Performance of Ten Cotton Varieties in the Northern Texas High Plains

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ABSTRACT

Results of a four-year study conducted in the northern Texas High Plains indicate that cotton *(Gossypium hirsutum L.)* can be successfully grown and can provide a viable alternative to other currently produced higher water use crops. However, it is essential that producers be aware of the differing production requirements as compared to those in more southern type environments. Regardless of the variety selected, it is very likely that the cotton lint harvested will have a lower micronaire than that typical of warmer environments. Also, as fewer growing degree-days are generally experienced, planting must occur at times when soils are warm enough for rapid growth early in the growing season. Due to the colder regime, little to no insect problem was encountered during the time frame of this study. Producers should also be aware that northern Texas cotton production is subject to early termination.

KEYWORDS: cotton production, variety trials, cotton quality

INTRODUCTION

Historical Perspective

Historic crop production records indicate that a minor acreage of cotton *(Gossypium hirsutum L.)* has been grown in the northern Texas High Plains since 1968 (USDA-NASS 2004). The bulk of this acreage has been recorded in Deaf Smith County. Total cotton acreage in the 17 northern most counties of the Texas High Plains

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was less than 20,000 acres per year until 1998. By 2002, cotton acreage had increased to almost 80,000 acres in these same counties.

Cotton production was reported for the three counties in the Oklahoma panhandle as early as 1951 and continued at very low levels until 1969. No cotton production was recorded from 1970 through 2002 (last year of available records). Producers generally produced other crops that were more profitable (USDA-NASS 2004).

Conversely, cotton acreage in southwest Kansas was not reported in crop production statistics until 2001, although it was recorded in other parts of Kansas as early as 1991. Acreage increased from 5,100 acres in 2001 to 44,000 acres in 2002 in southwest Kansas (USDA-NASS 2004). Agricultural popular press articles touted the ability of growers in Kansas to produce cotton, haul it to Texas for ginning, and apparently still maintain the ability to make a profit (Griekspoo 2004). If cotton could be grown profitably in Kansas, Texas growers felt the same could be done in the northern Panhandle of Texas (Smith 2001). In 2004, a newly, constructed cotton gin located in the northern part of Texas contracted for the processing of over 100,000 bales (Carson County Gin, White Deer, TX). Average production is anticipated at two bales or more per acre. Future plans are to locate another gin further north and west in Texas.

When considering the production of cotton, planting date is of prime consideration. Cotton is a warm season crop and as such prefers warm soil temperatures (Hake et al. 1990). Early planting in the high plains often finds seeds placed in relatively cold soils for germination with little growing degree-day (GDD) accumulation. Delaying planting until soils are warmer increases the risk of having fewer growing degree-days during the later portion of the growing season to adequately mature the crop. Conversely, an early fall freeze can terminate the crop. Typically, soils in northern Texas normally warm considerably by mid-May with the expectation of adequately warmer soils within a short time thereafter (see Figure 1). Cotton planting dates later than early June certainly run the risk of incurring cold temperatures in the fall while the crop is maturing.

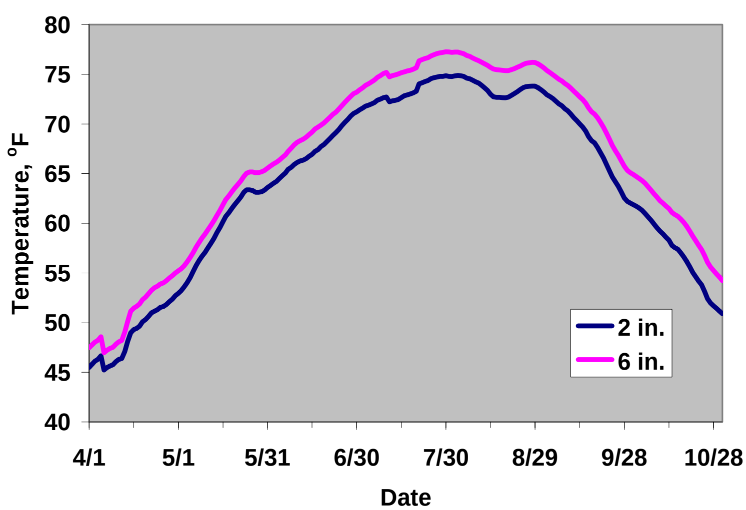

Figure 1. 1995-2003 average daily minimum 2 & 6-inch soil temperatures (10 day running average) at the North Plains Research Field, Etter, TX.

