



# The Agriculture Program

THE TEXAS A&M UNIVERSITY SYSTEM

## Effect of Planting Date and Maturity Group on Soybean Yield in the Texas High Plains

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### Summary

On average the mid IV was the highest yielding soybean in two of three years. Coupling this variety with a planting date before the second week in June appears to be the best option for soybeans in the High Plains.

### Introduction

Over the last few years producer interest in soybeans has broadened in the Texas High Plains. Producers are interested in soybeans as an alternative crop to corn or grain sorghum due to their ability to provide soil nitrogen, fewer insect pest problems, or to help clean up weedy fields by the use of Roundup Ready soybeans. Soybeans can be planted in a number of different schemes from an early planted full-season crop to a short-season crop behind winter wheat. Due to the relative inexperience of soybean producers in the High Plains, two questions usually arise pertaining to planting soybeans: What maturity group do I plant and when do I plant it? Therefore, a three year study was implemented to attempt to answer these questions.

### Materials and Methods

Beginning in 1999 studies were conducted to evaluate six different soybean maturity groups planted on five different dates. In 1999 the study was conducted near Bushland on the Texas Ag Experiment Station. In 2000 and 2001 the studies were conducted near Etter on the North Plains Research Field. The maturity groups were a mid III, late III, early IV, mid IV, late IV, and mid V. The same Pioneer varieties were planted each year for consistency, though in 2001 the mid III and mid V varieties were changed due to availability. Targeted dates of planting for each year were May 1, May 15, June 1, June 15, and July 1. Actual planting dates may have varied slightly due to weather or other circumstances. All studies were designed as a randomized block and statistical analysis was performed using a two-factor (planting date by maturity group) analysis of variance. Cultural practices and specifics for each study are listed in table 1. Harvesting dates varied in each study due to the various maturity groups and planting dates.

**Table 1. Cultural practices and site description for studies in 1999, 2000, and 2001.**

Site Description	1999	2000	2001
<b>Location</b>	Bushland; TAES	Etter; NPRF	Etter; NPRF
<b>Soil Type</b>	Pullman Silty Clay Loam; pH 7.1; OM 1.1	Sherman Silty Clay Loam; pH 8.0; OM 1.4	Sherman Silty Clay Loam; pH 8.0; OM 1.4
<b>Plot Description</b>	7.5' by 100'; 3 reps	30' by 150'; 3 reps	30' by 150'; 3 reps
<b>Row Spacing</b>	30 inches	30 inches	30 inches
<b>Planter</b>	JD 1700 MaxEmerge Plus	JD 7100 MaxEmerge	JD 1700 MaxEmerge Plus
<b>Varieties (early to late)</b>	93B51, 9396, 94B01, 94B81, 9492, 95B41	93B51, 9396, 94B01, 94B81, 9492, 95B41	93B53, 9396, 94B01, 94B81, 9492, 95B53
<b>Actual Planting Dates</b>	May 11, May 25, June 8, June 28, July 7	May 5, May 19, June 2, June 15, July 5	May 8, May 23, June 6, June 19, July 3
<b>Seeding Rate</b>	120,000 sds/ac	150,000 sds/ac	150,000 sds/ac
<b>Herbicides</b>	Roundup post @ 1.0 qt/ac	Treflan ppi @ 1.5 pt/ac; Roundup post @ 1.0 qt/ac	Treflan ppi @ 1.5 pt/ac; Roundup post @ 1.0 qt/ac
<b>Inoculation</b>	Nitragin granular; 5 lbs/ac in-furrow	Nitragin granular; 6.5 lbs/ac in-furrow	Nitragin granular; 6.5 lbs/ac in-furrow
<b>Irrigation (furrow)</b>	<u>Planting Date, Amount (in)</u> All dates received 15 inches total	<u>Planting Date, Amount (in)</u> May 5, 15.7 May 19, 15.9 June 2, 8.2 June 15, 9.9 July 5, 9.9	<u>Planting Date, Amount (in)</u> May 8, 14.0 May 23, 14.0 June 6, 14.0 June 19, 10.5 July 3, 10.5
<b>Rainfall</b>	13.4 inches total (May - October)	10.95 inches total (May - November)	9.49 inches total (May - October)
<b>Harvest Dates</b>	October 11 & 26	Sep 21, Oct 2, Nov 21	October 3 & 22

