

# COMMON LAMBSQUARTERS AND KOCHIA CONTROL IN LIBERTY LINK AND XTEND SOYBEAN AS PART OF A SUGARBEET ROTATION IN 2016 AT BARNEY, ND

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The objective of this study was to demonstrate a weed control system in soybean using herbicides with a site of action different than EPSP synthase inhibitor (glyphosate) and have rotation flexibility with sugarbeet as a rotational crop the following season.

## MATERIALS AND METHODS

An experiment was conducted near Barney, ND in 2016. The trial site was prepared using a Kongskilde ‘s-tine’ field cultivator with rolling baskets on May 4, 2016. ‘L08-14’ Liberty Link and ‘16X07N’ Roundup Ready 2Xtend soybean from Peterson Farm Seed was seeded in 22-inch rows at 160,000 seeds per acre on May 4 with a John Deere 1700XP 6-row planter. Liberty Link soybean were seeded in one block that was 7 treatments wide by 4 replications deep and Xtend soybean were seeded in an adjacent block with the same dimensions. Preemergence (PRE) treatments were applied May 4. Postemergence (POST) treatments were applied May 24, June 2, and June 21. All herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO<sub>2</sub> at 30 psi to the center four rows of six row plots 30 feet in length. Soybean injury and common lambsquarters and kochia control were evaluated June 1, 22, 29, and September 7. Data from June 22 are not shown in this publication.

All soybean injury and weed control evaluations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Experimental design was randomized complete block with 4 replications for each trial. Data were analyzed with the ANOVA procedure of ARM, version 2015.6 software package.

**Table 1. Application Information – Barney, ND 2016**

Application	A	B	C	D
Date	May 4	May 24	June 2	June 21
Time of Day	1:00 PM	3:00 PM	9:00 AM	3:30 PM
Air Temperature (F)	69	86	59	83
Relative Humidity (%)	24	29	60	32
Wind Velocity (mph)	7	5	6	7
Wind Direction	NNW	SW	NW	W
Soil Temp. (F at 6")	59	70	54	70
Soil Moisture	Good	Fair	Good	Fair
Cloud Cover (%)	0	70	10	30
Next Rainfall (amount)	May 11	May 25	June 3	June 22
Corn Stage	PRE	VC	V2	V4
Common Lambsquarters	-	1 inch	3 inch	1 inch
Kochia	-	1 inch	2 inch	3 inch
Redroot Pigweed	-		2 inch	1 inch

## SUMMARY

Xtend soybean are tolerant to both dicamba and glyphosate. Soybean injury was observed from treatments containing Cobra (Table 2) following the first POST application (application B). Injury ranged from 45 to 50% with the greater levels of injury coming from Sharpen PRE fb Cobra. No other treatments caused soybean injury following the first POST application. Injury was observed from other treatments following the second POST application but may be partially attributed to weed competition as Xtend soybean showed 19% injury on June 29 following two applications of Roundup PowerMax.

**Table 2. Soybean injury and weed control in Liberty and Xtend soybeans at Barney, ND in 2016.**

Treatment	Rate	Appl <sup>1</sup>	-----June 1-----			-----June 29-----			---Sept 7---	
			soyb <sup>2</sup> % inj	kocz %cntl	colq %cntl	soyb % inj	kocz %cntl	colq %cntl	kocz %cntl	colq %cntl
Dual Magnum+Sharpen	1.3+1 pt + fl oz	A	0	0	60	11	61	40	17	87
Liberty <sup>3</sup>	29 fl oz	C								
Dual Magnum+Valor SX	1.3+2.5 pt + oz	A	0	0	53	10	49	53	27	75
Liberty <sup>3</sup>	29 fl oz	C								
Sharpen	1 fl oz	A	50	100	84	45	100	61	100	48
Cobra <sup>4</sup>	10 fl oz	B								
Cobra <sup>4</sup>	10 fl oz	D								
Sharpen	1 fl oz	A	0	93	89	14	75	60	45	40
Basagran <sup>5</sup>	0.8 pt	B								
Basagran <sup>5</sup>	0.8 pt	D								
Liberty <sup>3</sup>	29 fl oz	B	0	93	86	14	94	75	82	68
Liberty <sup>3</sup>	29 fl oz	D								
Liberty <sup>3</sup> + Cobra <sup>4</sup>	22 + 8 fl oz+fl oz	B	45	100	90	43	100	76	100	61
Liberty <sup>3</sup> + Cobra <sup>4</sup>	22 + 8 fl oz+fl oz	D								
Liberty <sup>3</sup> + Basagran <sup>5</sup>	22+0.8 fl oz + pt	B	0	95	90	21	89	71	60	53
Liberty <sup>3</sup> + Basagran <sup>5</sup>	22+0.8 fl oz + pt	D								
Warrant + Sharpen	3 + 1 pt + fl oz	A	0	0	38	13	81	79	68	89
Engenia + RU PowerMax <sup>6</sup>	12.8+32 fl oz+fl oz	C								
Warrant	3 pt	A	0	99	96	3	100	96	100	100
Engenia + RU PowerMax <sup>6</sup>	12.8+32 fl oz+fl oz	B								
Engenia + RU PowerMax <sup>6</sup>	12.8+32 fl oz+fl oz	D								
Engenia	25.6 fl oz	A	0	100	98	4	94	99	97	100
Engenia + Warrant	12.8+3 fl oz + pt	B								
RU PowerMax <sup>7</sup>	32 fl oz/a	D								
Sharpen	1 fl oz/a	A	0	98	93	11	88	88	73	98
Engenia + Warrant	12.8+3 fl oz + pt	B								
RU PowerMax <sup>7</sup>	32 fl oz/a	D								
Engenia + RU PowerMax <sup>6</sup>	12.8+28 fl oz+fl oz	B	0	100	95	8	96	98	100	100
Engenia + RU PowerMax <sup>6</sup>	12.8+28 fl oz+fl oz	D								
Engenia + RU PowerMax +Basagran <sup>6</sup>	12.8+28 fl oz+fl oz +0.8 +pt	BD BD	0	100	98	9	96	99	100	100
RU PowerMax <sup>7</sup>	32 fl oz/a	B	0	60	88	19	32	76	45	88
RU PowerMax <sup>7</sup>	32 fl oz/a	D								
<b>LSD (0.05)</b>			<b>4.9</b>	<b>13.7</b>	<b>15.6</b>	<b>11.8</b>	<b>20.3</b>	<b>10.7</b>	<b>20.9</b>	<b>16.7</b>

