

A SYSTEMS APPROACH FOR WATERHEMP CONTROL IN CORN IN A SUGARBEET ROTATION IN 2016 AT MOORHEAD, MN

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The objective of this study was to demonstrate a weed control system in corn 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 Moorhead, MN in 2016. The trial site was prepared using a Kongskilde ‘s-tine’ field cultivator with rolling baskets on May 7, 2016. ‘DKC38-04 RIB’ corn was seeded in 22-inch rows at 32,000 seeds per acre on May 12 with a John Deere 1700XP 6-row planter. Preemergence (PRE) treatments were applied May 16. Postemergence (POST) treatments were applied June 14 and 23. All herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO₂ at 30 psi to the center four rows of six row plots 30 feet in length. Corn injury and common lambsquarters and waterhemp control were evaluated June 13, July 8, and August 24.

All corn 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 2016.4 software package.

Table 1. Application Information – Moorhead, MN 2016

Application	A	B	C
Date	May 16	June 14	June 23
Time of Day	9:30 AM	9:30 AM	10:00 AM
Air Temperature (F)	51	65	65
Relative Humidity (%)	56	68	62
Wind Velocity (mph)	47	7	3
Wind Direction	N	SE	NW
Soil Temp. (F at 6")	48	68	64
Soil Moisture	Poor	Poor	Good
Cloud Cover (%)	80	100	0
Next Rainfall (amount)	May 25	June 14	June 29
Corn Stage	PRE	V6	V8
Common Lambsquarters	-	3 inch	4 inch
Waterhemp	-	2 inch	6 inch

SUMMARY

Corn injury from herbicides was minimal in this trial (Table 2). Preemergence Clarity may have slowed corn germination based upon observations from late May and early June. Corn injury observed on July 8 from PRE Harness+Sharpen was 23%, but declined to no visible injury on August 24. The cause of this visual injury on July 8 is unclear. POST applications showed some corn injury on July 8. This injury may be more attributed to weed competition rather than herbicide injury. Observations taken August 24 show little, if any, corn injury from herbicide treatments.

Table 2. Corn injury and weed control from herbicides at Moorhead, MN in 2016.

Treatment	Rate	Appl ¹	-----June 13-----			-----July 8-----				----August 24----		
			corn	colq ²	wahe	corn	colq	wahe	copu	corn	colq	wahe
			% inj	---%cntl---		% inj	-----% cntl-----			% inj	---% cntl---	
Harness + Sharpen	32 + 2.5 fl oz + fl oz	A	5	86	99	23	38	94	93	0	30	75
Harness + Clarity	32 + 16 fl oz + fl oz	A	16	95	99	5	85	93	100	0	83	100
Laudis+AAtrex ³	3 + 12 fl oz + fl oz	B										
Harness + AAtrex	32 + 12 fl oz + fl oz	A	10	81	99	8	86	95	99	0	93	95
Status ³	3.5 oz	B										
Harness	32 fl oz	A	0	66	94	0	94	95	100	0	98	96
Status ³	3.5 oz	B										
Harness	32 fl oz	A	3	64	98	3	94	100	100	3	98	100
Laudis + AAtrex ³	3 + 12 fl oz + fl oz	B										
Sharpen	2.5 fl oz	A	9	79	70	8	94	69	80	0	97	84
Status ³	3.5 oz	B										
Sharpen	2.5 fl oz	A	9	81	68	5	95	93	94	0	94	96
Laudis + AAtrex ³	3 + 12 fl oz + fl oz	B										
Verdict + AAtrex	13 + 12 fl oz + fl oz	A	9	84	89	0	99	89	95	0	98	91
Status ³	3.5 oz	B										
Verdict	13 fl oz	A	5	83	94	10	99	98	99	3	100	98
Status ³	3.5 oz	B										
Sharpen	2 fl oz	A	3	66	68	5	96	89	98	0	96	95
Warrant + Status +	48 + 3.5 fl oz + oz	B										
RU PowerMax ⁴	28 fl oz	B										
Clarity	16 fl oz	A	11	73	60	0	100	96	100	0	100	99
Outlook + Laudis +	18 + 3 fl oz + fl oz	B										
AAtrex ³	12 fl oz	B										
Laudis + AAtrex ³	3 + 12 fl oz + fl oz	B	0	0	0	30	98	63	84	0	89	71
Status+PowerMax ⁴	3.5 + 32 oz + fl oz	B	0	0	0	25	96	48	100	0	94	60
Laudis + AAtrex ³	3 + 12 fl oz + fl oz	B	0	0	0	10	100	100	100	0	100	100
Status+PowerMax ⁴	3.5 + 32 oz + fl oz	C										
LSD (0.05)			NS	8.8	6.9	11.4	11.3	8.8	8.9	NS	12.3	20.1

¹Appl refers to application information in Table 1. A=PRE, B=POST applied June 14, C=POST applied June 23

²colq=common lambsquarters; wahe=waterhemp; copu=common purslane

³Indicates addition of Methylated Seed Oil (MSO) at 1.5 pt/A. Product provided by Loveland.

