

Weed Management Systems in Cotton in the Texas High Plains



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Introduction

Populations of Palmer amaranth that survived multiple glyphosate applications were reported at several locations in the Texas High Plains in 2011. Preliminary greenhouse studies suggested that these populations were tolerant to up to 88 oz of Roundup PowerMax. Although it may not be possible to completely prevent the development of herbicide resistant weeds on-farm, Best Management Practices (BMPs) to delay development would include: tillage, use of soil residual herbicides, full herbicide use rates, field hygiene, controlling weed escapes prior to seed maturation, and utilizing weed management “systems” that include several different herbicide “modes of action” that are effective on the same weed species. Growers in the High Plains are aware of the rapid development of glyphosate resistant weeds in the southeast. Cotton varieties that contained glyphosate and worm resistance were planted on over 95% of all U.S. cotton acreage in 2011; therefore, sustainable weed management systems must be developed and practiced to preserve the longevity of current and newly discovered herbicide-tolerant crop technology.

Objectives

The objective of this research was to evaluate Palmer amaranth control and cotton response in Roundup Ready Flex cotton in two different soil textures with an emphasis on soil residual herbicides applied 30 days preplant, preplant incorporated, preemergence, early-postemergence, mid-postemergence, and postemergence-directed.

Materials and Methods

Field trials were conducted in 2011 in the Texas High Plains at two locations with different soil textures. Soil at Halfway in the northern High Plains is classified as a clay loam, whereas soil at Lamesa in the southern High Plains is a fine sandy loam. Plots, 4 rows by 30 or 45 feet, were replicated four times. DeltaPine 0912 B2RF and Phytogen 375 WRF were planted May 12 at Halfway and DeltaPine 1032 B2RF and Phytogen 375 WRF were planted May 26 at Lamesa. Herbicide applications were broadcast applied using a CO₂-pressurized backpack sprayer containing TurboTee 110015 spray tips. Water was used as the carrier at 10 gallons per acre (GPA). Layby applications were made using a Redball hooded sprayer containing TurboTee 8002 VS spray tips calibrated to deliver 10 GPA. Palmer amaranth control was recorded at the 4 postemergence application timings and cotton yield calculated at the end of the growing season.



An effective residual-based weed management “system” in Roundup Ready Flex cotton. This photo was taken on August 18, 2011 at Halfway, TX.

Table 1. Palmer amaranth control and cotton yield at Halfway, TX as affected by sequential herbicide applications^a.

Treatment	Rate		Timing ^b	Palmer amaranth control					Cotton Yield
	lb ai/A	oz/A		Jun 9	Jun 21	Jul 5	Jul 25	Aug 9	
Treflan	1	32	30 D PPI	98	82	100	99	100	699
Caparol	1.2	38.4	PRE						
Roundup PowerMax	0.95	22	6-8 LF						
Warrant	1.125	48	6-8 LF						
Roundup PowerMax	0.95	22	LAYBY						579
Direx	1	32	LAYBY	84	96	92	100	98	
Treflan	1	32	30 D PPI						
Roundup PowerMax	0.95	22	2-4 LF						
Warrant	1.125	48	2-4 LF						626
Roundup PowerMax	0.95	22	LPOST						
Roundup PowerMax	0.95	22	LAYBY						
Direx	1	32	LAYBY	91	93	74	99	96	
Roundup PowerMax	0.95	22	30 D PP						691
Valor SX	0.064	2	30 D PP						
Roundup PowerMax	0.95	22	2-4 LF						
Warrant	1.125	48	2-4 LF						
Roundup PowerMax	0.95	22	LPOST						704
Direx	1	32	LAYBY	86	84	84	81	68	
Treflan	1	32	30 D PPI						
Ignite 280	0.53	29	2-4 LF						
Warrant	1.125	48	2-4 LF						651
Ignite 280	0.53	29	LPOST						
Ignite 280	0.53	29	LAYBY						
Direx	1	32	LAYBY	89	86	79	97	93	
Roundup PowerMax	0.95	22	30 D PP						716
Valor SX	0.064	2	30 D PP						
Staple LX	0.075	3	2-4 LF						
Warrant	1.125	48	2-4 LF						
Roundup PowerMax	0.95	22	LPOST						0.5482
MSMA	3	64	LAYBY						
Direx	1	32	LAYBY						
Treflan	1	32	30 D PPI	89	88	86	99	95	
Staple LX	0.075	3	2-4 LF						NS
Warrant	1.125	48	2-4 LF						
Roundup PowerMax	0.95	22	LPOST						
Direx	1	32	LAYBY						
pValue				0.0001	0.0001	0.0001	0.0001	0.0001	0.5482
LSD _(0.10)				13	8	8	9	15	NS

^aAbbreviations: D, days; LF, leaf; LPOST, late-postemergence; PP, preplant; PPI, preplant incorporated; PRE, preemergence.
^b30 DPP, Apr 13; PRE, May 12; 2-4 LF, Jun 9; 6-8 LF, Jun 21; LPOST, Jul 6; LAYBY, Jul 21.

Table 2. Palmer amaranth control and cotton yield at Lamesa, TX as affected by sequential herbicide applications^a.

