2009 ANNUAL REPORT FOR THE TEXAS SOYBEAN BOARD

TITLE: AGRONOMIC FACTORS INVOLVED IN SOYBEAN PRODUCTION ALONG THE TEXAS GULF COAST

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INTRODUCTION

Weather conditions along the upper Texas Gulf Coast during the 2009 soybean growing season were abnormally dry throughout the growing season. Rainfall for the most part was widely scattered and below normal for the entire region. Due to the above average temperatures and below average rainfall across much of south Texas, Asian Soybean Rust (ASR) did not develop in the Lower Rio Grande Valley and subsequently never was an issue in the upper Texas Gulf Coast soybean production region. The less than normal rainfall contributed to below average yields or resulted in growers not harvesting beans in some areas due to poor quality and little or no yield.

Most of the soybeans along the upper Texas Gulf Coast are planted from mid-March through May and are categorized as early soybean production system plantings (ESPS). Production components such as planting date and variety can be manipulated to counter the effects of various environmental factors on soybean development and yield. The rationale for planting early is to avoid the high temperatures of July and August and to take advantage of late spring and early summer rains for maximum flowering, seed set, and seed filling. High temperatures during seed filling disrupt soybean seed development to the point that many seeds are shriveled, shrunken, and wrinkled at maturity. Many of these abnormal seeds will not germinate, but most of them can be removed by seed conditioning. Surprisingly, germination of seeds that look perfect (although they may be smaller than normal) is also lower. Both determinate and indeterminate soybean cultivars have reduced growth rates under drought stress and resume normal growth rates when such stress is removed. This may be an important growth attribute to consider if producers expect considerable soil moisture deficits due to short, intermittent droughts during the growing season. Also, early planting results in early harvest before stink bugs can become an issue.

The objectives of these studies were three-fold: (1) evaluate the response of different soybean cultivars to various planting dates from mid-February through the middle of May along the upper Texas Gulf Coast soybean production area, (2) determine the response of soybeans planted at a seeding rate of 5 or 10 seed/ft, and (3) determine the response of soybean to fungicides in the presence or absence of disease depending on weather conditions.

MATERIALS AND METHODS

Planting date by seeding rate by cultivar. A field study was conducted in Calhoun County to evaluate the response of soybean cultivars to seeding rates of 5- and 10-seed/ft with planting dates from early February to mid-May. Planting dates were February 10, March 25, April 6 and 21, and May 4 and 18. Soybeans were planted at 5 or 10 seed/ft with a Monosem vacuum planter. Five conventional soybean varieties (HBK 5025, HBK 5941, RIO 8360, RIO 8325, and Vernal) were compared with three Round-up Ready varieties (HBK 5123RR, HBK 5425RR, and NKS49W6RR) and a Liberty-Link variety (HBK 494) at each planting date and seeding rate.

Cultivar by planting date. Field studies were conducted in Victoria (Duane Kiner Farm) and Wharton (A. J. Kresta Farm) Counties to determine the response of soybean cultivars when planted at various planting dates. At the Victoria County location, thirty-three soybean cultivars and at the Wharton County location thirty-six cultivars were evaluated. We strive to begin these studies around the middle of March while planting on a 2-week interval; however, this may vary from location-to-location depending on rainfall, etc. Planting dates at the Victoria County location were March 23 and April 6 and 21 while at the Wharton County location the planting dates were March 24, April 7 and 24. At both locations soybean seed were planted with a Monosem vacuum planter calibrated to deliver 10 seed/ft. Boundary was applied preemergence (PRE) to control weeds at the Wharton County location while Prowl plus Pursuit were applied PRE at the Victoria County location. Select was applied postemergence to control annual grasses which escaped the PRE herbicide treatment. At each location, soil samples were taken at 0-6 and 6-12 inch depths at planting and after harvest to determine the amount of soil nutrients removed from the soil during the growing season.

Soybean cultivar response with one plant date. Twenty-four cultivars were planted in a replicated trial on March 26 in Jackson County.