In recent years, producers have experienced a declining groundwater table, increased water district regulations on irrigation water use, increasing cost of groundwater pumpage, and the high water use requirements of traditionally grown crops such as corn. These concerns have resulted in growers taking a second serious look at cotton, a crop using much less water use than corn *(Zea mays idenata)*, thus reducing irrigation pumpage costs, conserving the groundwater resource, and meeting the reduced pumpage requirements of regional water districts.

In the past decade, little research has been supported on cotton to aid growers in the northern Texas High Plains. It has generally been assumed that cotton grown in the northern regions would have a reduced quality because of a short growing season and a reduced number of growing degree-days. It was also expected that problems might be encountered with reduced micronaire and with the number of bolls that failed to open. To aid northern Texas High Plains growers in their decisions, a small, "pilot type" study was initiated in 1999 and continued for three years at the North Plains Research Field (NPRF) near Etter, Texas. The objective of this study was to evaluate ten cotton varieties and two planting dates with respect to yield and fiber properties of cotton and to determine if there were other potential production problems for growers to consider. This article reports the results of the four year study at the NPRF.

MATERIALS AND METHODS

These studies were conducted at the Texas A&M University- Texas Agricultural Experiment Station's – North Plains Research Field near Etter, Texas (36° 00′ N. latitude, 101° 59′ W. longitude, 3,618 feet elevation). Plot preparation was similar in each of the study years. Each year plots were established on land that was not used for cotton tests the prior year. Following harvest, however, that year's stalk residue was shredded and disked in and planted to either corn or soybeans. Trifluralin (2 pts/ac in 1999, 1.5 pts/ac in 2000 and 2002) or pendimethalin (3 pts/ac in 2001) were applied and incorporated preplant for weed control. The plot area was then listed and beds cultivated immediately prior to planting. Seed beds were established on 30 inch centers. The plot size per variety was 3 rows by 50 feet in length. Total plot size was 0.52 acres. No fertility was applied in 1999 or 2000. In 2001, 180 lbs/ac N was applied as 32-0-0 and in 2002 80 lbs/ac N was applied as anhydrous ammonia. Planting was accomplished using a John Deere 71 Flex Planter™. Monthly meteorological data experienced during this study and long term averages are shown in Table 1. Irrigation water use requirements and GDD's for 1999-2002 as computed from the North Plains Evapotranspiration (NPET) network are included (Tables 1 and 2). Specifically, the daily and cumulative seasonal cotton evapotranspiration rates and requirements as related to a well-watered grass reference (ETos; The ASCE standardized reference evapotranspiration equation, Allen, 2005) per crop year are provided in Figures 2 through 5. Each year, three irrigations were applied at specific times to maintain a high soil moisture profile level during the crop season (Table 2) and plots were arranged in a split plot design with three replications using two planting dates as main plots and varieties as split plots. Plots were planted on May 7 and June 7 in 1999, May 15 and 30 in 2000, May 15 and 31 in 2001, and May 16 and 31 in 2002 and analyzed accordingly (Statistix7 2000). The analysis was conducted by year due to different varieties and some missing replication values. No insecticides were applied during any of the study years. Harvest aid materials were applied if a killing freeze was not anticipated or received by the long-term average first freeze date of

October 15 in each of the years. This was done to assess a "typical" or average duration production period. Prep™ (2 pts/ac) and Ginstar™ (8 oz/ac) were applied on October 19 in 1999, and Prep (2.33 pts/ac) and Ginstar (8 oz/ac) were applied on October 3 in 2000. Harvest dates were November 12, November 30, October 30, and December 17 in 1999, 2000, 2001, and 2002, respectively. The same varieties (Table 3) were not used each year of the study. Changes in varieties were made each year to accommodate requests and potentially represent varieties to be used by producers within the region. As northern Texas has no broadleaf herbicide ban, in 2000, 2001 and 2002, hormone herbicide drift applied within the surrounding area by producers significantly damaged the young cotton plants. The amount of damage varied between years. In 2002, damage was significant enough to cause part of the study to be abandoned. In that event, two replications of some of the varieties from each planting date were harvested and analyzed as two separate studies. As a result, there is no valid planting date comparison for 2002.