<sup>1</sup>Appl refers to application information in Table 1.<sup>2</sup>soyb=soybean; kocz=kochia; colq=common lambsquarters<sup>3</sup>Indicates addition of ammonium sulfate (AMS) at 17 lb/100 gal (5% v/v). N-Pak AMS provided by Winfield.<sup>4</sup>Indicates addition of crop oil concentrate (COC) at 1.5 pt/A. Combelt COC used.<sup>5</sup>Indicates addition of methylated seed oil (MS) at 1.5 pt/A. MSO provided by Loveland.<sup>6</sup>Indicates addition of Class Act Ridion at 1 %v/v provided by Winfield.<sup>7</sup>Indicates addition of ammonium sulfate (AMS) at 8.5 lb/100 gal and non-ionic surfactant (NIS) at 0.25% v/v. N-Pak AMS provided by Winfield and Prefer 90 NIS provided by West Central, Inc.

Common lambsquarters control was generally greater from Roundup PowerMax or Engenia containing treatments than from Liberty containing treatments. The spring of 2016 was relatively dry and activation of PRE herbicides was difficult. Preemergence applications of Dual Magnum+Sharpen, Dual Magnum+Valor, or Warrant+Sharpen provided only 40% to 60% lambsquarters control prior to applying POST herbicides. In the Liberty Link system, the treatments containing a PRE fb Liberty gave the greatest lambsquarters control from 75% to 87%. Preemergence Sharpen fb two applications of Cobra or Basagran gave 48% and 40% lambsquarters control, respectively. Adding Liberty to both applications of Cobra or Basagran tended to increase control compared to Cobra or Basagran alone, but tended to decrease lambsquarters control compared to making two applications of Liberty. In the Xtend system, common lambsquarters control was greatest from treatments containing Engenia, regardless of whether a PRE had been applied or not. Warrant+Sharpen applied PRE fb Engenia+Roundup PowerMax applied June 2 gave 89% lambsquarters control and was similar to control from two applications of Roundup PowerMax which gave 88% control. All other treatments, which contained Engenia, gave 98% to 100% lambsquarters control on September 7.

No kochia control was observed from any PRE treatments prior to the first POST application being made. Sharpen and Valor SX have both shown good kochia control in other trials, but the lack of activating rainfall kept these herbicides from performing up to their potential. Kochia control at the end of the season was less than 30% when Liberty was applied once following a PRE herbicide. Two applications of Liberty with no PRE herbicide gave 82% kochia control on September 7. Basagran, either alone or with Liberty, gave only 45% and 60% kochia control, respectively, at the end of the season. Cobra, however, applied alone or with Liberty gave 100% kochia control at the end of the season. In the Xtend system, treatments containing 2 applications of Engenia, either PRE fb POST or two POST applications gave 97% to 100% kochia control at the end of the season. One application of Engenia, regardless of the PRE herbicide applied, gave 68% to 73% kochia control. Two applications of Roundup PowerMax gave only 45% kochia control and indicates the presence of glyphosate resistant kochia at this location.

## **CONCLUSIONS**

Liberty herbicide, while very effective at controlling many weeds, can have difficulty controlling hard to wet weeds. Achieving good to excellent spray droplet retention on the leaf surfaces of both kochia and common lambsquarters is difficult due to the hairy pubescence of kochia and waxy cuticle of lambsquarters. Since Liberty is only a contact herbicide, spray droplet retention is critical. Environment at, and following, Liberty application is incredibly important to maximize Liberty efficacy. Information regarding Liberty can be found in the North Dakota Weed Control Guide (W-253) in paragraph B9. Kochia control in the Liberty system was 100% from two applications of Cobra, either with or without Liberty. Lambsquarters control was greatest at 87% from PRE Dual Magnum+Sharpen fb Liberty.

Roundup Ready2 Xtend soybean show excellent promise at helping growers control difficult weeds such as lambsquarters and kochia. Two POST applications or a PRE fb POST application of Engenia was needed to achieve 97% to 100% kochia control in this trial. A single application of Engenia, even following a PRE herbicide, gave only 68% to 73% kochia control. Lambsquarters control was greatest from treatments containing two POST applications of at least two different herbicides. Applying herbicides with multiple effective modes of action can greatly increase control of difficult to control weeds such as lambsquarters, even in the Xtend system.