® applied in alternation when recommended by the Early Leaf Spot Advisory Program (http://agweather.

mesonet.org) was evaluated in comparison to the same fungicides applied according to the calendar.

Pressure from leaf spot was low and the disease did not increase until September. Sclerotinia blight also developed late in the season. All spray programs reduced leaf spot compared to untreated check (Table 4). Disease control with the experimental fungicide V-10135 was good when used in programs with Headline®, but not when applied in a four-spray block program. The weather-based advisory program recommended another application in early September, but it was not made due to the low disease pressure at this site. Fungicide programs that included Headline® gave the best disease control. Disease control with full-season Bravo® programs at 1 and 1.5 pt/A were similar. Endura®, used for Sclerotinia blight, was very effective against leaf spot when used season long. Endura® also provided excellent control of Sclerotinia blight. Sclerotinia blight was also low in check plots and the four-spray V-10116 programs where significant defoliation from leaf spot helped prevent disease development. The trial did not receive sufficient irrigation to produce high yields and grades given the hot and dry summer. As a result of the low disease pressure and yield potential, yields and crop values did not differ among treatments.

Evaluation of full-season and reduced fungicide programs in Beckham County

In southwestern production areas, soilborne diseases have not been severe; however, early leaf spot has been a problem in fields where peanuts are cropped continuously. In previous trials in the area, excellent control of early leaf spot followed a reduced calendar program consisting of three applications made on 14-day intervals beginning about August 1. The objective of this study was to compare reduced fungicide programs made according to the weather-based Early Leaf Spot Advisory Program and the three-application calendar program to full-season calendar programs that included various registered and experimental fungicides.

Early leaf spot developed to moderate levels at this location. Untreated check plots had over 90 percent leaf spot and were 50 percent defoliated, just reaching levels of disease that cause yield loss. All of the fungicide programs except for the experimental fungicide V-10135 provided good disease control, resulting in less than 5 percent defoliation (Table 5). The weather-based advisory program recommended another application in early September, but it was not made due to the low disease pressure at this site. Fungicide programs that included Headline® gave the best disease control. Disease control with full-season Bravo® programs at 1 and 1.5 pt/A were similar. Pythium pod rot also was a problem, but none of the fungicide programs reduced this disease. Leaf spot pressure was not sufficient to reduce yields, which were high in this trial and did not differ among treatments. Because of the low disease pressure, fungicide programs for early leaf spot were not profitable.

Evaluation of tebuconazole formulations

Folicur® (tebuconazole) has been registered since 1995 for use on peanuts to control leaf spots and soilborne diseases such as southern blight and limb rot. Various generic formulations of tebuconazole are now registered for use on peanuts. A trial was conducted to compare TriSum®, a new generic formulation, to Folicur® for control of leaf spot at the Agronomy Research Station in Perkins on Tamspan 90 peanuts. Both Folicur® and TriSum® provided good leaf spot control and differences between the two products were not observed. Problems with leaf spot control observed with tebuconazole in previous years were not apparent in this trial. The addition of Bravo® or Topsin® to TriSum® did not increase disease control.

Table 4. Effect of fungicide programs on control of early leaf spot on Tamspan 90 peanuts at the Agronomy Research Station – Perkins, 2006.