Treatment	Rate		Timing ^b	Palmer amaranth control				Cotton Yield
	lb ai/A	oz/A		Jun 15	Jul 1	Jul 15	Aug 8	
Treflan	0.625	20	30 D PPI	95	80	100	100	282
Caparol	0.8	25.6	PRE					
Roundup PowerMax	0.95	22	6-8 LF					
Warrant	1.07	45.6	6-8 LF					
Roundup PowerMax	0.95	22	LAYBY					264
Direx	0.8	25.6	LAYBY	88	100	97	99	
Treflan	0.625	20	30 D PPI					
Roundup PowerMax	0.95	22	2-4 LF					
Warrant	1.07	45.6	2-4 LF					347
Roundup PowerMax	0.95	22	LAYBY					
Direx	0.8	25.6	LAYBY	60	99	92	97	
Roundup PowerMax	0.95	22	30 D PP					
Valor SX	0.064	2	30 D PP					
Roundup PowerMax	0.95	22	2-4 LF					
Warrant	1.07	45.6	2-4 LF					
Roundup PowerMax	0.95	22	LAYBY					248
Direx	0.8	25.6	LAYBY	98	98	93	93	
Treflan	0.625	20	30 D PPI					
Ignite 280	0.53	29	2-4 LF					
Warrant	1.07	45.6	2-4 LF					264
Ignite 280	0.53	29	LAYBY					
Direx	0.8	25.6	LAYBY	76	85	88	91	
Roundup PowerMax	0.95	22	30 D PP					
Valor SX	0.064	2	30 D PP					
Staple LX	0.0325	1.3	2-4 LF					
Warrant	1.07	45.6	2-4 LF					
MSMA	1.98	38.4	LAYBY					0.4536
Direx	0.8	25.6	LAYBY					
Treflan	0.625	20	30 D PPI	94	91	92	95	
Staple LX	0.0325	1.3	2-4 LF					
Warrant	1.07	45.6	2-4 LF					11
MSMA	1.98	38.4	LAYBY					
Direx	0.8	25.6	LAYBY					
pValue				0.0001	0.0001	0.0001	0.0001	
LSD _(0.10)				11	9	9	9	NS

^aAbbreviations: D, days; LF, leaf; LPOST, late-postemergence; PP, preplant; PPI, preplant incorporated; PRE, preemergence.
^b30 DPP, Apr 7; PRE, May 6; 2-4 LF, Jun 22; 6-8 LF, Jul 5; LPOST, Jul 25; LAYBY, Jul 25.

Summary of Results

Halfway, TX (Table 1)

- On Jun 9, just prior to a 2 to 4 leaf application (early-postemergence, EPOST), systems containing either Roundup PowerMax + Valor applied 30 days before planting (DBP) or Treflan PPI controlled Palmer amaranth 84 to 98%. The Roundup PowerMax + 2,4-D tank mix applied 30 DBP controlled Palmer amaranth less than 50%.
- On Jun 21, 12 days after an EPOST application, Roundup PowerMax + Warrant controlled Palmer amaranth 93 to 96%, whereas the Ignite + Warrant and Staple + Warrant treatments controlled this weed 84 to 88%. The Roundup PowerMax + 2,4-D 30 DBP system controlled Palmer amaranth less than 80%.
- On Jul 5, 14 days after a 6 to 8 leaf application (mid-postemergence, MPOST), Treflan followed by (fb) Roundup PowerMax + Warrant EPOST or MPOST “systems” controlled Palmer amaranth 92 to 100%, whereas the Treflan fb Ignite + Warrant or Staple + Warrant “systems” controlled this weed 84 to 86%. Without Treflan, Palmer amaranth was controlled <75% regardless of “system”.
- On Jul 25, 20 days after a late-postemergence (LPOST) application, Roundup PowerMax LPOST controlled Palmer amaranth 96 to 100%, which was greater than control observed following Ignite LPOST (81%). Soil residual activity in the system containing Treflan PPI fb Caparol preemergence (PRE) fb Roundup PowerMax + Warrant MPOST without a LPOST application maintained effective Palmer amaranth control (99%).
- On Aug 9, 19 days after a Layby application, all glyphosate-based systems controlled Palmer amaranth at least 89%, whereas the Ignite-based system was less effective at controlling Palmer amaranth (68%).
- Cotton yield was similar across all treatments regardless of the effectiveness of Palmer amaranth control. Record temperatures and drought resulted in below average yield in 2011.

Lamesa, TX (Table 2)

- On Jun 15, prior to an EPOST application, residual Palmer amaranth control was 60 to 76% following Roundup PowerMax + Valor preplant and 88 to 98% following Treflan PPI. No residual control was observed following Roundup PowerMax + 2,4-D preplant.
- On Jul 1, 9 days after an EPOST application, all systems containing Roundup PowerMax + Warrant or Ignite + Warrant EPOST controlled Palmer amaranth at least 98%. Treflan fb Staple + Warrant EPOST controlled Palmer amaranth 91%. Staple + Warrant without Treflan PPI and Treflan fb Caparol with an EPOST application were less effective (80 to 85%).
- On Jul 15, 10 days after a MPOST application, all glyphosate- and Ignite-based systems controlled Palmer amaranth 92 to 100%, whereas Staple-based systems controlled this weed 88 to 92%.
- On Aug 8, 14 days after a Layby application, Roundup PowerMax + Direx controlled Palmer amaranth 97 to 100%, whereas Ignite + Direx and MSMA + Direx controlled this weed at least 91%.
- Cotton yields were much below average due to the record heat and drought and were not different across “systems”.