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Result Demonstration Report

Effect of Planting Date and Maturity Group on Soybean Yield in the Texas High Plains in 2000

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Introduction:

Interest in soybean production continues to grow as producers seek alternatives to conventional crops such as wheat, corn, sorghum, and cotton. Producers particularly like to plant Roundup Ready soybeans in order to clean up weeds that have become a problem in other crops. Typically soybeans are planted from early May to the first week of July. Planting dates vary depending on how soybeans are being utilized by the producer. Some producers are planting early with the hopes of producing high yield, while others are trying to produce a second crop after wheat harvest or, in the Texas South Plains, seeding soybeans as a catch crop after failed cotton. A question that is often asked is which maturity group of soybeans should be planted on a given planting date? This study is the second year of a three to four year experiment to try to answer this question.

Methods and Materials:

Studies were located at Texas Agricultural Research Stations near Etter and Halfway, Texas. Six soybean varieties of different maturity groups were selected for planting. Maturity groups represented were mid III, late III, early IV, mid IV, late IV, and mid V. Varieties from a single company (Pioneer Hi-Bred) were used in order to ensure that the criteria for placing varieties in maturity groups would be consistent. Each variety was then planted on five dates beginning in early May and continuing until early July. The study design was a randomized block and statistical analysis was performed using a two-factor (planting date and maturity group) analysis of variance. The Halfway location was randomized such that the Aearly@ maturing varieties, i.e., mid-III, late-III, and early-IV, as well as Alate@ maturing varieties, could be blocked together as a group within each planting date. This enabled further irrigation as needed of later maturity soybeans without watering matured varieties. Cultural practices and specifics for each site are listed in table 1.

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Table 1. 2000 Cultural practices and site description for studies conducted at Etter, and Halfway, TX.

Cultural Practice, Methods, etc.	TAES-Etter	TAES-Halfway
Soil Type	Silty Clay Loam, pH 8, O.M. 1.4	Pullman clay loam, pH ~7.8, O.M. ~0.5%
Plot size and reps	Randomized, 30 by 150 ft., 3 reps	Randomized within early and late maturity, 13.33= X 100=, 4 reps (2 reps in Date 5 due to rabbit damage)
Row Spacing (inches)	30@	40@
Planter	John Deere MaxEmerge Plus 7100	John Deere MaxEmerge 7100
Seeding Rate (seed/acre)	150,000	125,000-137,000
Herbicide (product/acre)	Treflan, 1.5 pt/A Roundup 1.0 qt/A	Prowl, 1.0 qt/A
Inoculant (product/acre)	Nitragin G, 6.5 lb, in-furrow	LiphaTech Soil Implant, 5.5 lb. in-furrow (also 0X & 2X @10 lbs./A for Dates 2 & 4)
Irrigation (furrow)	Planting Date, Total Irrig. (in) May 5 B 15.7 May 19 B 15.9 Jun 2B 8.2 Jun 15 & Jul 5 B 9.9	Planting Date, Total Irrig. (in.) May 1 B early, 13.2; late, 16.0 May 17 B early, 13.8, late, 16.0 Jun 7 B early, 13.0, late 15.4 Jun 16, early 10.9, late 14.0 Jul 3 B early 9.0, late 12.3
Rainfall (inches/month)	May 0.75, Jun 2.50, Jul 0.64, Aug 0.00, Sep 0.28	Apr 1.31, May 0.10, Jun 3.96, Jul 0.57, Aug 0.26, Sep 0.01, Oct 3.24
Harvest Dates (dependent on variety and planting date)	Sep 21, Oct 2, Nov 21	Oct 9-10, Nov 29-Dec 1

Results:

EtterCBoth 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 2). Highest average yield of 36.0 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.

Table 2. Planting date and maturity group effect on soybean yield at Etter.

Variety (Pioneer)	Maturity Group	Planting Date[1]					Average[2]
		May 5	May 19	June 2	June 15	July 5	
		---------- Yield, bu/acre ----------					
93B51	Mid III	41.7 ab	38.9 abc	31.4 e-h	25.8 i-l	20.9 imn	31.7 AB
9396	Late III	39.8 ab	40.1 ab	30.6 ghi	29.9 g-j	23.5 klm	32.8 A
94B01	Early IV	38.4 a-d	36.7 b-e	31.1 f-i	28.7 g-k	18.5 mn	30.7 ABC
94B81	Mid IV	36.4 b-f	33.1 d-g	24.7 jkl	27.2 h-k	16.6 no	27.6 D
9492	Late IV	42.7 a	33.6 c-g	28.4 g-k	26.6 h-k	16.4 no	29.6 BCD
95B41	Mid V	16.7 no	5.7 q	17.3 no	11.9 op	8.2 pq	12.0 E
Average[2]		*36.0 A*	*31.4 B*	*27.3 C*	*25.0 D*	*17.3 E*	

[1] Yield of each variety at each planting date followed by the same small letter are not significantly different according to ANOVA at P = 0.05.

[2] Average yield of each variety or average yield of each planting date followed by the same capital letter are not significantly different according to ANOVA at P = 0.05.

HalfwayCLike Etter, both soybean maturity and planting date had significant effects on yield in 2000 (Table 3). A significant interaction between varieties and planting data also existed. The greatest average yield, 42.5 bu/acre, was achieved with the early May 1 planting date. Across the season the mid-IV maturity soybean was highest in yield, 36.0 bu/acre. Similar to Etter, for approximately every 14 days that planting was delayed from May 1 to June 16 yield was reduced an average of 4.6 bu/acre. Yield was reduced another 8.7 bu/acre when planted on July 3 compared to June 16. Part of the decrease in yield may be attributed to slightly lower plant populations across the planting dates. This suggests that for later planted soybeans in 2000 the summer heat may have restricted stand establishment.