Treatment and rate/A (timing)[1]	Early leaf spot (%)[2]	Defoliation (%)[3]	Sclerotinia blight (%)	Yield (lb/A)	Crop value ($/A)[4]
Check	87	55.0	4	2119	314
Bravo® 6F 1.5 pt (1,6) Headline® 2.08F 9 fl oz (2,4) Folicur® 3.6F 7.2 fl oz (3,5)	3	0.0	17	2199	326
Bravo® 6F 1.5 pt (1,6) Headline® 2.08F 9 fl oz (2,4) V-10116 50WD 4 oz (3,5)	4	0.0	20	2337	346
Bravo® 6F 1.5 pt (1,3,5,6) Headline® 9 fl oz (2,4)	1	0.0	17	2294	340
V-10116 50WD 3 oz (1,3,5,6) Headline® 9 fl oz (2,4)	14	0.8	21	2562	380
Bravo® 6F 1.5 pt (1,6) V-10135 50WD 1 lb (2-5)	63	22.1	8	2301	341
Endura® 70WG 8 oz (1-6)	8	0.0	0	3216	477
Bravo® 6F 1.5 pt (1-6)	9	0.0	12	2366	351
Bravo® 6F 1.0 pt (1-6)	17	0.0	12	2323	344
Tilt®/Bravo® 4.3SE 1.5 pt (1-6)	5	0.0	17	2352	349
Absolute® 4.17F 3.5 fl oz (1,3,5) Echo® 6F 1.5 pt (2,4,6)	6	0.0	16	2424	359
Absolute® 4.17F 3.5 fl oz (1,3) Provost 3.6F 5 fl oz (2,4,6) Echo® 6F 1.5 pt (5)	7	0.0	14	2497	370
Bravo® 6F 1.5 pt (1,6) Folicur® 3.6F 7.2 fl oz (2-5)	24	6.7	10	2214	328
Tilt®/Bravo® 4.3SE 1.5 pt (1,3,6) Headline® 2.08E 6 fl oz (2,4,5)	2	0.0	17	2424	359
Tilt®/Bravo® 4.3SE 1.5 pt (A1) Headline® 2.08E 6 fl oz (A2)	31	4.6	11	2199	326
LSD (P=0.05) [5]	10	6.9	10	NS	NS

1 Numbers (1-6) correspond to the application dates of 1=June 26, 2=July 10, 3=July 24, 4=Aug. 7, 5=Aug. 22, and 6=Sept. 5 for the 14-day programs; and numbers A1-A2 correspond to the application dates of A1=June 26 and A2=Aug. 22 for the Early Leaf Spot Advisory Program. The adjuvant Induce® was added to V-10116 applications at 0.25 percent of the total spray volume, and to Folicur® and Absolute® applications at 0.06 percent of the total spray volume.

2 Percentage of leaflets with symptoms (including defoliation) on Oct. 20.

3 Percentage of leaflets defoliated on Oct. 20.

4 Crop value based on an average grade of 59% TSMK.

5 Fisher's least significant difference (LSD); NS=treatment effect not significant at $P \leq 0.05$.

Table 5. Effect of reduced and full-season fungicide programs on control of early leaf spot of Jupiter peanuts at the DeLeon Farm – Erick, 2006.

Treatment and rate/A (timing)[1]	Early leaf spot (%)[2]	Defoliation (%)[3]	Pod Rot (%)	Yield (lb/A)	Crop value ($/A)[4]
Check	82	52.5	25	5109	878
Tilt®/Bravo® 4.3SE 1.5 pt (2,3,4)	33	3.4	23	5136	883
Headline® 2.08E 6.0 fl oz (2,4) Tilt®/Bravo® 4.3SE 1.5 pt (3)	4	0.0	19	5626	967
Tilt®/Bravo® 4.3SE 1.5 pt (A1,A2)	39	4.2	28	5009	861
Headline® 2.08E 6.0 fl oz (A1) Tilt®/Bravo® 4.3SE 1.5 pt (A2)	26	2.1	21	5263	905
Bravo® 6F 1.5 pt (1) Headline® 2.08F 9 fl oz (2,4) Folicur® 3.6F 7.2 fl oz (3,5)	6	0.0	23	5236	900
Bravo® 6F 1.5 pt (1) Headline® 2.08F 9 fl oz (2,4) V-10116 50WD 4 oz (3,5)	5	0.0	29	4873	838
Bravo® 6F 1.5 pt (1,3,5) Headline® 2.08F 9 fl oz (2,4)	7	0.0	28	5354	920
V-10116 50WD 4 oz (1,3,5) Headline® 2.08F 9 fl oz (2,4)	3	0.0	20	5127	881
Bravo® 6F 1.5 pt (1,5) V-10135 50WD 1 lb (2,3,4)	63	24.2	22	5309	913
Absolute® 4.17F 3.5 fl oz (1,3,5) Echo® 6F 1.5 pt (2,4)	7	0.0	23	5191	892
Absolute® 4.17F 3.5fl oz (1,3) Provost 3.6F 5 fl oz (2,4) Echo® 6F 1.5 pt (1-5)	23	1.3	24	5245	902
Bravo® 6F 1.5 pt (1-5)	13	0.4	25	5336	917
Bravo® 6F 1.0 pt (1-5)	20	0.8	13	4973	855
Tilt®/Bravo® 1.5 pt (1-5)	24	3.3	16	5227	899
LSD (P=0.05)[5]	11	5.0	NS	NS	NS