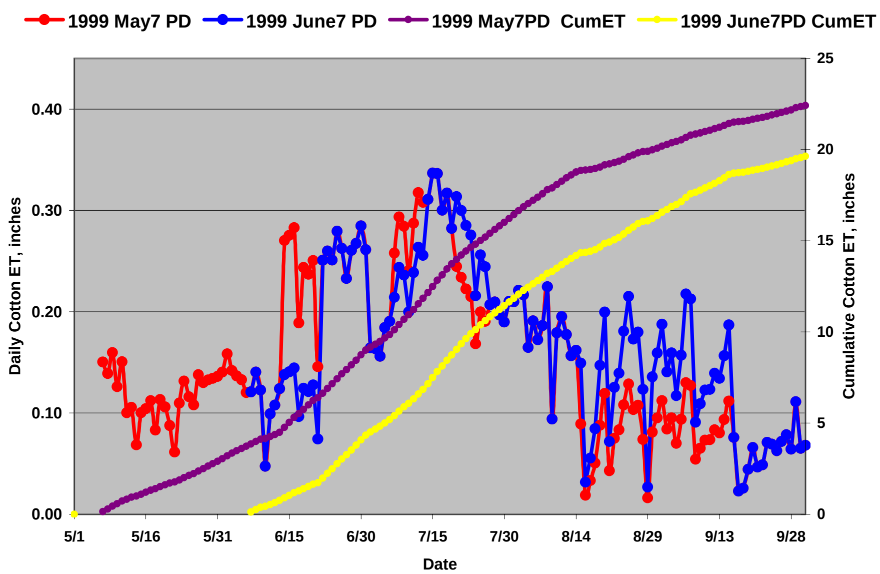

Figure 2. 1999 daily and seasonal cotton ET data at the North Plains Research Field, Etter, TX.

Table 1. Climatic data for 1999-2002 and long term average, North Plains Research Field, Etter, TX.

	Average Maximum Air Temperature, °F				Average Minimum Air Temperature, °F				Monthly Rainfall, Inches				Growing Degree Days Cotton				Long Term Averages			
	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002	Max temp	Min temp	Rain, in	Cotton GGD
May	78.4	84.4	78.1	81.6	49.7	51.4	50.5	48.6	3.11	0.75	2.95	0.49	169	277	182	201	80.6	50.0	1.83	207
June	87.0	85.5	90.4	92.7	59.9	60.0	60.5	62.8	5.16	2.57	1.80	1.36	403	383	464	532	88.9	60.8	2.72	446
July	91.6	95.0	96.7	92.6	62.6	64.7	65.7	64.4	0.67	0.64	2.12	1.01	530	616	657	573	94.0	64.3	1.11	594
Aug	94.6	97.4	91.6	91.8	61.7	62.6	61.9	63.2	1.26	0.00	1.59	3.98	563	620	519	542	93.8	62.4	1.71	561
Sept	82.3	90.3	85.7	83.3	53.6	54.0	53.9	55.4	1.69	0.28	1.03	1.10	262	400	300	285	85.4	54.2	1.03	312
Oct	76.9	70.0	75.2	63.3	39.1	46.2	40.3	40.0	0.57	6.66	0.00	3.44	52	64	82	25	71.3	41.4	2.67	56
Nov	69.9	51.8	62.0	57.3	30.6	25.6	36.6	29.5	0.00	0.06	0.98	0.08	0	0	0	0	60.3	30.6	0.28	0
Total	-	-	-	-	-	-	-	-	12.46	10.96	10.47	11.46	1980	2360	2204	2159	-	-	11.34	2176

Table 2. Irrigation dates and gross applied irrigation amounts, 1999-2002, NPRF cotton variety trial, Etter, TX.