Best yielding varieties across all planting dates were early-IV, mid-IV, and late-IV. Although hot weather at Halfway might have favored earlier maturing varieties, the group IVs in fact were better performers in 2000. Of particular interest to producers is that the inclination to shorten maturity with late-planted soybeans may be mistaken. For June 16 and July 3 planting dates the later maturing group IVs were significantly better yielding than group III soybeans. In this study, group III soybeans planted at the last two planting dates was 5 to 12@ shorter than the group IVs. This could lead to lower pod set and harvest inefficiencies. Also, in our study we noted that Pioneer Hi-Bred variety 9396, marketed as a late-III, was in fact the shortest maturing in summer 2000.

Table 3. Planting date and maturity group effect on soybean yield at Halfway.

Variety (Pioneer)	Maturity Group	Planting Date[1]					Average[2]
		May 1	May 17	June 7	June 16	July 3	
		---------- Yield, bu/acre ----------					
93B51	Mid III	38.1 b-e	30.4 fgh	26.0 h-k	19.8 k-n	14.9 n	25.8 B
9396	Late III	40.8 bcd	27.9 g-j	28.9 ghi	17.2 lmn	14.0 n	25.7 B
94B01	Early IV	40.2 bcd	26.1 h-k	33.2 efg	29.0 ghi	25.5 h-k	30.8 AB
94B81	Mid IV	50.8 a	40.0 bcd	31.2 fgh	35.8 c-f	22.4 i-l	36.0 A
9492	Late IV	43.3 b	43.4 b	29.1 gh	34.3 d-g	18.5 lmn	33.7 A
95B41	Mid V	41.6 bc	21.8 j-m	25.4 h-k	26.3 h-k	15.2 mn	26.0 B
Average[2]		*42.5 A*	*31.6 B*	*29.0 BC*	*27.1 C*	*18.4 D*	

[1] Yield of each variety at each planting date followed by the same small letter are not significantly different according to ANOVA at P = 0.05.

[2] Average yield of each variety or average yield of each planting date followed by the same capital letter are not significantly different according to ANOVA at P = 0.05.

Halfway soybeans received no fertilizer applications, and soybeans had not been grown on the field for at least 10 years. Under these circumstances one might expect a low potential for *Rhizobium* nodulation from native soil strains of *Rhizobium*. We have learned from our experience with black-eyed peas and peanuts in the South Plains that *Rhizobium* nodulation may not be taken for granted. Most soybean growers in the Plainview area do not inoculate their soybeans with *Rhizobium*. Is this practice detrimental to crop yield? To test this, we also instituted at Dates 2 and 4 a *Rhizobium* inoculant trial using granular Soil Implant inoculant for soybean from Liphatech (formerly Nitragin). Replicated nodule counts were performed (Table 4) and yields were measured at 0X, 1X (standard rate of 5.5 lbs./acre), and 2X inoculation rates (Table 5). *Rhizobium* nodulation from native soil microbes was less than 5 nodules per plant whereas inoculation at the 1X rate appears to increase nodule numbers to the mid-20s. In 2000, the slight increases in yield from 0X to 1X inoculant rate, about 1.5 bu/acre, was not significant and would about equal the cost of the inoculant. Slightly higher but still nonsignificant increases in yield due to 2X inoculant rate were observed, 2.7 bu/acre, compared to 1X. Poor inoculation was achieved at Date 3, but the other dates suggest that yields would not have changed much even if better nodulation were observed. Nodule number alone is not the sole measure of successful nodulation as nodule size and nodule activity are also important. Nodule sizes were qualitatively observed to be slightly larger at the two earlier planting dates. Poor nodulation at Date 5 suggests summer heat may have reduced *Rhizobium* viability later in the season thus less infection.

Table 4. Average *Rhizobium* nodule numbers per plant of mid-IV maturity soybeans at Halfway.

Inoculant Factor	Inoculant Rate	Planting Date[1]				
	(lbs./acre)	May 1	May 17	June 7	June 16	July 3

		---------- Average *Rhizobium* nodules/plant --------				
0X	0		4.8 d		2.4 d	
1X	5.5	24.5 b	21.7 b	4.6 d	26.6 b	13.1 c
2X	10.0		22.8 b		38.6a	

[1)]Yield of each variety at each planting date followed by the same small letter are not significantly different according to ANOVA at P = 0.05.

Table 5. *Rhizobium* inoculation rate effect on mid-IV soybean yield for two dates at Halfway.

Inoculant Factor	Inoculant Rate	Planting Date[1)]					Average[2)]
	(lbs./acre)		May 17		June 16		
		-------- Yield, bu/acre --------					
0X	0		38.7 a		34.2 a		36.5 A
1X	5.5		40.0 a		35.8 a		37.9 A
2X	10.0		42.7 a		38.5 a		40.6 A
Average[2)]			*40.5 A*		*36.2 B*		

[1)]Yield of each variety at each planting date followed by the same small letter are not significantly different according to ANOVA at P = 0.05.
[2)]Average yield of each variety or average yield of each planting date followed by the same capital letter are not significantly different according to ANOVA at P = 0.05.

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