1 Application numbers 1-5 correspond to spray dates for the calendar programs of 1=July 5, 2=July 19, 3=Aug. 2, 4=Aug. 16, and 5=Aug. 30. Application numbers A1-A2 correspond to the spray dates for the Early Leaf Spot Advisory Program of A1=July 5 and A2=Aug. 16. The adjuvant Induce® was added at 0.25 percent of the total spray mixture to V-10116 applications, and at 0.06 percent of the total spray to Absolute® and Folicur® applications.

2 Percentage of leaflets with symptoms (including defoliation) on Oct. 9.

3 Percentage of leaflets defoliated on Oct. 9.

4 Crop value based on an average grade of 69% TSMK.

5 Fisher's least significant difference (LSD), NS=treatment effect not significant at $P \leq 0.05$.

Seedling Diseases

Evaluation of fungicide seed treatments for stand establishment

Seedling disease is usually not a problem in peanut production because fungicide seed treatments such as Vitavax® PC and Tops®/Vitavax® 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 on the variety Tamrun OL 02 to compare new seed treatment fungicides (Trilex® Optimum, Trilex® Star, and Dynasty®) to Vitavax® PC and Tops®/Vitavax® PC. Various experimental seed treatment fungicides were also evaluated.

Warm dry conditions at planting resulted in rapid emergence and low seedling disease pressure. Check plots averaged 2.9 plants per foot. Small increases in stand establishment (3.3 to 3.4 plants per foot) were observed for Trilex® Optimum, Dynasty®, Vitavax® PC, and two of the experimental fungicides. Because of the low disease pressure, yield effects were not significant. Results from this trial and those in previous years indicate that new seed treatment fungicides are comparable in performance to Vitavax® PC.

Continued Evaluation of Weed Control Strategies in Oklahoma Peanut Production Areas

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2006 progress made possible through OPC and NPB support

- Management of ALS[1] resistant Palmer amaranth in peanuts will require a good soil residual program, probably involving Valor® herbicide.
- Irrigation timing before and after a Dual® Magnum or Outlook® layby application may impact the ability of these herbicides to control Palmer amaranth. Irrigating one to two days before these products are applied may cause some weeds to begin the germination process and root development prior to the herbicide being applied, thus allowing those weeds to escape the herbicide treatment. Irrigating soon after applying these herbicides will ensure their activation in the soil.
- Postemergence applications of Cobra® or Gramoxone® Max will effectively control small (less than two-inches tall) Palmer amaranth plants, but should be preceded with a layby application of Dual® Magnum or Outlook® followed with irrigation.

Palmer amaranth *(Amaranthus palmeri)* continues to be the most troublesome weed across western Oklahoma peanut producing areas. This weed has developed resistance to acetolactate synthase (ALS) inhibiting herbicides, such as Cadre®, Pursuit®, and Strongarm®. Palmer amaranth is one of the most troublesome weeds in Oklahoma peanut production today due to its rapid growth rate, high competitiveness, long germination period, and high seed production potential.

As a continued effort to help peanut producers develop new methods to control this weed, trials were established near Erick, Ft. Cobb, and Weatherford, Oklahoma. Herbicide treatments included Prowl® H_2O applied preemergent either alone or with Dual® Magnum or Outlook®. Postemergent herbicides included Gramoxone® Max, Cobra®, or Ultra Blazer® applied alone or sequentially with Dual® Magnum or Outlook®. The layby applications of Dual® Magnum or Outlook® were evaluated as a means for extending the soil residual activity of our herbicide programs, thus placing less reliance on postemergent herbicides currently available.

