TITLE:

Peanut Irrigation/Precision Agriculture Study at AG-CARES, Lamesa, Texas 2003.

AUTHORS:

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METHODS AND MATERIALS:

Planting Date	: April 28, 2003
Variety	: FlavorRunner 458, Tamrun96, Florunner @ 100 lb/ac
Insecticide	: None.
Herbicide	: 1 qt/ac Sonalan PPI. 2,4-DB June 23
Rhizobium	: Nitragin "Implant +" granular inoculant applied in seed drill (5 lb/ac)
Irrigation	: Low Energy Precision Application (LEPA) beginning July 14 Low Elevation Spray Application (LESA) all season
Soil	: Amarillo fine sandy loam
Fertilizer	: 10 lb/ac N, 34 P_2O_4 lb/ac preplant. 30 lb N via irrigation system June 2 and June 20
Harvest Date	: Dug October 17. Threshed Oct 27, 28.

During the period from 1995 through 1999, the base peanut irrigation strategy that has been successful at this location involved: (1) pre-irrigation if needed to begin the season with a full profile; (2) application of approximately 0.50 inches of water immediately after planting; (3) supplying 0.50 to 0.75 inches of moisture per week during early vegetative growth until about July 1; (4) provision of sufficient water to replace 0.75 of calculated cotton evapotranspiration (ET) at 2.5 to 3.5-day intervals (usually 1.50 to 1.75 inches of moisture per week) throughout the rapid fruit development period from about July 1 through at least mid-September; and (5) reduced water supply of approximately 0.50 to 0.75 inches per week until harvest with perhaps 0.25 inches of water the day before digging if needed. Yields in 1996, 1997, 1998, and 1999 rivaled those of the better grower yields in the area. Yields in 1995 were lower than desired, probably because of under-watering early in the season. Yields in 2000 were lower than desired, but were attributed to poor weather at harvest time, which increased digging and combining losses. Throughout the 1995 to 2000 period, LEPA irrigation during the fruiting phase of development, running from approximately July 1 through mid-September equaled or exceeded the yields achieved with LESA irrigation.

As the 2001 season progressed, research personnel became concerned that pod development was not progressing normally, so we dropped drag hoses and socks off of all drops except for one 24-row area in mid-August and applied two passes of 0.4" of irrigation water totaling 0.8" in an effort to wet the pod-development zone. Drag hoses and socks were then reinstalled and LEPA irrigation resumed. Those peanuts that had spray irrigation for only that short period yielded more than LEPA. This was generally attributed to the hot, dry conditions experienced that year. Although 2001 was hot and dry, it was not as hot and dry as 1998

when LEPA yields greatly exceeded LESA yields. The most obvious difference was varieties grown. In 1995, 1996, and 1997, we grew Florunner; in 1998 and 1999, we grew Tamrun88; and in 2000 and 2001, we grew FlavorRunner 458. We had no information about whether FlavorRunner 458 responds differently to irrigation application method, but other researchers have suggested that there is a difference in heat stress response between peanut varieties. We therefore decided to include varieties used in the past along with FlavorRunner 458 in our 2002 and 2003 irrigation experiments at AG-CARES and at the Western Peanut Growers Research Farm (WPGRF). We were unable to obtain Tamrun88 seed, so we used Tamrun96 and Florunner along with FlavorRunner 458.

RESULTS AND DISCUSSION:

Both the 2001 and 2002 crop years were dry; 2003 was wetter, but still had significant dry periods. Monthly rainfall information for the 2001, 2002, and 2003 crop years and 1956 - 2000 is shown in Table 1. In addition, the table shows comparisons for approximate peanut crop growth phases: (1) Pre-watering April; (2) Vegetative phase May - June; and (3) Fruiting phase July - Mid-September, although the 1956 – 2000 historic rainfall amounts includes all of September and is, therefore, perhaps an over-estimate for September and fruiting phases.

Table 1. Comparison of 2002 Rainfall with 2001 and 1956-2000 Averages by Month and Approximate Crop Development Period.