⁴Indicates addition of Ammonium Sulfate (AMS) at 8.5 lb/100 gal + High Surfactant Methylated Seed Oil Concentrate (HSMOC) at 1.5 pt/A. N-Pak AMS and Destiny HC (HSMOC) were provided by Winfield.

Common purslane was sporadically present in most areas of this trial. Purslane control was evaluated July 8 as 93% to 100% control by all PRE fb POST herbicide treatments except Sharpen fb Status which gave only 80% control. Laudis+AAtrex POST gave 84% purslane control and was the only other treatment to give less than 90% control. POST treatments containing PowerMax gave 98% to 100% purslane control.

Common lambsquarters control varied by herbicide treatment and evaluation timing. Lambsquarters control from PRE herbicides was evaluated June 13 and ranged from 64% to 95%. PRE Harness gave 64% to 66% lambsquarters control. PRE Sharpen at 2.5 fl oz/A gave 79% to 81% control while PRE Sharpen at 2 fl oz/A gave 66% lambsquarters control. PRE Clarity and PRE Verdict gave 73% and 83% lambsquarters control, respectively. PRE Verdict+AAtrex gave similar lambsquarters control to PRE Verdict. When only PRE Harness + Sharpen was applied, lambsquarters continue to germinate throughout the season and control dropped from 86% on June 13 to 30% on August 24. PRE Harness+Clarity gave 95% lambsquarters control on June 13, but control dropped to 83% on August 24 despite a POST application of Laudis+AAtrex. This was the only PRE fb POST treatment to give less than 93% lambsquarters control on August 24. A single POST application of Laudis+AAtrex or Status+Roundup PowerMax resulted in 89% and 94% lambsquarters control at the final evaluation. Dry conditions early in the 2016 growing season may have conditioned lambsquarters to have a thicker waxy cuticle which make herbicide retention and absorption more difficult than under ideal growing conditions. Two POST applications, Laudis+AAtrex fb Status+PowerMax gave 100% lambsquarters control on August 24.

Waterhemp at this location is known to have some level of resistance to glyphosate. Waterhemp control from two or three glyphosate applications ranged from 34% to 66% in trials at this location in 2016. Treatments containing PRE Harness provided excellent waterhemp control ranging from 94% to 99% on June 13. PRE Verdict gave 94% waterhemp control. PRE Sharpen at 2 or 2.5 fl oz/A gave waterhemp control ranging from 68% to 70%, while PRE Clarity gave 60% waterhemp control. PRE Verdict+AAtrex gave similar, to slightly less, waterhemp control than PRE Verdict. Due to the duration of waterhemp germination and emergence, PRE Harness+Sharpen did not provide season long control and gave only 75% waterhemp control by August 24. Sharpen fb Status gave only 84% waterhemp control and was the only PRE fb POST treatment that gave less than 91% waterhemp control at the end of the season. A single POST application of Laudis+AAtrex or Status+PowerMax gave 71% or 60% waterhemp control, respectively, on August 24. However, making sequential applications of Laudis+AAtrex fb Status+PowerMax gave 100% waterhemp control at the end of the season.

CONCLUSIONS

Crop safety from the herbicides applied in this trial was good to excellent. Corn germination may have been slowed by PRE Clarity, but corn outgrew any visual symptoms midway through the growing season. PRE herbicides varied in controlling common lambsquarters early in the season. Verdict gave 83% lambsquarters control prior to any POST herbicide applications followed by Sharpen at 2.5 fl oz/A at 80%, Clarity at 73%, Sharpen at 2 fl oz/A at 66%, and Harness at 65%. However, a PRE tank mix of Harness+Sharpen gave 86% lambsquarters control and Harness+Clarity gave 95% control prior to POST applications. Waterhemp control also varied by PRE herbicide. Harness gave 96% waterhemp control followed by Verdict at 94%, Sharpen at 69%, and Clarity at 60%. Again, a PRE tank mix of Harness+Sharpen or Harness+Clarity gave 99% waterhemp control. Three PRE fb POST treatments gave 98% or greater control of both waterhemp and common lambsquarters. One of these treatments, PRE Clarity fb Outlook+Laudis+AAtrex, included a residual herbicide, Outlook, applied postemergence to the crop, but preemergence to waterhemp. This application can be considered a 'lay-by' application and it proved very effective this season. A single application of POST herbicide gave less than acceptable control of waterhemp at 60% to 71% and good control of common lambsquarters at 89% to 94%. In order to provide excellent control of both weed species, two POST applications of differing herbicides needed to be made. Rotating modes of action will help reduce selection pressure on tough to control weeds, thereby slowing the development of herbicide resistant weeds.