Prowl® H_2O applied alone did not control Palmer amaranth, but controlled most other annual grasses and broadleaf weeds. Dual® Magnum or Outlook® applied preemergent with Prowl® H_2O adequately controlled Palmer amaranth during the first one to three weeks after emergence at the various locations. Early postemergent applications of Gramoxone® Max, Cobra®, or Ultra Blazer® applied with Dual® Magnum

[1] ALS = Acetolactate Synthase

or Outlook® controlled Palmer amaranth at least 90 percent of the time, however within one to two weeks after application, retreatment for newly emerging Palmer amaranth seedlings was necessary. For this reason, we believe that layby applications of Dual® Magnum or Outlook® should be applied four to five days prior to application of Gramoxone® Max, Cobra®, or Ultra Blazer®, and followed with an irrigation. This should allow enough time for Palmer amaranth seeds, which have imbibed water, to germinate and plants to emerge before the postemergent herbicide is applied.

Screening of F1/F2 Seed for the Presence of a Molecular Marker for *Sclerotinia minor* Resistance

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2006 progress made possible through OPC and NPB support

- Near-infrared reflectance analysis proved to be an efficient tool for determining high oleic acid content in peanut seed.
- Genetic profiling of parental and progeny seed allowed for confirmation of true hybrid progeny as well as screening for the presence of the molecular marker for *Sclerotinia minor* (*S. minor*) resistance.
- Greenhouse testing of detached shoots from hybrid and reference plants proved useful in screening for *S. minor* resistance as well as correlation of resistance and molecular marker presence.
- This multi-component approach to F1/F2 analysis allowed efficient screening for desired traits at an early stage in line development.

Fungal diseases of peanuts, such as Sclerotinia blight caused by *Sclerotinia minor* (*S. minor*), are responsible for increased production costs and incredible yield losses for peanut producers in Oklahoma. Current Sclerotinia blight management strategies include cultivar selection and expensive fungicide application. Recently, the Southwestern Sheller Industry has abruptly discontinued seed production of cultivars that exhibit the hard roasted kernel trait, including the most widely grown disease resistant and/or high oleic varieties Tamrun 96 and Tamrun OL 01. The same industry has also begun to require that only peanut seeds that have high oleic acid content will be contracted. Oklahoma producers are currently without adequate replacement cultivars. This project is part of a research program that will produce new cultivars suitable for commercial production in Oklahoma. These new cultivars will have improved resistance to fungal pathogens, be high oleic in nature, and will not have the hard-roasted kernel trait. Crosses have already been made using parents that have elevated resistance to *S. minor* and parents that have high oleic acid content. Also, a genetic marker for *S. minor* resistance has been identified and a technique has been developed by which DNA can be extracted from a small portion of the peanut seed while leaving the seed viable. By screening peanut seeds for the presence of the marker for *S. minor* resistance, potentially resistant seed can be identified at the F1/F2 generation and the efficiency of developing new peanut cultivars will be greatly enhanced. Genetic screening for the resistance marker is just one part of a three-component approach to early generation analysis, the other two parts being near-infrared reflectance (NIR) analysis and greenhouse testing for *S. minor* resistance. The objective of this project was to screen F1 and F2 seed for the presence of the *Sclerotinia minor* resistance marker and for high oleic acid content.

Screening Peanut Seed for Molecular Marker Presence and Oleic Acid Content

Using a method reported by Tillman et al. (2005) at the University of Florida, NIR can be used to reliably determine whether a peanut seed has a high oleic acid content or not without damaging the seed germination potential. Another non-destructive method developed by Chenault et al. (2007) allows the extraction of DNA from a small portion of the peanut seed for genetic analysis. Both of these methods were employed to analyze peanut seed at the F1 or F2 stage so as to speed up the screening process prior to greenhouse testing for *S. minor* resistance. All F1 seed (1263 total) harvested from the crosses listed in Table 1 were initially analyzed by NIR to determine their oleic acid content. The NIR method used has proven reliable in determining if a seed is high oleic (H) in nature, but determination of mid-oleic content is less consistent. Thus, individual seeds receiving an NIR rating above 70 were rated as high (H), while seed rated below 70 were scored as not-high (NH) in oleic acid content (Table 1). However, given the fact that at the F1 stage, hybrid seed of crosses between high oleic and non-high oleic parents most often result in seed with a NIR score below 70 but above 50, a score of mid-high oleic (MH) was given to those seed with NIR readings below 70 but above 60. Genetic testing for the presence of the *S. minor* resistance marker was performed only on those seed that received an NIR rating of H or MH.