1999		2000		2001		2002	
July 07	4.0	June 15	4.0	June 27	4.0	May 21	6.75
July 21	4.0	July 24	4.0	July 23	4.0	June 11	3.92
August 10	4.0	August 24	4.0	August 09	4.0	July 16	5.34
Total	12.0		12.0		12.0		16.01

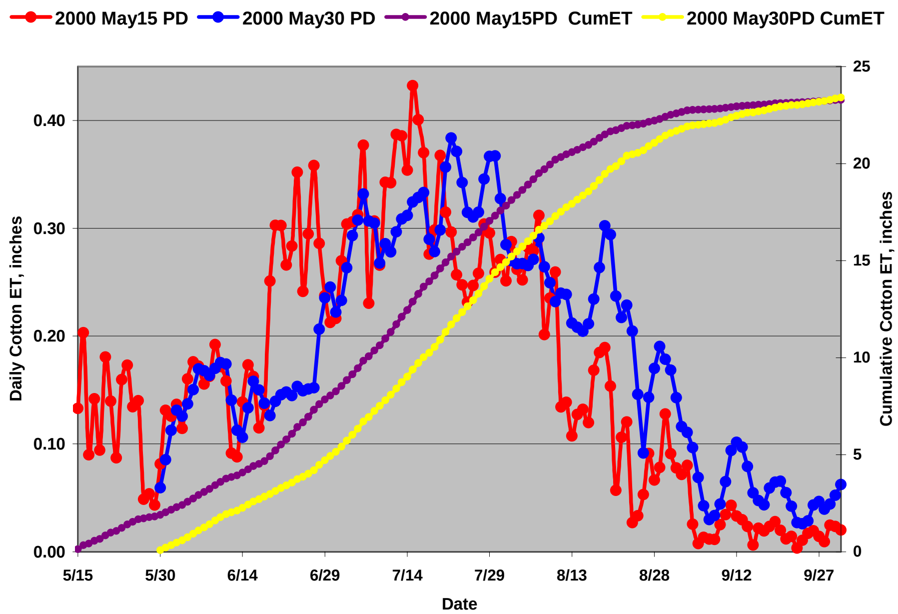

Figure 3. 2000 daily and seasonal cotton ET data at the North Plains Research Field, Etter, TX.

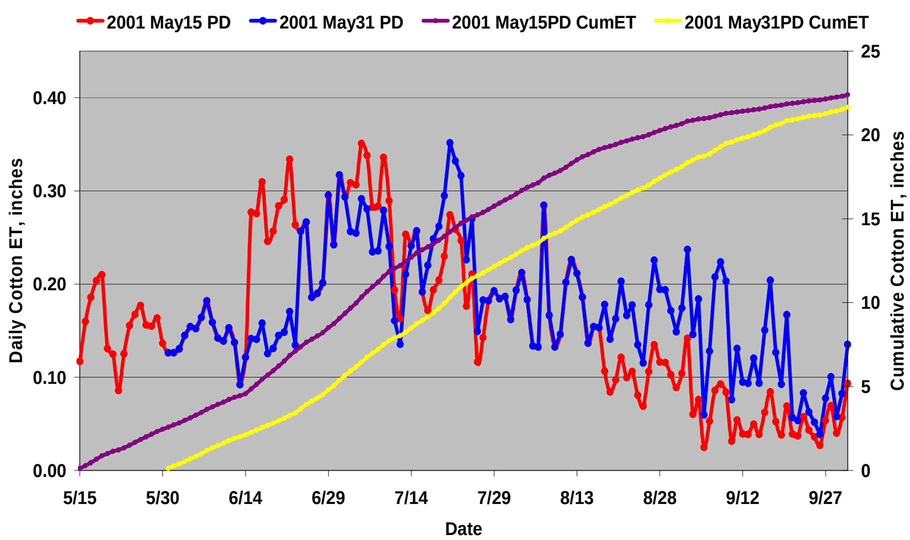

Figure 4. 2001 daily and seasonal cotton ET data at the North Plains Research Field, Etter, TX.

