Use of Residual Herbicides for Tough to Control Weeds in Snap Beans

Final Report for 2011

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Pennsylvania Vegetable Marketing and Research Program
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Weed Control in Snap Beans

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Introduction:

Snap beans are produced on approximately 7,000 acres in Pennsylvania and 3,000 acres in Delaware (PDA Ag Statistics, 2009-10; DE Agricultural Statistics). Weed control can be a problem in this very important processing and fresh market crop. Weed control impacts snap bean yield as well as harvest efficiency, harboring other pests, and reducing the deposition of other pesticides. Only a limited number of herbicides are currently available for snap beans. Some herbicides provide weed control for a period of time after application (residual effect), which is a benefit for achieving full-season control. The herbicides commonly used for broadleaf weed control such as Raptor, Sandea, and Reflex have replant restrictions that can impact their usefulness. Furthermore, there have been documented resistant weed biotypes to some of these herbicides in our region. Other herbicides such as Basagran have little to no impact on crop rotations but Basagran has a very limited number of weed species that it controls. A number of issues for herbicide usage in the Mid-Atlantic region need additional work to determine the consistency of results, and obtain data over a wider range of environmental and production conditions.

Objectives:

1. Determine the most efficient timing of residual herbicides by comparing use at planting [PRE] versus postemergence [POST].
2. Evaluate herbicide combinations and surfactants for difficult to control weeds in snap beans, particularly lambsquarters.

Methods:

The studies were conducted at the PSU's Russell E. Larson Agricultural Research Farm in Centre County, PA, and the University of Delaware Research and Extension Center in Sussex County, DE in 2011. The plots were four rows by 25 to 30 feet long, and Slenderpak was seeded at PSU on June 3, while Dart was used at UD, planted June 15. Postemergence (POST) treatments were applied July 6 and 7 at PSU and UD, respectively. Treatments are listed in Table 1. Reflex and Sandea are labeled for both preemergence (PRE) and POST application and they were applied at both timings. Secondly, Basagran, Reflex, Sandea, and Raptor were applied POST in tank-mix combinations. The inclusion of certain adjuvants (e.g., surfactants) was also evaluated to determine if any provided improved postemergence herbicide performance with minimal crop injury. POST treatments were applied approximately mid-day with full sunlight to increase the likelihood of injury. The UD site was irrigated, but PSU site was not. PRE herbicides were activated at both locations with a timely rain shower, but rainfall limited snap bean development later in the season at PSU. All treatments were replicated three times. Plots were yielded via hand-harvesting at PSU and use of Pix-All harvester at UD.

Results:

<u>PSU site:</u>
Statistical differences were detected between treatments within one week of the POST applications, yet no treatment had more than 10% injury.

PRE weed control ratings for lambsquarters were taken about 5 weeks after planting (data not presented in tables). Dual alone provided about 70% weed control, Dual plus Reflex at 1.25 pt/A was about 85% control, while Dual plus Reflex (1.67 pt/A) or Dual plus Sandea were over 90% control.

Full-season lambsquarters was inadequate when Reflex was applied POST, yet PRE applications of Reflex (1.67 pt/A) provided 90% control (Table 1). Similarly, Sandea was more effective when used as a PRE application, but had limited activity when it was applied POST.

<u>UD site:</u>

Dual alone did not stunt beans at 3 WAP, but Dual plus Sandea or Reflex resulted in 10 to 12% stunting. As much as 15% stunting was observed with POST treatments at 2 WAT. Injury from POST treatments was more pronounced at UD than PSU, but no consistent trends were observed. No differences were detected between the adjuvants included in this trial.

PRE weed control ratings were taken about 3 weeks after planting (data not presented in table). Excellent control of Palmer amaranth was observed with all treatments. Control of common lambsquarters was above 93% when Reflex or Sandea were applied at planting, while Dual alone was less than 50%. Morningglory control was best with Dual plus Sandea, but control was less than 80% and Dual plus Reflex was about 50%.

Full-season control of Palmer amaranth was at least 97% for all treatments (Table 1). Common lambsquarters control was excellent (>93%) for all treatments except Dual followed by Reflex (70%) or Dual followed by Sandea (no control).

Morningglory control was improved if Reflex was used POST compared to PRE (Table 1). Reflex applied PRE followed by Sandea POST was better than either Reflex applied with Dual PRE alone or Dual PRE followed by Sandea applied POST.

Dry weather impacted yield at both locations. Rainfall at PSU was sufficient to activate the PRE herbicides, but there was inadequate rainfall for yield. At UD, hot weather forced a split set of snap beans that severely impacted yield.