Response to fungicides. Although weather conditions were not conducive to rust development, concerns about soybean rust infestations and other foliar disease problems prompted a fungicide study in Victoria and Wharton Counties using 10 different fungicides to determine the response of soybeans and soybean diseases to fungicide applications. Two fungicide applications (R4, R6) were applied at each location with a CO_2 backpack sprayer equipped with hollow-cone nozzles calibrated to deliver 15 gal/A at 56 PSI.

Nutrient removal from soil by the soybean plant during growing season. At the Wharton and Victoria County variety by date of planting studies, one RR and one conventional variety were selected (Wharton County: Pioneer 95Y20RR and HBK 5025; Victoria County: Pioneer 95Y20RR and RIO 8325) and soil samples from near the planting zone or tap root area at 0 to 6 inch and 6 to 12 inch were taken at planting and again after harvest to determine nutrient removal during the growing season.

RESULTS AND DISCUSSION

Rainfall throughout the area was below normal during the growing season with extremely dry conditions in most months with the exception of April in Wharton County and May in Victoria County (Table 1). Rainfall information was not available for the Calhoun County location but rainfall was below normal throughout the growing season at this location also. At the Calhoun County location, February 10, March 25, and April 6 planting dates were harvested. Although the soybean plants flowered and produced pods at the other planting dates, the pods never did fill due to the extremely dry conditions.

Table 1. Rainfall amounts for Victoria and Wharton Counties during the 2009 growing season.

Month	**Victoria County**	**Wharton County**
	Inches	
March	1.44	0.98
April	1.44	6.81
May	2.77	0.88
June	0.42	1.01
July	0.7	1.48
August	1.94	1.68
Total	8.71	12.84

Planting date by seeding rate by cultivar. Soybean yields were obtained with Feb 10, March 25, and April 6 planting dates when planted at 5 or 10 seed/ft (Table 2). The earliest planting date produced the highest yield for each variety and seeding rate. Most varieties did show a response to seeding rate.

Table 2. Soybean variety response to seeding rate and planting date in Calhoun County, 2009.

		Planting date					
Variety	Seeding rate/ft	2/10	3/25	4/6	4/21	5/4	5/18
		Bu/A					
HBK 5425RR	5	24.3	17.4	4.6	0	0	0
	10	28.7	21.4	5.0	0	0	0
HBK 5123RR	5	26.0	13.1	4.6	0	0	0
	10	26.5	17.9	6.1	0	0	0
HBK 5025	5	27.0	18.8	4.6	0	0	0
	10	32.5	23.0	6.9	0	0	0
HBK 5941	5	25.5	15.5	5.4	0.8	0	0
	10	27.4	19.5	7.3	0	0	0
HBK 494	5	26.5	21.6	9.6	0	0	0
	10	28.7	24.6	10.8	1.2	0	0
NKS49W6RR	5	21.9	19.8	10.8	0	0	0
	10	24.1	20.9	11.5	0.4	0	0
RIO 8360	5	0	0	0	0	0	0
	10	8.7	5.4	0	0	0	0
RIO 8325	5	0	0	0	0	0	0
	10	8.2	2.7	0	0	0	0
VERNAL	5	0	0	0	0	0	0
	10	11.7	4.6	0	0	0	0
LSD (0.05)		1.2					

Plot size was 2 rows wide by 30 ft long with 3 reps.

Cultivar by planting date. *Wharton County*. The March 24 planting date produced the highest yield (20.9 bu/A) of any planting date (April 7, 15.5 bu/A; April 27, 6.1 bu/A) when averaged over all varieties (data not shown). With the March 24 planting date, the variety TV 54R28RR produced the highest yield of over 31 bu/A (Table 3). Several other varieties produced yields of over 26 bu/A (AG

5304RR, 28.3 bu/A; Croplan 4998RR, 26.6 bu/A; DG 37P49RR, 27.5 bu/A; DK 5068RR, 26.4 bu/A; DP 4888RR, 26.1 bu/A; DP 5335RR, 29.2 bu/a; and NKS 49W6RR, 28.0 bu/A). Considering the dry conditions and lack of much sub-soil moisture these are excellent yields. With the April 7 planting date, DP 5335RR produced the highest yield of 23.6 bu/A while AG 5503RR, NKS49W6RR, TV 54R28RR, and TV55R15RR produced over 20.0 bu/A. Yields from the April 24 planting date were no greater than 11.9 bu/A for any varity due to a lack of soil moisture (Table 3). Planting to harvest interval was greatest for the RIO cultivars and Vernal with at least 141 days (Table 4). Typically most varieties required 112 to 119 days from planting to harvest. Similar trends in harvest intervals were seen with the April 7 and April 27 planting dates.