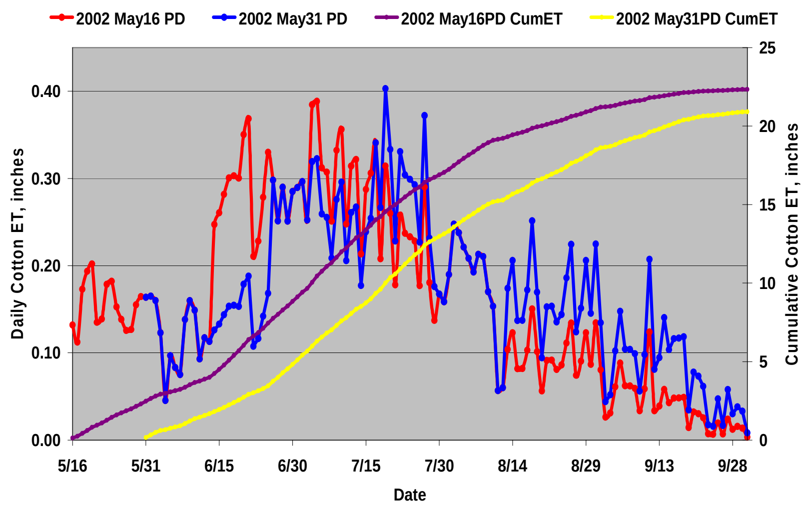

Figure 5. 2002 daily and seasonal cotton ET data at the North Plains Research Field, Etter, TX.

Table 3. Cotton varieties tested at the North Plains Research Field in 1999 through 2002.

1999	2000	2001	2002
All Tex Express	2379	BXN16	BXN 16
DP 2156	AFD Rocket	PM 2200 RR	PM 2200 RR
DP 2379	DP 2156	PM 2280 BG/RR	PM 2280 BG/RR
PM 2200 RR	PM 183	PM 2326 BG/RR	PM 2326 BG/RR
PM 2326 RR	PM 2326 BG/RR	PM 2326 RR	PM 2326 RR
PM 280	PM 2326 RR	PM 2379 RR	PSC 355
PM HS26	PM HS26	PM HS26	SG 215 BG/RR
Stoneville BXN47	PSC 355	Pyramid	Sphinx
Tamcot Luxor	Pyramid	Sphinx	ST 2454 R
Tamcot Sphinx	Sphinx	ST2454R	ST 3539 BR

RESULTS

Planting date

Significant differences in yield due to planting date were observed in 1999 but were not observed in 2000 or 2001. In 1999, the earlier planting date yielded 185 lbs/ac more lint. In 1999, the only fiber properties affected were micronaire and uniformity. Planting date influenced the percent lint and the loan value. Cotton planted in late May not only yielded less, but also had a lesser percentage of lint and a lower loan value than the earlier planted cotton. The lower loan value was the result of value penalties imposed because of the low micronaire. Micronaire values between 3.5 and 4.9 receive no penalty or a small premium. Cotton with values outside this range receives progressively greater penalties as the micronaire increases or decreases further. Two of three years loan values were higher for the early-planted cotton. Planting dates in 2000 or 2001 did not influence fiber properties.

Varieties

Two glyphosate tolerant and eight standard varieties were grown in 1999. The fiber properties for each variety averaged across planting dates are presented in Tables 4, 6, 8, 10 and 11. Yields were considered excellent and ranged up to 1069 lbs/ac lint. Data regarding fiber differences between the two planting dates are shown in Tables 5, 7, and 9. Micronaire readings were all below the acceptable range and ranged from 2.4 to 3.0. Fiber lengths ranged from 1.03 to 1.12 (33/32nds to 36/32nds) inches and were all considered acceptable. Fiber strength was excellent and was high enough to warrant a small premium. Differences in percent lint are also noted between the varieties. The large differences were probably the result of immature bolls that accumulated with the lint during the harvest operation and contributed little to the final lint weight. When the value per acre is considered (yield x loan), some varieties are twice as valuable as others from the study data.