## Results and Discussion

**1999.** Variety selection (maturity group) did not have a significant effect on yield, nor was there an interaction between variety and planting date. However, planting date had a significant effect on yield regardless of the variety planted (Table 2). There was only a 2.4 bushel difference in average yield between soybeans planted on May 11 and June 8. However, between June 8 and June 28 there was a 9.1 bu/acre drop in yield followed by another 6 bu/acre drop when planted on July 7. This data would suggest that no appreciable loss in yield would be expected as long as soybeans are planted prior to June 8. Although this was true in 1999, this conclusion may not hold true in other years with different weather conditions. In 1999, May weather was unseasonably wet and cool. As a result soybeans did not grow well most of the month. If weather conditions would have been more normal soybeans would have likely benefitted from the earlier planting. In addition, there seemed to be some advantage in planting longer maturing soybeans (mid IV, late IV, and mid V) on May 11. This advantage may very well have been significant if better growing conditions had been present in May. There was no advantage in planting a short maturing variety late in the season. The mid IV soybean variety was the highest yielding variety when planted on June 8, June 28, and July 7.

**Table 2. 1999 soybean yield means (bu/ac) at Bushland.**

Variety (Pioneer)	Maturity Group	Planting Date					Average <sup>2</sup>
		May 11	May 25	June 8	June 28	July 7	
93B51	Mid III	32.9 e-l <sup>1</sup>	43.0 a-f	44.4 a-d	30.1 h-l	27.3 jkl	35.5 a
9396	Late III	37.9 a-j	35.4 c-k	45.1 abc	30.6 h-l	28.3 jkl	35.4 a
94B01	Early IV	37.2 b-j	49.1 a	43.7 a-e	33.1 d-l	29.0 i-l	38.4 a
94B81	Mid IV	42.7 a-f	39.8 a-i	46.2 abc	40.3 a-i	31.2 g-l	40.0 a
9492	Late IV	44.0 a-e	41.4 a-h	37.0 b-k	35.1 c-l	23.9 l	36.3 a
95B41	Mid V	47.2 ab	42.1 a-g	40.1 a-i	32.1 f-l	25.6 kl	37.5 a
Average <sup>3</sup>		40.3 a	41.8 a	42.7 a	33.6 b	27.6 c	

<sup>1</sup>- means followed by the same letter are not significantly different at P=0.05.

<sup>2</sup>- average across planting dates within each group.

<sup>3</sup>- average across groups within each planting date.

**2000.** Both variety selection and planting date had significant impacts on yield in 2000. A significant interaction between varieties and planting date also existed. The significant interaction was largely due to inconsistency and generally poor results obtained with the group V soybean 95B41 (Table 3). Highest average yield of 35.9 bu/acre was obtained on the earliest planting date (May 5). For approximately every 14 days that planting was delayed from May 5 to June 15 yield was reduced an average of 3.7 bu/acre. Yield was reduced 7.7 bu/acre when planted on July 5 compared to June 15. Best yielding varieties across all planting dates were mid III, late III, and early IV varieties. This was likely due to the extremely dry, hot weather

experienced from July 1 through harvest. These weather conditions tended to favor the earlier maturing varieties. Trouble with an irrigation well late in the season may also have caused the later maturing varieties, especially when planted late, to not yield as well as they may have otherwise. In summary, with the weather conditions present in 2000, planting an early maturing variety as early as possible would have provided the best yield potential with the least amount of risk. Additionally, height to first pod was measured in 2000 (appendix table 5). Interestingly, the later the soybeans were planted, the lower on the plant the first pods were set. Also, the shorter maturing soybeans set pods lower on the plant. Though the majority of yield is found in the middle to lower part of the plant, pods too close to the ground can hinder efficient harvesting.

**Table 3. 2000 soybean yield means (bu/ac) at Etter.**

Variety (Pioneer)	Maturity Group	Planting Date					Average <sup>2</sup>
		May 5	May 19	June 2	June 15	July 5	
93B51	Mid III	41.7 ab <sup>1</sup>	38.9 abc	31.4 e-h	25.7 i-l	20.8 lmn	31.7 ab
9396	Late III	39.8 ab	40.1 ab	30.6 ghi	29.8 g-j	23.4 klm	32.7 a
94B01	Early IV	38.3 a-d	36.7 b-e	31.1 f-i	28.7 g-k	18.5 mn	30.6 ab
94B81	Mid IV	36.3 b-f	33.1 d-g	24.7 jkl	27.2 h-k	16.6 no	27.6 b
9492	Late IV	42.7 a	33.6 c-g	28.4 g-k	26.6 h-k	16.4 no	29.5 b
95B41	Mid V	16.7 no	5.7 q	17.3 no	11.9 op	8.1 pq	11.9 c
Average <sup>3</sup>		35.9 a	31.3 b	27.2 c	25.0 c	17.3 d	

<sup>1</sup>- means followed by the same letter are not significantly different at P=0.05.