Victoria County. The first two planting dates of March 23 and April 6 produced 20.8 and 21.3 bu/A, respectively when averaged over all varieties while the April 21 planting date averaged 15.6 bu/A (data not shown). This area of Victoria County did receive some rainfall during the growing season which contributed to more consistent soybean yields over all three planting dates. With the March 23 planting date, DK 5068RR, HBK 5025, and TV 55R15RR produced yields of over 25 bu/A while several varieties produced over 20 bu/A (Table 3). With the April 6 planting date, DK 5068RR and NKS 49W6RR produced over 28 bu/A and with the exception of the RIO cultivars, Vernal, and DG 36Y48RR, all varieties produced over 20 bu/A. With the April 21 planting date, 10 varieties produced over 20 bu/A. Similar trends as seen in Wharton County was seen in Victoria County with respect to the planting to harvest interval. The RIO cultivars and Vernal required approximately 140 days while the other varieties typically required no greater than 120 days.

Cultivar response to one planting date. At the Jackson County location, approximately 1.7 inch of rainfall was received in April and 2.0 inch in May. TV 55R15RR produced over 19 bu/A while most other varieties yielded between 11 and 18 bu/A (Table 3).

Nutrient removal during the growing season. At the 0 to 6 inch soil depth, the percent removal from the soil of each nutrient was nitrogen > potassium > phosphorus for all varieties (Figures 1 and 2) with the exception of RIO 8325 in Victoria County where the percent nutrients removed was almost equal (Figure 2). At the 6 to 12 inch depth, slightly higher percentage of phosphorus was removed from the soil than nitrogen with all varieties. At this depth, the percent of potassium removed was greater in Victoria County (Figure 2) compared with Wharton County (Figure 1). Nitrogen (N) and phosphorus (P_20_5) accumulates in the seed and pods of the soybean plant while potassium (K_20) is important to the stems and leaves as well as the pods. As a consequence, the potassium needs are about twice as great as the phosphorus needs. However, only half of the phosphorus and potassium needs are for the vegetative growth, whereas the balance is for seed development. Soybeans remove about 0.8 lbs of P_20_5 and about 1.4 lbs of K_20 per bushel of yield.