Month	2003	2002	2001	1956-2000*
April	0.42"	1.79"	0.09"	1.25"
May	4.50"	0.12"	1.60"	2.36"
June	1.80"	1.02"	1.43"	2.39"
July	0.00"	1.70"	0.00"	2.13"
August	2.29"	0.00"	0.67"	1.68"
September	1.04"	0.80"	1.37"	2.93"
TOTAL	10.05"	5.43"	5.16"	12.78"

Crop Period	2003	2002	2001	1956-2000*
Pre-Water	0.42"	1.79"	0.09"	1.25"
Vegetative	6.30"	1.14"	3.03"	4.75"
Fruiting	3.33"	2.50"	2.04"	6.74"

*1956-2000 data includes all of September, while 2001, 2002 and 2003 is through mid-September.

A comparison of 2001 Peanut Yield Mapping System (PYMS) data from the 24-row area that remained LEPA was made with an adjacent 24-row area that received the August 14 LESA irrigation. The peanuts that received the LESA applications significantly out-yielded (3,775 lb/ac) those that remained LEPA (3,469 lb/ac).

In 2003, yields and grades were determined from four small plots (4 rows x 20 feet) selected as typical from each variety-irrigation method combination. Comparisons between varieties are questionable from a statistical standpoint, because each variety was in a distinct portion of the field with only four samples per treatment. Table 2 shows yields and grades from the varieties, irrigation methods, and irrigation methods for each variety. In the small plot data, there were no significant differences among varieties irrigated with LEPA, Tamrun96 significantly out-yielded FlavorRunner 458, with Florunner intermediate. LEPA significantly out-yielded LESA in each variety and across all varieties. There were no variety-by-irrigation-method interactions, because all varieties lost 402 to 553 lb/ac in yield when LESA was used compared to LEPA. There were no differences in grade among varieties or irrigation method.

Table 2. Peanut Yields and Grades from Small Plot Samples at AG-CARES 2003.

Variety	All Irrigation Methods	LEPA	LESA
Florunner	3004 ab[1]	3205 a	2803 ab
FlavorRunner 458	2875 b	3151 a	2599 b
Tamrun96	3094 a	3361 a	2827 a

Irrigation Method	All Varieties	FlavorRunner 458	Tamrun96	Florunner
LEPA	3239 a[1]	3152 a	3361 a	3205 a
LESA	2743 b	2599 b	2827 b	2803 b

Variety	Irrigation Method	Yield	Yield Loss With LESA
Florunner	LEPA	3205 a[1]	402
Florunner	LESA	2803 b	
FlavorRunner 458	LEPA	3152 a	553
FlavorRunner 458	LESA	2599 b	
T-96	LEPA	3361 a	534
T-96	LESA	2827 b	

[1] Values in each column followed by the same letter are not statistically different

The PYMS allows us to take a large number of measurements that are GPS-referenced so that we can identify each yield figure with other features at that specific site. PYMS was developed by engineers and scientists at the University of Georgia at Tifton, GA and is mounted on a 4-row KMC combine. Table 3 shows results from PYMS data. When PYMS yield data were analyzed, there were no significant differences among varieties under any irrigation method and LEPA significantly out-yielded LESA in all varieties. There were no variety-by-irrigation-method interactions with all varieties losing 304 to 398 lb/ac with LESA.

Analyses are continuing to determine what factors might be related to the different results found in 2002. We have also prepared peanut paste from each variety and irrigation method to check for off-flavors.

Table 3. Peanut Yields from Peanut Yield Mapping System (PYMS) at AG-CARES 2003.

120 Random PYMS Sites

Variety	All Irrigation Methods	LEPA	LESA
Florunner	3491 a[1]	3643 a	3339 a
FlavorRunner 458	3397 a	3572 a	3221 a
Tamrun96	3345 a	3544 a	3146 a

Irrigation Method	All Varieties	FlavorRunner 458	Tamrun96	Florunner
LEPA	3586 a[1]	3572 a	3544 a	3643 a
LESA	3235 b	3221 b	3146 b	3339 b

Variety	Irrigation Method	Yield	Yield Loss With LESA
Florunner	LEPA	3643 a[1]	304
Florunner	LESA	3339 b	
FlavorRunner 458	LEPA	3572 a	351
FlavorRunner 458	LESA	3221 b	
T-96	LEPA	3544 a	398
T-96	LESA	3146 b	

[1] Values in each column followed by the same letter are not statistically different.

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