DNA was extracted from F1 and/or F2 seed chosen for genetic profiling and was analyzed via polymerase chain reaction (PCR) using primers specific for the Sclerotinia blight resistant molecular marker in peanut. The genetic profile of each seed provided two pieces of critical information that are important for the efficient development of advanced breeding lines with the desired characteristics previously discussed: 1) proof that an F1 seed is a definite hybrid between the two parental lines and 2) presence or absence of the molecular marker for Sclerotinia blight resistance. In cases where both parental lines contained the marker for *S. minor* resistance, the genetic profile of each parental line was distinct. Therefore, the F1 progeny could be identified as either a definite hybrid or a self, ensuring that only hybrids were kept for further development and testing. Table 2 provides an overview of the genetic profiling of the F1 and/or F2 seed thus far with respect to the presence of the molecular marker for Sclerotinia blight resistance. A total of 262 F1 seeds have been profiled this far, but testing remains on going. F2 seed from cross number 27 (CS103 X Tamrun OL 02) have also been profiled yielding 42/42 seeds positive for marker presence.

Greenhouse Testing of F1 Plants for *S. minor* Resistance

Greenhouse testing of F1 plants for resistance to *S. minor* was performed as previously reported (Goldman et al., 1995). Two cuttings per F1 plant were tested. Parental control plants along with the cultivars Okrun and Southwest Runner are also tested for reference. The Area Under Lesion Expansion Curve (AULEC) was calculated for all cuttings according to the following formula then averaged per plant:

$$AULEC = \sum^{n-1} (x_i + x_i+1/2)(t_i+1 - t_i)$$

Table 3 shows an example of data collected from a greenhouse testing experiment along with corresponding NIR

Table 1. Results of NIR testing on F1 and F2 seed from crosses made in 2005-2006 for development of high-oleic Sclerotinia blight resistant peanut lines. High-oleic parental lines are shown in bold type.

Cross #	Parental Genotypes (Female X Male)	NIR #F1 sd tested	Rating H/NH	NIR #F2 sd tested	Rating H/NH
1, 13, 39	Southwest Runner X **ARSOK-R2**	102	0/102	21	1/20
2, 14, 37	Valencia C X **ARSOK-R2**	76	0/76	*	*
3, 15, 35	R268 X **ARSOK-R2**	106	0/106	5	0/5
4, 5,16, 17, 33	R213 X **ARSOK-R2**	235	0/235	30	1/29
6, 18, 29	R213 X **ARSOK-R1**	97	0/97	143	1/142
7, 22, 40	**ARSOK-R2** X Southwest Runner	10	1/9	*	*
8, 21, 38	**ARSOK-R2** X Valencia C	44	17/27	154	6/148
9, 20, 36	**ARSOK-R2** X R268	48	12/36	305	4/301
10, 19, 34	**ARSOK-R2** X R213	74	35/39	72	0/72
11, 24, 32	**ARSOK-R1** X R268	44	36/8	41	19/22
12, 23, 30	**ARSOK-R1** X R213	63	61/2	8	0/8
25	**Tamrun OL 02** X CS103	185	22/163	48	0/48
26	**Tamrun OL 02** X R273	65	63/2	8	2/6
27	CS103 X **Tamrun OL 02**	72	38/34	77	38/39
28	R273 X **Tamrun OL 02**	76	0/76	126	3/123
31	R268 X **ARSOK-R1**	3	0/3	*	*
41	**ARSOK-R2** X Jupiter	11	0/11	*	*
42	**ARSOK-R2** X CS128	2	0/2	*	*
43	**ARSOK-R2** X CX208	9	0/9	*	*
44	Jupiter X **ARSOK-R2**	7	1/6	*	*
45	Jupiter X **ARSOK-R1**	8	0/8	*	*
46	**Tamrun OL 02** X Jupiter	6	0/6	*	*
47	Jupiter X **Tamrun OL 02**	14	1/13	*	*
48	**ARSOK-R1** X CS128	9	0/9	*	*
49	CS128 X **ARSOK-R1**	7	0/7	*	*
50	**Tamrun OL 02** X CS128	5	0/5	*	*
51	CS128 X **TamrunOL 02**	3	0/3	*	*
52	CS208 X **Tamrun OL 02**	5	0/5	*	*
53	CS208 X **ARSOK-R1**	3	0/3	*	*
54	**Tamrun OL 02** X R268	2	0/2	*	*
55	CS208 X **Tamrun OL 02**	3	0/3	*	*
56	**ARSOK-R1** X Jupiter	9	0/9	*	*
57	**Tamrun OL 02** X CS208	4	0/4	*	*