Table 3. Soybean variety response to planting dates in Jackson, Wharton, and Victoria Counties, 2009.							
	WHARTON			VICTORIA			JACKSON
VARIETY*	March 24	April 7	April 24	March 23	April 6	April 21	March 26
AG 4907RR	25.4	19.6	8.8	21.3	24.8	20.2	13.6
AG 5304RR	28.3	18.3	10.0	24.5	26.8	20.4	
AG 5503RR	22.5	20.2	6.9	18.6	21.3	14.2	11.2
AG 5606RR	22.4	15.0	6.4	22.9	22.8	9.0	
AG 5803RR	22.6	15.7	5.8	24.8	23.3	12.8	
CROPLAN 4955RR	25.4	17.2	4.5	23.4	26.8	22.7	15.7
CROPLAN 4998RR	26.6	19.3	10.4	21.0	21.6	18.6	16.0
DG 31R54RR		14.5	0				
DG 32P48RR		14.3	10.8				
DG 36C44RR		15.4	0				
DG 36Y48RR	19.2	14.7	0	19.2	19.8	16.0	13.5
DG 37P49RR	27.5	17.9	8.1	19.2	22.0	19.0	14.8
DK 4866RR	25.1	17.8	10.0	21.3	24.7	21.8	12.9
DK 5068RR	26.4	18.4	10.0	25.6	29.1	23.7	
DP 4888RR	26.1	18.8	10.4	23.7	25.6	22.3	17.5
DP 5335RR	29.2	23.6	11.5	24.3	23.7	19.6	16.5
HBK 494	22.5	18.2	10.0	22.8	24.2	19.2	16.4
HBK 4926	20.5	12.3	7.3	22.5	20.9	18.6	16.0
HBK 5025	25.2	17.4	6.5	25.0	23.6	17.5	17.0
HBK 5941	11.7	10.6	0	24.3	20.9	12.5	
HBK 5123RR	16.3	12.8	0	21.9	23.8	10.9	15.7
HBK 5425RR	20.6	18.8	2.7	24.3	26.4	11.4	16.3
NKS 48C9RR	25.5	19.6	-	23.6	24.3	21.5	16.8
NKS 49W6RR	28.0	20.1	8.1	24.7	28.7	19.1	15.3
NKS 51T8RR	25.6	19.8	11.9	21.1	23.9	21.6	17.3
PIONEER 94Y90RR	21.9	15.4	11.5	22.5	21.8	18.7	17.8
PIONEER 95Y20RR	16.8	13.8	11.1	20.9	23.0	19.6	17.5
RIO 8315	0	0	0	0	0	0	0
RIO 8325	10.0	7.7	0	16.0	10.1	0	
RIO 8360	9.8	9.7	5.8	14.6	9.7	7.9	
RIO 8364	0	0	0	6.5	0	0	0
TV 46R19RR	23.8	16.3	8.8	22.4	25.5	22.0	
TV 49R17RR	19.8	14.0	0	17.7	21.0	21.0	14.3
TV 54R28RR	31.1	20.1	7.3	21.1	20.6	14.3	16.6
TV 55R15RR	25.2	21.3	10.0	25.2	23.2	10.1	19.2
VERNAL	8.8	9.2	0	18.8	17.7	9.5	
LSD (0.05)	2.2			2.3			1.4
* Conventional varieties are in BOLDFACE. Plot size at Wharton and Victoria County locations was 2 rows wide by 30 ft long. Plot size at Jackson County was 2 rows wide by 78 ft long. At all locations there were 3 reps.							

