RO-NEET AND EPTAM WEED EFFICACY AND SUGARBEET TOLERANCE

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Introduction

Sugarbeet yield loss to weed interference averaged 70% in sugarbeet growing areas in North America (Soltani et al. 2018). This equates to about $211 and $369 million loss of income from sugarbeet production in North Dakota and Minnesota, respectively. Cycloate, pyrazon, ethofumesate, and EPTC were applied preplant incorporated (PPI) or preemergence (PRE) for weed control in sugarbeet fields in the Red River Valley and Michigan from 1970 to the mid-1980s (Dale et al. 2006). However, use of soil-applied herbicides declined to less than 5% of sugarbeet acres in North Dakota and Minnesota in the mid-1980s because of reliance on POST herbicides and cultivation (Luecke and Dexter 2003). Weeds continue to be a major concern due to limited herbicide options within sugarbeet. EPTC and cycloate could reemerge as important herbicides for weed control.

The objective of this experiment was to evaluate weed control and sugarbeet tolerance from Ro-Neet and Eptam alone or in mixtures.

Materials and Methods

Experiments were conducted on natural weed populations and bioassay species strips near Hickson, ND in 2015, 2016, 2018, and 2019. The experimental area was prepared for planting by applying the appropriate fertilizer and tillage. Sugarbeet was seeded in 22-inch rows at 60,560 seeds per acre with 4.7 inch spacing between seeds.

Herbicide treatments included PPI applications of Ro-Neet, Eptam, and Ro-Neet + Eptam at multiple rates in 2015, 2016, 2018 (Table 1) and 2019 (Table 2). All 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 35 feet in length. Herbicides were immediately incorporated using a rototiller set 3 to 4 inches deep. The center 8 feet of each plot was rototilled to remove the variability that could otherwise be caused by the incorporating tillage.

Table 1. Herbicide treatments, rates, and application timing in trials near Hickson, ND in 2015, 2016, and 2018.

Herbicide Treatment	Rate (pt/A)	Timing of Application
Ro-Neet SB	4.5	PPI
Ro-Neet SB	5.36	PPI
Ro-Neet SB + Eptam	2.67 + 2.29	PPI
Ro-Neet SB + Eptam	4.5 + 2.29	PPI
Eptam	3.5	PPI

Table 2. Herbicide treatments, rates, and application timing in trials near Hickson, ND in 2019.

Herbicide Treatment	Rate (pt/A)	Timing of Application
Ro-Neet SB	4.5	PPI
Ro-Neet SB	5.36	PPI
Ro-Neet SB + Eptam	2.67 + 2.29	PPI
Ro-Neet SB + Eptam	4.5 + 2.29	PPI
Eptam	3.5	PPI
Eptam	2.5	PPI

Sugarbeet tolerance and grass and broadleaf weed control were evaluated visually, beginning approximately seven days after sugarbeet emergence. Sugarbeet emergence date was dependent on growing conditions in each year. Evaluations generally were on weekly intervals following the first evaluation and continued until weeds overtook the plots. Sugarbeet injury and common lambsquarters, redroot pigweed, foxtail millet, and oat control was evaluated in 2019. All evaluations were a visual estimate of control in the four treated rows compared to the

adjacent untreated strip. Experimental design was randomized complete block with 4 replications. Data were analyzed with the ANOVA procedure of ARM, version 2019.4 software package.

Results

Eptam and Ro-Neet Across Years

Sugarbeet injury was greater or tended to be greater from Eptam or Ro-Neet SB plus Eptam compared to Ro-Neet SB alone at 4.5 or 5.36 pt/A. (Table 3). Sugarbeet injury from Ro-Neet SB + Eptam at 2.67 + 2.29 pt/A was the same as sugarbeet injury from Ro-Neet SB + Eptam at 4.5 + 2.29 pt/A. Injury tended to decrease from 7 days after emergence (DAE) to 28 DAE.

Table 3. Sugarbeet injury 7, 14, and 28 days after emergence (DAE) combined across years.

		Sugarbeet Growth Reduction		
Treatment	Rate	7 DAE	14 DAE	28 DAE
	--pt/A--	----------%----------		
Ro-Neet SB	4.5	18	5 a	3 a
Ro-Neet SB	5.36	20	6 a	10 ab
Ro-Neet SB + Eptam	2.67 + 2.29	44	32 b	26 bc
Ro-Neet SB +Eptam	4.5 + 2.29	50	33 b	31 c
Eptam	3.5	48	43 b	30 c
LSD (0.05)		NS	13	16

Redroot pigweed control from Eptam alone or Ro-Neet SB + Eptam was greater than pigweed control from Ro-Neet SB alone (Table 4). There was no statistical difference in control between Eptam at 3.5 pt/A and Ro-Neet SB + Eptam at 2.67 + 2.29 pt/A or Ro-Neet SB + Eptam at 4.5 + 2.29 pt/A. However, numeric control tended to be greatest from Ro-Neet SB + Eptam at 4.5 + 2.29 pt/A. Redroot pigweed control from Ro-Neet SB at 5.36 pt/A was greater than pigweed control from Ro-Neet at 4.5 pt/A. However, control was less than Eptam or Ro-Neet SB plus Eptam treatments. Treatments that gave the greatest pigweed control 7 DAE also gave the greatest control 14 and 28 DAE. However, control tended to decline as time progressed. Oat control from Eptam or Ro-Neet SB plus Eptam was greater than 95% across all evaluation timings. Oat control from Ro-Neet SB at 4.5 or 5.36 pt/A was less than control from Ro-Neet SB + Eptam at either 2.67 or 4.5 pt/A + 2.29 pt/A.