In 2000, eight standard varieties, one glyphosate tolerant variety, and one stacked gene variety were grown. Yields ranged from 436 to 600 lbs/ac lint (Table 6). Reduced yields were partially the result of hormone herbicide damage received early in the growing season. Micronaire values were considerably higher than the previous year and were all in the upper end of the acceptable range. However, fiber length and strength were greatly reduced. Some varieties received a small loan penalty for low fiber strength. Other fiber properties differed among varieties but differences had little influence on loan value. Total loan value per acre ranged from $181 up to $463.

In 2001, three standard varieties, one stacked gene variety, and six varieties with herbicide tolerance were included. Yields ranged from 695 lbs/ac up to 915 lbs/ac lint. Total per acre value ranged from $318 up to $467. Differences were observed among varieties for all fiber properties measured (Table 8). The most influential of these on fiber value was the micronaire. Some varieties had a micronaire in the acceptable range (no penalty) while others were low and received a penalty. In general, all micronaire readings were on the low side. Most varieties received a premium for strength with two being neutral.

Included in the study of 2000 and 2001 were HS 26, 2326 RR, and 2326 BG/RR varieties. HS 26 is the parent variety of 2326 RR and 2326 BG/RR. In 2000, the yield and value per acre were greater for 2326 BG/RR; however, the increase was probably not great enough to cover the increased seed cost and technology fee assessed. In 2001, the yield was greater for 2326 BG/RR but the value was slightly reduced because of shorter fiber length. In 2000, micronaire, fiber length, strength, elongation, and leaf content differences were neutral while uniformity was slightly poorer for 2326 BG/RR. In 2001, differences were found in micronaire, fiber length, uniformity, elongation, leaf content, Rd, and +b but not in strength. With little to no insect problems, little advantage was gained from the gene technology for insect control. Also, none of the varieties were treated with glyphosate during the growing season to control weeds. This technology can be profitable in fields with a history of heavy weed infestations or if reduced or minimum tillage is practiced.

Table 4. Yield and fiber quality by variety- NPRF cotton variety trial. Etter, TX. 1999.

Variety	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
D&PL 2379	3.0	1.07	82.3	30.1	7.3	1.8	76.9	9.0	19.8	1069	45.53
D&PL 2156	2.7	1.05	81.5	29.1	6.9	1.8	77.7	9.0	19.5	1006	42.64
PM HS26	2.8	1.07	82.3	32.0	7.2	1.8	77.6	9.0	18.7	1000	45.22
PM 2326RR	3.0	1.10	82.8	32.2	7.1	1.8	77.1	9.1	18.2	980	47.78
Tamcot Sphinx	2.7	1.09	81.6	32.0	6.7	1.8	76.1	9.1	18.3	870	44.55
PM 280	2.5	1.12	81.3	31.3	6.4	1.7	77.7	9.0	16.2	860	42.36
D&PL 2200RR	2.6	1.09	81.4	30.4	6.7	2.2	77.6	8.9	16.2	805	42.74
Tamcot Luxor	2.7	1.08	82.0	29.9	6.5	2.2	76.4	8.7	18.6	800	43.40
All Tex Express	2.4	1.03	80.9	30.0	6.1	2.0	77.4	8.9	16.0	714	37.78
Stoneville BXN 47	2.4	1.05	80.4	27.9	6.1	2.2	76.2	9.6	13.9	606	39.16
$LSD_{.05}$	0.3	0.02	1.0	1.7	0.4	n.s.	n.s.	0.6	2.4	126	3.60

Table 5. Yield and fiber quality by planting date- NPRF cotton variety trial. Etter, TX. 1999.

Planting Date	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
1	2.8	1.07	81.9	30.4	6.8	1.8	77.4	8.8	18.8	964	45.17
2	2.5	1.08	81.4	30.5	6.6	2.1	76.7	9.2	16.3	779	41.07
$LSD_{.05}$	0.3	n.s.	0.4	n.s.	n.s.	n.s.	n.s.	n.s.	2.2	60	2.42

Table 6. Yield and fiber quality by variety- NPRF cotton variety trial. Etter, TX. 2000.