<sup>2</sup>- average across planting dates within each group.

<sup>3</sup>- average across groups within each planting date.

**2001.** In 2001 both planting date and maturity group had a significant effect on yield. There was also a significant planting date by maturity group interaction. The highest averaging yield of 28.6 bu/ac was obtained from the June 19 planting date (Table 4). The late IV group (9492) had the highest average yield among all groups at 27.5 bu/ac. In 2001 any group could be planted until May 23 with no significant difference in yield. If planting after the beginning of June it appeared that using a group later than a late IV would cause a reduction in yield. The mid V planted on July 3 in this study did not even have time to mature before the first killing freeze. On average in 2001, planting after June 19 appeared to cause a reduction in yield as did planting a group later than a late IV.

**Table 4. 2001 soybean yield means (bu/ac) at Etter.**

Variety (Pioneer)	Maturity Group	Planting Date					Average <sup>2</sup>
		May 8	May 23	June 6	June 19	July 3	
93B53	Mid III	22.3 h-k <sup>1</sup>	21.7 jk	31.0 abc	29.3 a-e	21.3 jk	25.1 a
9396	Late III	24.0 e-k	22.3 h-k	27.3 a-i	32.3 a	26.3 b-j	26.5 a
94B01	Early IV	22.3 h-k	23.3 g-k	29.7 a-d	29.0 a-f	25.7 c-j	26.0 a
94B81	Mid IV	27.7 a-h	25.7 c-j	27.7 a-h	29.7 a-d	25.0 d-j	27.1 a
9492	Late IV	28.0 a-g	23.3 g-k	31.3 ab	32.7 a	22.0 ijk	27.5 a
95B53	Mid V	31.7 ab	21.7 jk	23.7 f-k	18.7 k	0.0 L	19.1 b
Average <sup>3</sup>		26.0 ab	23.0 bc	28.4 a	28.6 a	20.1 c	

<sup>1</sup>- means followed by the same letter are not significantly different at P=0.05.

<sup>2</sup>- average across planting dates within each group.

<sup>3</sup>- average across groups within each planting date.

<sup>4</sup>- no data was collected from this treatment; soybeans did not mature.

## Conclusions

In two out of three years planting after the second week in June drastically reduced yields. In all years planting in July resulted in lower yields on average. When deciding on a maturity group it appears that conditions throughout the growing season will have a major impact on which one will perform best. In 1999 we saw that the longer maturing groups appeared to have an advantage while in 2000 the opposite was true. To make matters more confusing, in 2001 it appeared that you could just about plant any group any time of the year. Two out of three years the exception was the mid V soybean which did not perform well at all and can probably be ruled out for areas north of Amarillo. On average the mid IV was the highest yielding soybean in two of three years. Coupling this variety with a planting date before the second week in June appears to be a fail-safe option for soybeans in the High Plains. In spite of this, the data show that other options exist as well. Additionally, two out of three years the late III, early IV, and mid IV soybeans yielded better than the mid III when planted in July. This would suggest that there is no advantage to planting a maturity group shorter than a late III when planting late as would be the case behind wheat. The longer maturity groups should have a higher yield potential and will be less likely to set pods close to the ground which could make harvest difficult (Appendix Table 5).

## Appendix

Table 5. Soybean pod height in centimeters. 2000.

Variety (Pioneer)	Maturity Group	Planting Date					Average <sup>2</sup>
		May 5	May 19	June 2	June 15	July 5	
93B51	Mid III	5.3 j <sup>1</sup>	6.0 j	6.7 ij	5.3 j	7.0 hij	6.1 d
9396	Late III	12.3 e-h	9.3 f-j	6.0 j	8.0 hij	7.0 hij	8.5 d
94B01	Early IV	8.0 hij	9.0 f-j	9.3 f-j	8.0 hij	12.0 e-i	9.3 c
94B81	Mid IV	18.7 cd	15.7 cde	15.3 cde	15.3 cde	11.7 e-i	15.3 b
9492	Late IV	14.0 d-g	13.7 d-g	14.3 c-f	8.7 g-j	5.0 j	11.1 c
95B41	Mid V	33.3 a	34.7 a	34.7 a	19.7 c	26.0 b	29.7 a
Average <sup>3</sup>		15.3 a	14.7 a	14.4 a	10.8 b	11.4 b	

<sup>1</sup>- means followed by the same letter are not significantly different at P=0.05.

<sup>2</sup>- average across planting dates within each group.

<sup>3</sup>- average across groups within each planting date.