Table 4. Soybean variety harvest date as influenced by planting date, 2009.							
	WHARTON			VICTORIA			JACKSON
VARIETY*	March 24	April 7	April 24	March 23	April 6	April 21	March 26
AG 4907RR	7/14	7/21	8/12	7/9/09	7/22/09	8/5/09	7/13
AG 5304RR	7/21	7/21	8/19	7/13/09	7/27/09	8/10/09	
AG 5503RR	7/14	7/21	8/19	7/9/09	7/13/09	8/18/09	7/13
AG 5606RR	7/21	7/29	8/24	7/22/09	8/5/09	8/18/09	
AG 5803RR	7/21	8/4	8/24	7/22/09	8/5/09	8/24/09	
CROPLAN 4955RR	7/14	7/29	8/24	7/13/09	7/27/09	8/10/09	7/13
CROPLAN 4998RR	7/21	7/29	8/19	7/13/09	7/27/09	8/10/09	7/13
DG 31R54RR	-	7/29	-	-			
DG 32P48RR	-	7/21	8/12	-			
DG 36C44RR	-	7/14	-	-			
DG 36Y48RR	7/14	7/21	-	-	7/13/09	8/10/09	7/13
DG 37P49RR	7/14	7/29	8/19	-	7/27/09	8/10/09	7/13
DK 4866RR	7/14	7/21	8/12	7/9/09	7/22/09	8/5/09	
DK 5068RR	7/14	7/21	8/19	7/13/09	7/27/09	8/10/09	
DP 4888RR	7/14	7/21	8/19	7/13/09	7/27/09	8/10/09	7/13
DP 5335RR	7/14	7/29	8/12	7/9/09	7/13/09	8/10/09	7/13
HBK 494	7/14	7/21	8/19	7/13/09	7/27/09	8/5/09	7/13
HBK 4926	7/14	7/21	8/19	7/13/09	7/27/09	8/10/09	7/13
HBK 5025	7/21	7/29	8/19	7/22/09	7/27/09	8/10/09	7/13
HBK 5941	7/14	8/12	-	7/27/09	8/10/09	8/24/09	
HBK 5123RR	7/21	8/4	-	7/13/09	7/27/09	8/18/09	7/13
HBK 5425RR	7/21	8/4	8/24	7/22/09	8/5/09	8/24/09	7/13
NKS 48C9RR	7/14	7/21	8/12	7/9/09	7/22/09	8/5/09	7/13
NKS 49W6RR	7/14	7/29	8/19	7/13/09	7/27/09	8/10/09	7/13
NKS 51T8RR	7/21	7/29	8/19	7/13/09	7/27/09	8/10/09	7/13
PIONEER 94Y90RR	7/14	7/21	8/12	7/9/09	7/27/09	8/5/09	7/13
PIONEER 95Y20RR	7/14	7/21	8/19	7/9/09	7/27/09	8/10/09	7/13
RIO 8315	-	-	-	-	-	-	-
RIO 8325	8/19	8/19	-	8/10/09	8/24/09	-	
RIO 8360	8/19	8/19	8/19	8/10/09	8/18/09	8/24/09	
RIO 8364	-	-	-	8/18/09	-	-	-
TV 46R19RR	7/14	7/21	8/19	7/9/09	7/22/09	8/5/09	
TV 49R17RR	7/14	7/21	-	7/9/09	7/22/09	8/5/09	7/13
TV 54R28RR	7/14	7/29	8/24	7/9/09	7/22/09	8/10/09	7/13
TV 55R15RR	7/21	7/29	8/24	7/9/09	7/27/09	8/18/09	7/13
VERNAL	8/12	8/12	-	8/5/09	8/10/09	8/24/09	
* Conventional varieties are in BOLDFACE. Plot size at Wharton and Victoria County locations was 2 rows wide by 30 ft long. Plot size at Jackson County was 2 rows wide by 78 ft long. At all locations there were 3 reps.							

Soybean response to fungicides. No ASR or any other foliar diseases were found on soybean at the Victoria or Wharton County locations or any other location where we had soybeans planted. This was due to weather conditions not conducive to disease development. In the fungicide study in Wharton County, Headline at 6.0 oz/A produced soybean yields of over 27 bu/A while Stratego (10 oz/A) plus Leverage (3.8 oz/A), Folicur (4.0 oz/A), Quilt (14.0 oz/A), and Domark (4.0 oz/A) plus Headline (6.0 oz/A) produced yields that ranged from 24.6 to 26.4 bu/A (Figure 3). The untreated check and Stratego (10.0 oz/A) plus Gem (1.0 oz/A) produced soybean yields of approximately 23.0 bu/A. At

Victoria County, all fungicides produced soybean yields of at least 26.0 bu/A while the untreated check yielded 24.3 bu/A (Figure 4). Net returns were calculated for each location. Fungicide and application costs were considered in determining net returns. In Wharton County, Folicur and Headline resulted in net returns of greater than $15.00/A over the untreated check while Stratego plus Gem or Leverage resulted in a loss (Figure 5). At Victoria County, Stratego plus Gem or Folicur alone produced net returns of greater than $20.00/A while Quilt produced net returns of almost $10.00/A (Figure 6). Stratego plus Leverage, Headline, and Domark resulted in a loss. Although weather conditions at either location were not conducive to disease development, most fungicides resulted in a numerical yield increase over the untreated check. However, this did not always result in an increase in net returns due to the costs of fungicides and fungicide application.

ACKNOWLEDGMENTS

We would like to thank the Texas Soybean Board for their continued support of this research project. Also, we would like to thank the following growers who gratuitously allowed us to do research on their farms: A. J. Kresta, Wharton County; Wehmeyer Brothers, Calhoun County; Clint Shutt, Jackson County; and Duane Kiner, Victoria County. We would also like to thank Kevin Brewer, Dwayne Drozd, A. J. Jaks, and Bill Klesel for plot maintenance and harvesting of plots.