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Tolerance of Spanish Peanut to Soil Applied Cotton Herbicides after Crop Failure and Control of Volunteer Spanish Peanut in Cotton

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SUMMARY

Regardless of tillage after cotton failure, initial peanut injury was greatest following Staple and Caparol + Staple treated plots. Injury was also observed in the Dual Magnum-treated plots. Injury following these treatments was observed all season including at the end of the season. Within the "no tillage after cotton failure" system, no treatment reduced peanut yield relative to the non-treated control. However, within the "tillage after cotton failure" system, yield loss was observed in the Staple and Staple + Caparol treated plots. In the cotton replant system, cotton injury following Prowl and Caparol never exceeded 9% and 2% regardless of tillage. In the Dual Magnum no-tilled plots, cotton was injured up to 25% during the season. In the Staple and Caparol + Staple "no tillage after cotton failure" treated plots, cotton was injured up to 25 to 33%. Dual Magnum induced injury was less in the tilled plots compared to no tillage plots at all observation dates. Staple and Caparol + Staple treated plots injured cotton as much as 22% and injury from these treatments in tillage plots was often less than the injury caused by these treatments in no tillage plots. Within tillage system, no herbicide treatment reduced cotton yield relative to the non-treated control. Roundup WeatherMax (glyphosate) was most effective treatment at controlling volunteer 'Tamsan 90' Spanish peanut. At 2 weeks after treatment (WAT), Roundup WeatherMax at 32 ounces controlled peanut 91%. At approximately 16 WAT, Roundup WeatherMax at 32 ounces applied early controlled peanut 88%. No other treatment controlled peanut over 77% at the end of the season.

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INTRODUCTION

In 2001-02, an average of 2.8 million acres were planted to cotton in the Southern High Plains 1-S district. Over this period, an average of 67% of the planted acres were harvested while the other 33% were lost to unpredictable environmental conditions such as wind, hail, and rainfall extremes. In 2003, we lost well over 1 million acres of cotton. Plant back options following cotton failure include sorghum, soybeans, guar, and peanuts, but crop tolerance to many of the soil applied cotton herbicides is unknown. In 2002, numerous questions were raised regarding the tolerance of Spanish peanut to several cotton herbicides following cotton failure. In 2003, we started to investigate the tolerance of Spanish peanut following cotton failure. Previous research dated back as far as 1950 indicates that Spanish peanuts are often more sensitive to soil applied herbicides such as Treflan and Prowl. In 2003, we observed injury to Olin peanut in plots treated with Dual magnum, Staple, and Staple + Caparol. Injury was first apparent in the Dual Magnum plots (up to 5%), but was more apparent in the Staple-treated plots 4 and 8 weeks after planting. There was no difference in peanut injury in plots tilled (bed reformed) after crop failure compared to plots not tilled (peanuts planted directly into stale seedbeds).

MATERIALS AND METHODS

Field experiments were established using traditional small plot techniques. Plot sizes ranged from 2 rows by 30 or 50 feet. Herbicides were applied with a CO₂ backpack sprayer using a carrier volume of 10 gallons of water per acre. Visual weed control and peanut and cotton injury ratings were made at various intervals during the growing season on a scale of 0 = crop injury to 100 = complete crop death.

RESULTS AND DISCUSSION

Peanut recrop. Cotton was planted on May 11 and the following herbicides were applied at planting: Prowl, Staple, Dual Magnum, Caparol, and Caparol plus Staple. The cotton was terminated using paraquat on June 3. The Spanish variety Olin was planted on June 5 to beds that were either reworked or peanut seed was planted directly into stale seedbeds. Regardless of tillage, initial peanut injury was greatest following Staple (17 to 33%) and Caparol + Staple plots (10 to 37%) (Table 1). Injury was also observed in the Dual Magnum-treated plots (12 to 13%). Observations on July 5 and August 6 indicated a similar trend. On October 6, Staple-treated plots injured peanut 45 to 48%, whereas the Staple + Caparol-treated plots injured peanut 38 to 42%. We believe that the majority of the injury from the Staple + Caparol plots was due to the Staple and not the Caparol. Dual Magnum injury was also apparent at the end of season, but injury at less than 10%. Peanut injury from the Prowl and Caparol was less than 8% at all observations. Plots were harvested on October 20. Within the "no tillage after crop destruct" system, no treatment reduced peanut yield relative to the non-treated control. However, within the

“tillage after crop destruct” system, yield loss was observed in the Staple and Staple + Caparol plots. This study will be conducted one more year, and an economic analysis will be conducted for replant peanut and cotton systems (Table 1).

Cotton recrop. Similar to the study described above, cotton was planted on May 11 and the following herbicides were applied at planting: Prowl, Staple, Dual Magnum, Caparol, and Caparol plus Staple. The cotton was terminated using paraquat on June 3. Cotton was replanted on June 5 to beds that were either reworked or cotton seed was planted directly into stale seedbeds. Regardless of tillage, cotton injury following Prowl and Caparol never exceeded 9% and 2%, respectively (Table 2). In the Dual Magnum/ no tilled plots, cotton was injured 17% on June 21, 25 to 22% on July 5 and August 2, and 8% at the end of the season (October 13). In the Staple and Caparol + Staple/no tilled plots, cotton was injured as much as 33% and 25%, respectively. Dual Magnum induced injury was less in the tilled plots compared to no tillage plots at all observation dates. Staple and Caparol + Staple treated plots injured cotton as much as 22% and 13%, respectively, and injury from these treatments in tillage plots was often less than the injury caused by these treatments in no tillage plots. Within tillage system, no herbicide treatment reduced cotton yield relative to the non-treated control; however, a yield loss trend was apparent where significant visual cotton injury was observed. This study will be conducted one more year, and an economic analysis will be conducted for replant cotton and peanut systems (Table 2).