Variety	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
PM 2326 BG/RR	4.4	0.98	79.2	26.0	6.6	2.5	73.9	8.4	26.2	600	43.84
D&PL 2379	4.7	0.99	79.5	25.6	7.0	2.2	72.7	8.5	25.4	562	43.05
AFD Rocket	4.5	1.00	79.9	25.2	6.3	2.3	72.9	8.6	27.2	558	45.06
Tamcot Pyramid	4.5	0.98	79.0	23.2	6.1	1.8	73.2	8.6	28.2	554	42.68
D&PL 2156	4.2	0.96	79.1	24.0	5.9	1.7	73.8	8.7	25.3	541	42.64
PM HS 26	4.3	1.00	80.2	26.5	6.6	2.5	72.9	8.2	24.8	501	45.83
PM 2326 RR	4.6	1.00	80.2	26.0	6.6	3.0	72.6	8.4	25.5	484	45.89
PM 183	4.8	0.92	78.2	23.0	6.1	1.0	73.2	9.5	25.3	472	38.52
PSC 355	4.0	1.04	81.3	27.4	7.0	3.7	70.9	8.1	23.1	450	47.68
Tamcot Sphinx	4.4	0.99	79.6	25.4	5.9	2.2	72.7	8.7	24.4	436	44.48
$LSD_{.05}$	0.4	0.02	0.8	1.4	0.4	0.7	1.0	0.4	2.8	144	2.91

Table 7. Yield and fiber quality by planting date- NPRF cotton variety trial. Etter, TX. 2000.

Planting Date	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
1	4.5	0.99	79.6	25.1	6.4	2.4	72.8	8.5	25.2	509	44.30
2	4.4	0.98	79.6	25.4	6.4	2.2	72.9	8.7	25.9	522	43.64
$LSD_{.05}$	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Table 8. Yield and fiber quality by variety- NPRF cotton variety trial. Etter, TX. 2001.

Variety	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
Tamcot Pyramid	3.1	1.03	80.1	27.6	6.5	1.5	78.6	8.9	24.6	915	45.33
PM 2326 BG/RR	3.5	1.02	81.3	30.4	7.4	1.2	78.9	8.7	24.2	911	48.32
PM 2326RR	3.7	1.06	82.6	31.1	7.0	1.8	77.7	8.7	24.0	871	53.61
PM 2379 RR	3.6	1.04	81.8	30.6	7.7	1.2	79.4	8.7	24.2	863	50.93
PM 2280 BG/RR	3.0	1.08	80.5	30.1	6.5	1.2	79.7	8.4	23.6	858	47.53
Tamcot Sphinx	3.4	1.05	81.0	30.4	6.2	1.5	77.6	8.6	23.3	844	49.98
PM HS26	3.4	1.05	81.7	31.2	7.3	1.3	78.4	8.3	22.5	789	50.53
PM 2200RR	3.1	1.06	80.1	30.4	6.0	1.0	80.5	8.7	22.7	747	48.30
Stoneville ST2454R	3.6	1.03	81.0	29.0	6.8	1.3	78.6	8.7	25.1	728	48.52
Stoneville BXN16	3.1	1.04	80.7	29.1	5.9	1.0	80.4	8.2	23.5	695	45.73
$LSD_{.05}$	0.3	0.02	0.6	1.2	0.4	0.5	1.0	0.3	1.2	166	3.95

Table 9. Yield and fiber quality by planting date- NPRF cotton variety trial. Etter, TX. 2001.

Planting Date	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
1	3.3	1.04	81.1	29.9	6.7	1.4	79.0	8.5	23.8	840	48.50
2	3.4	1.05	81.0	30.0	6.7	1.2	79.0	8.7	23.7	804	49.25
$LSD_{.05}$											

Table 10. Yield and fiber quality by variety for the early planting date, cotton variety trial. Etter, TX. 2002.

