COMMON LAMBSQUARTERS CONTROL WITH THE BENSON, MN SEED SOURCE

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Summary

1. Greenhouse experiments confirmed the Benson common lambsquarters seed source is not as sensitive to glyphosate treatment as compared with the greenhouse common lambsquarters seed source.
2. We will continue to conduct experiments, searching for an effective tank mixture partner.
3. We will continue to recommend full glyphosate rates, glyphosate with adjuvants, and glyphosate mixtures, when possible, for common lambsquarters control.

Introduction

I spoke with a producer about concerns with controlling common lambsquarters with glyphosate near Benson, MN in 2021. The conversation was compelling enough that I decided to visit the field since glyphosate-resistant common lambsquarters is a threat to sugarbeet growers. The field was indeed a population of common lambsquarters that was not sufficiently controlled with glyphosate. We elected to conduct a probe experiment. We also collected seed for greenhouse evaluation at sugarbeet harvest.

Materials and Methods

A field experiment was conducted on indigenous populations of common lambsquarters in a field near Benson, MN in 2021. Sugarbeet was at the 8-lf stage and escaped common lambsquarters were 12-inches tall at application. Treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR-flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 40 feet in length. Application information can be found in Table 1. Visible sugarbeet injury (0% to 100%, 100% indicating complete loss of sugarbeet stature) and common lambsquarters control (0% to 100%, 100% indicating complete control) were collected at multiple time points. The number of surviving common lambsquarters plants per plot (4 rows spaced 22-inch and 35 ft long) were counted at multiple time points and seed was collected shortly before sugarbeet harvest. Data were analyzed with the ANOVA procedure of ARM, version 2021.2 software package.

Table 1. Application information, Benson, MN 2021.

Date	June 10, 2021
Time of Day	10:00AM
Air Temperature (F)	95F
Relative Humidity (%)	42%
Wind Velocity (mph)	3 mph
Wind Direction	W
Soil Temp. (F at 6")	80F
Soil Moisture	dry
Cloud Cover (%)	-
Sugarbeet stage	8 lvs
Common lambsquarters height	up to 12-inches

A greenhouse experiment was conducted with a putative glyphosate sensitive and resistant common lambsquarters seed source. Common lambsquarters seeded in a flat filled with PROMIX general purpose greenhouse media (Premier Horticulture, Inc., Quakertown, PA) to 1-inch was transplanted in 4 × 4-inch pots. Four common lambsquarters plants per pot was grown to approximately 4-inches at 75F to 81F under natural light supplemented with a 16 h photoperiod of artificial light. Herbicide treatments were applied using a spray booth (Generation III, DeVries Manufacturing, Hollandale, MN) equipped with a TeeJet® 8001 XR nozzle calibrated to deliver 10.5 gpa spray solution at 40 psi and 3 mph. Visible common lambsquarters control (0% to 100%, 100% indicating complete control) was evaluated 5, 14, 28, and 35 days after treatment (DAT). Experimental design was randomized complete

block with four replications. Data were analyzed with the ANOVA procedure of ARM, version 2021.2 software package.

Results and Discussion

Common lambsquarters control generally was the same across glyphosate treatments at the field experiment near Benson, MN. Roundup PowerMax alone provided only 80% common lambsquarters control and control was improved when adjuvants were combined with glyphosate or glyphosate and adjuvant mixtures with ethofumesate (Table 2).

Table 2. Visible common lambsquarters control in response to treatment, Benson, MN, 2021.[a]

		Lambsquarters Control	
Herbicide Treatment[b]	Herbicide rate	Count per plot	113 DAT[c]
	------fl oz /A------	---Number---	--%--
PowerMax	28	3.5 a	80
PowerMax	32	3.0 a	80
PowerMax + Prefer 90 NIS+ AMS	28 + 0.25% + 2.5 %	0.5 b	90
PowerMax + Prefer 90 NIS+ AMS	32 + 0.25% + 2.5 %	2.3 a	89
PowerMax + ethofumesate +NIS + AMS	28 + 6 + 0.25% + 2.5%	0.8 b	96
LSD (0.20)		1.4	NS

[a]Means within a rating that do not share any letter are significantly different by the LSD at the 20% level of significance.
[b]NIS=Non-ionic surfactant; AMS=liquid ammonium sulfate
[c]DAT=Days after treatment

We observed glyphosate symptomology on the greenhouse common lambsquarters source within 3 DAT. Symptomology develop slower with the Benson seed source but control was similar 5 DAT (Table 3). Roundup PowerMax applied on the greenhouse seed source improved common lambsquarters control 14 DAT compared with glyphosate alone, glyphosate with adjuvants or glyphosate, adjuvants, and herbicide mixtures, 14 DAT.

Table 3. Visible common lambsquarters control in response to treatment, Benson, MN and greenhouse seed source, greenhouse, 2022.[a]

		Seed	Lambsquarters Control			
Herbicide Treatment[b]	Herbicide rate	Source[c]	5 DAT[d]	14 DAT	28 DAT	35 DAT
	------fl oz /A------		----------%----------			
PowerMax	28	Benson	40 b	53 bc	65 bc	71 bc
PowerMax	32	Benson	20 c	55 bc	72 b	78 b
PowerMax + Prefer 90 NIS[c]+ AMS[d]	28 + 0.25% + 2.5 %	Benson	43 ab	63 b	70 bc	78 b
PowerMax + Prefer 90 NIS+ AMS	32 + 0.25% + 2.5 %	Benson	40 b	53 bc	67 bc	70 bc
PowerMax + Nortron + Destiny HC + AMS	32 + 6 + 1.5 pt + 2.5%	Benson	13 c	47 bc	55 c	54 d
PowerMax + Spin-Aid + Destiny HC + AMS	32 + 20 + 1.5 pt + 2.5%	Benson	5 c	43 c	56 bc	55 cd
PowerMax	28	GH	45 ab	99 a	99 a	99 a
PowerMax + Prefer 90 NIS+ AMS	32 + 0.25% + 2.5 %	GH	60 a	97 a	97 a	99 a
PowerMax	32	GH	50 ab	93 a	95 a	97 a
LSD (0.10)			14	15	14	12

[a]Means within a rating that do not share any letter are significantly different by the LSD at the 10% level of significance.
[b]NIS = non-ionic surfactant; AMS = ammonium sulfate
[c]Seed Source was collected from near Benson, MN in 2021; greenhouse seed source collected in 2021.
[d]DAT=Days after treatment

Adjuvants, ethofumesate or phenmedipham (Spin-Aid) did not improve common lambsquarters control from glyphosate at 28 or 32 fl oz/A on the Benson common lambsquarters seed source. At 35 DAT, we began to observe evidence of lambsquarters regrowth, although overall control continued to slowly improve, 14 to 35 DAT.

Roundup PowerMax at 28 fl oz/A controlled common lambsquarters using the greenhouse seed source (Figure 1). Roundup PowerMax at 28 or 32 fl oz/A did not control common lambsquarters using the Benson seed source, although sugarbeet probably would have a competitive advantage over the surviving common lambsquarters. We also observed segregation, Roundup PowerMax controlling one or two but not all common lambsquarters within the pot.

Figure 1. Common lambsquarters from left to right: untreated control; Roundup PowerMax at 28 fl oz/A, Benson source; Roundup PowerMax at 32 fl oz/A, Benson source; Roundup PowerMax at 28 fl oz/A, greenhouse source.

Conclusions

We are monitoring two common lambsquarters seed sources where Roundup PowerMax is not providing acceptable control. We intend to conduct field experiments to further evaluate common lambsquarters control.