Volunteer peanut control. Volunteer peanut control in cotton can be a problem in some years. Preplant tillage and in-season cultivation are effective, but are not options if conservation tillage systems (reduced or no-till) are used. The objective of this study was to examine the efficacy of herbicides that may be used postemergence in cotton. Roundup WeatherMax (glyphosate) was most effective treatment at controlling ‘Tamspar 90’ Spanish peanut. At 2 weeks after treatment (WAT), Roundup WeatherMax at 32 ounces controlled peanut 91%, which was better than all other treatments (Table 3). At approximately 6 WAT, Roundup WeatherMax at 21 and 32 ounces controlled peanut 80 and 91%, respectively. This control was greater than the control achieved by Ignite at 40 ounces (67%). At approximately 16 WAT, Roundup WeatherMax at 32 ounces applied early controlled peanut 88%. No other treatment controlled peanut over 77%. This data suggests that Roundup WeatherMax applied early was more effective than Roundup WeatherMax treatments applied later in the season. This data also suggests that Roundup WeatherMax was more effective than Ignite at controlling volunteer Spanish peanut. Cultivation two or more weeks after any of these herbicide treatments would probably improve control over the herbicide treatment without cultivation. Sequential applications of any treatment would probably improve peanut control over single applications. Sequential applications will be studied in 2005 (Table 3).

Table 1. Peanut recrop tolerance and yield following cotton herbicides applied preemergence before crop failure at the Western Peanut Growers Research Farm near Denver City, TX.

Treatment	Tillage after crop destruct	Rate (lb/A)	Rate (prod./A)	Peanut Injury (%)				Yield (lb/A)
				Jun 21	Jul 5	Aug 6	Oct 6	
Untreated	none	---	---	0	0	0	0	2932
Prowl 3.3EC	none	0.5	1.2 pt	0	0	1	0	4171
Staple 85WP	none	0.063	1.2 oz	17	20	47	48	2004
Dual Magnum 7.62EC	none	1.0	1 pt	12	2	5	7	3649
Caparol 4L	none	0.8	1.6 pt	0	3	8	5	4122
Caparol + Staple	none	0.8 + 0.063	1.6 pt + 1.2 oz	10	17	47	38	2085
Untreated	yes	---	---	0	0	0	0	3095
Prowl 3.3EC	yes	0.5	1.2 pt	0	2	3	2	3324
Staple 85WP	yes	0.063	1.2 oz	33	38	55	45	1824
Dual Magnum 7.62EC	yes	1.0	1 pt	13	8	12	7	3356
Caparol 4L	yes	0.8	1.6 pt	3	2	7	2	2802
Caparol + Staple	yes	0.8 + 0.063	1.6 pt + 1.2 oz	37	33	42	42	1802
LSD _(0.05)				19	14	14	10	1121

Table 2. Cotton recrop tolerance and yield following herbicides applied preemergence before crop failure at the Western Peanut Growers Research Farm near Denver City, TX.

Treatment	Tillage after crop destruct	Rate (lb/A)	Rate (prod./A)	Cotton Injury (%)				Yield (lb/A)
				Jun 21	Jul 5	Aug 2	Oct 13	
Untreated	none	---	---	0	0	0	0	600
Prowl 3.3EC	none	0.5	1.2 pt	0	3	7	0	572
Staple 85WP	none	0.063	1.2 oz	12	30	33	17	356
Dual Magnum 7.62EC	none	1.0	1 pt	17	25	22	8	381
Caparol 4L	none	0.8	1.6 pt	0	2	2	0	529
Caparol + Staple	none	0.8 + 0.063	1.6 pt + 1.2 oz	10	25	8	3	393
Untreated	yes	---	---	0	0	0	0	700
Prowl 3.3EC	yes	0.5	1.2 pt	0	3	9	0	658
Staple 85WP	yes	0.063	1.2 oz	3	13	22	4	556
Dual Magnum 7.62EC	yes	1.0	1 pt	15	17	13	3	662
Caparol 4L	yes	0.8	1.6 pt	0	0	2	2	595
Caparol + Staple	yes	0.8 + 0.063	1.6 pt + 1.2 oz	0	3	13	8	464
LSD _(0.05)				7	8	12	5	267

Table 3. Control of volunteer Spanish peanut with cotton herbicides that may be applied preplant, postemergence in transgenic crops, or postemergence-directed at the Western Peanut Growers Research Farm near Denver City, TX.

Treatment	Rate (lb ai/A)	Rate (prod./A)	Peanut Control (%)		
			Jun 09	Jul 05	Oct 13
Non-treated	---	---	0	0	0
MSMA 6L	2.0 early-season	1.33 qt	40	75	77
Roundup WeatherMax 4.5AS	0.75 ae early-season	21 oz	63	80	55
Roundup WeatherMax 4.5AS	1.125 ae early-season	32 oz	84	91	88
Roundup WeatherMax 4.5AS	0.75 ae mid-season	21 oz	NA	57	43
Roundup WeatherMax 4.5AS	1.125 ae mid-season	32 oz	NA	63	55
Liberty 1.67 EC	0.52 early-season	40 oz	68	67	53
LSD _(0.05)			13	14	24