Variety	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
Tamcot Sphinx	3.3	1.08	81.6	28.4	7.7	3.0	71.0	10.5	22.1	794	48.48
PM 2326 BG/RR	3.4	1.05	81.9	30.2	9.3	3.5	73.5	10.0	21.9	774	48.18
PM 2280 BG/RR	3.2	1.12	81.3	29.1	7.7	4.0	75.7	9.6	22.7	730	47.30
PM 2326 RR	3.2	1.10	83.2	30.5	7.9	2.5	73.5	10.8	17.8	589	48.33
$LSD_{.05}$	n.s.	0.03	0.9	n.s.	0.9	n.s.	1.0	n.s.	4.1	n.s.	n.s.

Table 11. Yield and fiber quality by variety for the late planting date- NPRF cotton variety trial. Etter, TX. 2002.

Variety	Micronaire	Length, inches	Uniformity	Strength (gm/tex)	Elongation	Leaf content	Rd	+b	lint percent	yield, lbs/acre	Loan, cents/lb
PM 2326 BG/RR	3.1	1.05	81.1	28.1	9.6	2.5	74.5	11.3	22.9	786	44.98
Tamcot Sphinx	3.1	1.08	81.3	29.3	7.6	2.0	73.9	11.5	23.8	673	47.25
PM 2200 RR	3.5	1.08	81.1	27.9	8.3	1.5	76.1	10.6	22.1	559	51.43
Stoneville BXN 16	3.0	1.06	80.4	26.9	8.2	1.5	76.3	10.0	22.1	539	46.35
PSC 355	2.8	1.13	81.0	27.8	9.6	3.5	71.6	12.0	18.9	534	40.10
PM 2326 RR	3.0	1.07	82.6	28.8	8.7	3.0	74.4	11.1	18.0	434	46.63
$LSD_{.05}$	0.5	0.05	2.2	2.1	1.7	n.s.	3.4	1.1	2.4	199	7.43

In 2002, the study suffered a major setback due to severe damage from hormone herbicide drift. In order to salvage some information from the study year, the planting dates were analyzed as separate studies and the number of replications reduced to two. While some of the varieties are identical for both planting dates, one has four varieties and the other six varieties. The first planting date portion contained one standard variety, one glyphosate tolerant variety and two varieties with stacked gene technology. Yields ranged from 589 lbs/ac up to 794 lbs/ac (Table 10). The production value per acre ranged from $285 to $385. Significant differences in fiber length, uniformity, elongation and Rd were observed. Micronaire was again below an acceptable range. Strength and fiber length were considered acceptable.

The second planting date in 2002 contained two standard varieties, three varieties with herbicide tolerance, and one stacked gene variety. Yield ranged from 434 lbs/ac up to 786 lbs/ac. Significant differences among varieties in lint percent, yield, and loan were observed (Table 11). The production value per acre ranged from $202 up to $354. Significant differences among varieties were observed for all fiber properties except leaf content. Micronaire was low while fiber length and strength were acceptable. Although a statistical comparison between planting dates could not be made, it was observed that the average yield of all varieties in the first planted date group was double the average yield of all varieties in the second planted group.

DISCUSSION

Results of this four-year study indicate that cotton can be successfully grown in the northern Texas High Plains. It must be emphasized that several things must be taken into consideration from a cotton production standpoint. Regardless of the variety chosen, it is very likely that any lint harvested will have a lower micronaire than desired. Lint with a micronaire greater than 4.9 or less than 3.5 will be penalized. Fewer growing degree-days on the northern Texas High Plains illustrates that care must be exercised to plant the crop when soils are warm enough (near 60 degrees F at the two inch soil depth) for rapid growth early in the growing season. It also indicates that the crop is generally subject to early termination at the end of the growing season. Nighttime low temperatures may also reach levels below that cotton will not grow or an associated and early fall freeze may prematurely terminate the crop. Due to the low temperatures incurred, no insect damage was encountered during the time frame of this study. Producers deciding to grow cotton should become familiar with common cotton insects, economic thresholds and the respective control procedures. In the event of insects, early and rapid treatment is essential as boll development on the lower portion of the plant is essential. Use of genetically modified cotton varieties to control certain cotton insects appears unjustified at this time for the region. This may change with time. Also, use of varieties that are genetically modified to tolerate certain herbicides is probably justified based on experience from other cotton growing regions. This will be especially true in reduced or minimum tillage production systems.

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