Table 4. Redroot pigweed and wild oat control 7, 14, and 28 days after emergence (DAE) combined across years.

		Redroot Pigweed Control			Wild Oat Control		
Treatment	Rate	7 DAE	14 DAE	28 DAE	7 DAE	14 DAE	28 DAE
	--pt/A--	----------%----------					
Ro-Neet SB	4.5	74 c	61 c	34 b	66 c	60 b	49 c
Ro-Neet SB	5.36	81 b	72 b	41 b	82 b	74 b	66 b
Ro-Neet SB + Eptam	2.67 + 2.29	94 a	89 a	73 a	100 a	97 a	97 a
Ro-Neet SB + Eptam	4.5 + 2.29	95 a	93 a	82 a	98 a	98 a	98 a
Eptam	3.5	92 a	88 a	73 a	99 a	98 a	98 a
LSD (0.05)		4	6	16	12	16	12

This ‘across years summary’ indicates redroot pigweed and oat control were greatest from Eptam alone or Ro-Neet SB + Eptam and not from Ro-Neet SB alone. With treatments containing Ro-Neet SB + Eptam, increasing the rate of Ro-Neet SB from 2.67 to 4.5 pt/A did not provide a statistical improvement in weed control. However, there was greater sugarbeet injury with Eptam alone or Eptam + Ro-Neet SB as compared to Ro-Neet SB alone (Table 3). Previous research and recommendations indicated tank-mixing Ro-Neet SB + Eptam was a technique to improve grass and broadleaf control and to decrease sugarbeet injury, especially shortly after planting (personal communication with A. Dexter). However, we did not observe improved sugarbeet safety with Ro-Neet SB + Eptam compared to Eptam alone in these trials

Eptam and Ro-Neet 2019

Sugarbeet injury was least with Ro-Neet SB at 4.5 pt/A or Ro-Neet SB + Eptam at 2.67 + 2.29 pt/A (Table 5). Injury was primarily stature reduction compared to the untreated rows due to delayed emergence. Injury tended to decrease as time progressed but was still evident 28 DAE. However, environmental conditions may have influenced sugarbeet injury. Rainfall was very abundant in July following dry conditions after planting and may have confounded early season stature reduction.

Table 5. Sugarbeet injury 7, 14, and 28 days after emergence (DAE) in 2019.

		Sugarbeet Growth Reduction		
Treatment	Rate	7 DAE	14 DAE	28 DAE
	--pt/A--	----------%----------		
Ro-Neet SB	4.5	33 ab	29 a	24 ab
Ro-Neet SB	5.36	51 c	45 b	41 bc
Ro-Neet SB + Eptam	2.67 + 2.29	30 a	28 a	15 a
Ro-Neet SB + Eptam	4.5 + 2.29	44 bc	26 a	26 ab
Eptam	3.5	48 c	35 ab	45 c
Eptam	2.5	43 bc	38 ab	40 bc
LSD (0.05)		12	15	17

We evaluated redroot pigweed, common lambsquarters, foxtail millet and oat control in 2019 (Table 6). Common lambsquarters density was not as uniform as the redroot pigweed and is reflected in the evaluations. Eptam at 2.5 and 3.5 pt/A, Ro-Net SB + Eptam at 4.5 + 2.29 pt/A and Ro-Neet SB + Eptam at 2.67 + 2.29 pt/A provided or tended to provide redroot pigweed control greater than Ro-Neet SB alone 14 DAE. Eptam at both rates provided greater than 90% visible redroot pigweed control 25 DAE (data not presented). Eptam or Ro-Neet SB + Eptam across rates controlled foxtail millet better than Ro-Neet SB alone. No differences in common lambsquarters control were observed from Eptam rate. Eptam alone or Eptam + Ro-Neet SB provided oat control greater than Ro-Neet SB alone. No statistical difference in oat control was observed between Eptam at 2.5 and 3.5 pt/A at either 7 or 14 DAE. Likewise, oat control from Ro-Neet SB + Eptam at 2.67 + 2.29 pt/A was the same as oat control from Ro-Neet SB + Eptam at 4.5 + 2.29 pt/A. Eptam at 3.5 pt/A gave or tended to give better foxtail millet control than Eptam at 2.5 pt/A. Foxtail millet control was best with Eptam alone or Ro-Neet SB + Eptam. Ro-Neet SB at either 4.5 or 5.36 pt/A was more effective at controlling foxtail millet than oat. Eptam was similar efficacy on both foxtail millet and oat.

Table 6. Redroot pigweed, common lambsquarters, foxtail millet, and wild oat control at 7 and 14 days after emergence (DAE) in 2019.

		7 DAE				14 DAE			
Treatment	Rate	rrpw[a]	colq	fxmi	oat	rrpw	colq	fxmi	oat
	--pt/A--	----------%----------							
Ro-Neet SB	4.5	65 c	50 b	81 bc	43 c	66 c	84	96 b	48 c
Ro-Neet SB	5.36	70 bc	81 a	80 c	53 b	78 b	88	96 b	63 b
Ro-Neet SB + Eptam	2.67 + 2.29	88 a	75 ab	89 ab	89 a	88 ab	90	98 ab	96 a
Ro-Neet SB + Eptam	4.5 + 2.29	91 a	85 a	89 a	90 a	91 a	93	97 ab	95 a
Eptam	3.5	87 a	81 a	92 a	93 a	92 a	92	99 a	97 a
Eptam	2.5	76 b	80 a	80 c	85 a	87 ab	91	99 a	96 a
LSD (0.05)		9	18	8	8	11	NS	2	4

[a]Weed species abbreviations (left to right): rrpw=redroot pigweed, colq=common lambsquarters, fxmi=foxtail millet.

References

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