*Not yet available for testing.

and molecular marker data. These tests are on going as plants reach the appropriate age for testing. This multi-component approach to analysis of peanut seed is improving the efficiency of developing hybrid peanut lines by identifying those with desired traits and the potential for eventual release for commercial production.

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Table 2. Results of genetic profiling of F1 and F2 seed produced from crosses designed to develop high-oleic peanut lines with Sclerotinia blight resistance. Parental lines containing the marker for *S. minor* resistance are shown in bold type.

Cross #	Parental Genotypes (Female X Male)	#F1 sd tested	# True Hybrids	Marker +/-
1, 13, 39	Southwest Runner X **ARSOK-R2**	89	40	40
2, 14, 37	**Valencia C** X **ARSOK-R2**	36	1	36
3, 15, 35	**R268** X **ARSOK-R2**	5	4	5
4, 5,16, 17, 33	**R213** X **ARSOK-R2**	13	13	13
6, 18, 29	**R213** X **ARSOK-R1**	13	13	13
7, 22, 40	**ARSOK-R2** X Southwest Runner	2	0	2
8, 21, 38	**ARSOK-R2** X **Valencia C**	36	4	36
9, 20, 36	**ARSOK-R2** X **R268**	8	8	8
10, 19, 34	**ARSOK-R2** X **R213**	7	2	7
11, 24, 32	**ARSOK-R1** X **R268**	6	1	6
12, 23, 30	**ARSOK-R1** X **R213**	2	1	2
25	Tamrun OL 02 X **CS103**	6	0	0
26	Tamrun OL 02 X **R273**	2	0	0
27	**CS103** X Tamrun OL 02	28	28	28
28	**R273** X Tamrun OL 02	14	0	14

Table 3. Results from greenhouse testing of F1 plants for *S. minor* resistance. NIR and molecular marker data for each plant are also listed, along with hybrid information.

Genotype	Cross #	Parental Genotypes (Female X Male)	Plant #	NIR	Avg. AULEC	Marker/ Hybrid
SW Runner				NH	146	-
Okrun				NH	257	-
TR OL 02				H	297	-
R213				NH	188	+
ARSOK-R1				H	156	+
ARSOK-R2				H	187	+
Valencia C				NH	205	+
R268				NH	188	+
CS103				NH	116	+
	6	R213 X ARSOK-R1				
			6-5-1	NH	158	+/+
			6-5-2	NH	254	+/-
			6-5-3	NH	174	+/+
			6-7-2	NH	136	+/+
	13	Southwest Runner X ARSOK-R2				
			13-2-6	NH	178	-/-
			13-6-4	NH	135	+/+
	16	R213 X ARSOK-R2				
			16-1-7	NH	242	+/-
			16-1-10	NH	220	+/-
			16-2-2	NH	104	+/+
			16-2-8	NH	97	+/+
	19	ARSOK-R2 X R213				
			19-2-3	NH	142	+/+
			19-2-6	NH	169	+/-
			19-2-9	NH	143	+/+
			19-5-2	H	185	+/-
	20	ARSOK-R2 X R268				
			20-5-3	NH	223	+/-
			20-5-10	NH	36	+/+
			20-5-12	NH	122	+/+
			20-8-3	NH	104	+/+
	21	ARSOK-R2 X Valencia C				
			21-2-3	NH	13	+/+
			21-5-2	NH	208	+/-
			21-5-3	NH	113	+/+
			21-7-6	NH	80	+/+
	27	CS103 X Tamrun OL 02				
			27-1-4	H	63	+/+
			27-1-8	H	124	+/+
			27-2-3	H	104	+/+
			27-5-2	H	28	+/+

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