Adjuvants at both locations did not increase the amount of crop injury, nor did they have an impact on weed control.

Table 1. Snap bean trials for management of troublesome weed species at PSU's Russell E. Larson Agricultural Research Farm in Centre County and the University of Delaware Research and Extension Center in Sussex County in 2011. Dual Magnum rates in DE were 1.25 pts/A rather than 1.67 pts/A due to sandier soil type (loamy sand versus silt loam). PRE=preemergence applications made at planting; POT=postemergence applications at 3 to 4 weeks after planting; WAT=weeks after treatment. Dual Magnum rate was 1.67 pt/A for PSU and 1.25 pt/A for UD. Treatments followed by the same letter are not significantly different from one another.

				PSU Centre County								UD Sussex County							
				Snap bean		Lambsqrtr		Velvetleaf		Snap bean		Snap bean		Lambsqrtr		Morningglory		Snap bean	
				21-Jul		1-Aug		1-Aug		1-Aug		22-Jul		1-Aug		1-Aug		1-Aug	
Treatment		Rate	Appl	% Injury		Control %		Control %		Yield (lb/A)		% Injury		Control %		Control %		Yield (lb/A)	
Name	Rate	Unit	Timing	2 WAT		4 WAT		4 WAT				2 WAT		4 WAT		4 WAT			
Untreated				0	d	0	d	0	b	1442	ab	0	e	0	c	0	c	N/A	
Dual Magnum	1.67	pt/a	PRE	1	cd	90	a	57	a	2255	ab	3.3	cde	100	a	44	b	487	a
Reflex	1.67	pt/a	PRE																
Dual Magnum	1.67	pt/a	PRE	3	cd	60	bc	55	a	1977	ab	1.7	de	70	b	69	a	1020	a
Reflex	1	pt/a	POT																
NIS	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	3	bcd	85	ab	60	a	1884	ab	9.6	abc	100	a	67	ab	364	a
Sandea	0.67	oz/a	PRE																
Dual Magnum	1.67	pt/a	PRE	6	bcd	52	c	80	a	2092	ab	0	e	0	c	44	b	856	a
Sandea	0.67	oz/a	POT																
NIS	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	5	bcd	77	abc	81	a	3045	a	11.7	ab	100	a	76	a	821	a
Reflex	1.25	pt/a	PRE																
Sandea	0.67	oz/a	POT																
NIS	0.25	% v/v	POT																

Dual Magnum	1.67	pt/a	PRE	7	bc	73	abc	84	a	2149	ab	14	a	100	a	83	a	487	a
Reflex	1.25	pt/a	PRE																
Sandea	0.67	oz/a	POT																
LI 700	4	pt/100 gal	POT																
Dual Magnum	1.67	pt/a	PRE	4	bcd	81	ab	65	a	2827	a	14	a	100	a	90	a	470	a
Sandea	0.67	oz/a	PRE																
Reflex	1	pt/a	POT																
NIS	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	7	bc	73	abc	78	a	1561	ab	13.3	a	97	a	86	a	866	a
Basagran	1.5	pt/a	POT																
Raptor	4	fl oz/a	POT																
NIS + UAN	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	5	bcd	72	abc	70	a	2565	ab	4.7	b-e	100	a	70	a	917	a
Basagran	1.5	pt/a	POT																
Raptor	4	fl oz/a	POT																
NIS	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	6	bcd	72	abc	60	a	2284	ab	8	a-d	100	a	78	a	929	a
Basagran	1.5	pt/a	POT																
Raptor	4	fl oz/a	POT																
LI 700	4	pt/100 gal	POT																
Dual Magnum	1.67	pt/a	PRE	10	b	75	abc	70	a	1903	ab	13.3	a	97	a	85	a	710	a
Basagran	1.5	pt/a	POT																
Reflex	0.75	pt/a	POT																
NIS + UAN	0.25	% v/v	POT																
Dual Magnum	1.67	pt/a	PRE	4	bcd	73	abc	70	a	3499	a	11.7	ab	100	a	84	a	657	a
Basagran	1.5	pt/a	POT																
Reflex	0.75	pt/a	POT																

NIS	0.25	% v/v	POT																		
Dual Magnum	1.67	pt/a	PRE	7	bc	77	abc	71	a	1993	ab	9	abc	93	a	74	a	720	a		
Basagran	1.5	pt/a	POT																		
Reflex	0.75	pt/a	POT																		
LI 700	4	pt/100 gal	POT																		