



Evaluation of Linex 4L Herbicide for Weed Control in Alfalfa

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Introduction: Linex 4L (linuron) is a group 7 herbicide that provides preemergence and early postemergence control of several broadleaf and grass weeds. Linex 4L is not currently registered for use in alfalfa, but there is interest in testing it for weed control in alfalfa especially for locations with weeds resistant to metribuzin and hexazinone. This study evaluated Linex 4L applied alone and in tank-mix combinations at spring greenup and in between cuttings.

Methods: Herbicide treatments were applied February 11th, 2020 when alfalfa was dormant and on April 2nd, 2020 when alfalfa had 2 inches of spring regrowth to control winter annual weeds for first cutting. Herbicide treatments were also applied on June 24th, 2020 when alfalfa had 1 to 2 inches of regrowth after 1st cutting to control weeds in between cuttings. Herbicides were applied using a CO₂ powered backpack sprayer at 20 gpa. Treatments were replicated 4 times in a randomized complete block design. Plots were 9ft by 20ft. The alfalfa stand was established in 2018. Crop injury was visually evaluated for chlorosis and stunting after application in each plot. Weed density was determined by counting weeds in each plot. Alfalfa yield was determined by measuring alfalfa biomass with a Carter Harvester in a 3ft by 18 ft strip in each plot. A grab sample was collected from each plot, weighed, and then dried in a forage drier for 7 days to determine alfalfa dry matter. Crop height was determined by randomly measuring the height of ten plants in each plot.

Results: Alfalfa throughout the trial area showed frost injury from February to April (Table 1). Linex applied to dormant alfalfa at all rates had similar injury ratings compared to the untreated control. Linex tank-mixed with burndown herbicides caused more injury compared to Linex alone, but the injury dissipated quickly after late March. All treatments applied to dormant alfalfa had similar 1st cutting alfalfa yield and alfalfa height compared to the untreated control (Table 2). Linex or metribuzin tank-mixed with burndown herbicides applied at 2 inch regrowth

caused significant injury that lingered to 1st cutting (Table 1 & Figure 1). These herbicide treatments also reduced alfalfa 1st cutting yield and height compared to the untreated control (Table 2). Linex or metribuzin tank-mixed with Gramoxone or Sharpen gave the best control of prickly lettuce (Table 2).



Figure 1. Crop injury two weeks after treatment from burn-down tank-mixes applied to alfalfa with 2 inches of spring regrowth.

Linex applied after 1st cutting at 8 oz and 16 oz per acre did not injure alfalfa (Table 3). Plots treated with the high rate of Linex after 1st cutting show more injury compared to the untreated control two weeks after treatment. The high rate of Linex did not reduce 2nd cutting alfalfa yield or height (Table 3). All treatments with Shark caused significant injury one and two weeks after treatment (Table 3 and Figure 2). Shark treatments also reduced 2nd cutting yield and alfalfa height (Table 3). Treatments with metribuzin were the only herbicide to reduce redroot pigweed density compared to the untreated control (Table 3).



Figure 2. Crop injury one week after treatment from Shark treatments after 1st cutting.

Table 1. 2020 Linex 4L Treatments Applied to Alfalfa at IREC- Crop Injury Following Herbicide Application

Dormant trt applied on 2/11/2020
 2inch regrowth trt applied on 4/2/2020

	Treatment	Prod. Rate/ Acre	Timing	greenup	1-2"	3"	4"	6"	12"	16"	harvest
				Crop Injury (chlorosis and stunting) 0-100%							
				2/24/2020	3/5/2020	3/20/2020	4/9/2020	4/29/2020	5/15/2020	5/26/2020	6/11/2020
1	Untreated Control	n/a	n/a	42.5d	5d	5a	6.25c	4c	0b	0b	0b
2	metribuzin (tricolor 75df) NIS	0.67 lb .25%v/v	dormant	47.5cd	7.5cd	5a	5c	5c	1b	0b	0b
3	Linex 4L	8 fl oz	dormant	45d	6.25cd	6.25a	7.5c	5c	0b	0b	0b
4	Linex 4L	16 fl oz	dormant	48.75cd	8.75cd	7.5a	6.25c	5c	1b	0b	0b
5	Linex 4L	24 fl oz	dormant	48.75cd	10cd	5a	6.25c	5c	0b	1b	0b
6	metribuzin (tricolor 75df) Gramoxone SC 2.0 NIS	0.67 lb 2 pts .25% v/v	dormant	57.5bc	15bc	5a	7.5c	5c	0b	0b	0b
7	metribuzin (tricolor 75df) Sharpen MSO	0.67 lb 2 fl oz 1% v/v	dormant	71.25a	25a	8.75a	7.5c	5c	0b	0b	0b
8	metribuzin (tricolor 75df) Shark EW MSO	0.67 lb 2 fl oz 1% v/v	dormant	72.5a	31.25a	8.75a	6.25c	5c	1b	0b	0b
9	Linex 4L Gramoxone SC 2.0 NIS	16 fl oz 2 pts .25% v/v	dormant	63.75ab	13.75bcd	5a	6.25c	4c	0b	0b	0b
10	Linex 4L Sharpen MSO	16 fl oz 2 fl oz 1% v/v	dormant	70a	22.5ab	6.25a	7.5c	6c	1b	0b	0b
11	Linex 4L Shark MSO	16 fl oz 2 fl oz 1% v/v	dormant	71.25a	30a	6.25a	8.75c	5c	1b	0b	0b
12	metribuzin (tricolor 75df) Gramoxone SC 2.0 NIS	0.67 lb 2 pts .25% v/v	2in regrowth	n/a	n/a	n/a	63.75b	46b	23a	21a	14a
13	metribuzin (tricolor 75df) Shark MSO	0.67 lb 2 fl oz 1% v/v	2in regrowth	n/a	n/a	n/a	81.25a	78a	21a	24a	15a
14	Linex 4L Gramoxone SC 2.0 NIS	16 fl oz 2 pts .25% v/v	2in regrowth	n/a	n/a	n/a	62.5b	44b	24a	23a	15a
15	Linex 4L Shark MSO	16 fl oz 2 fl oz 1%v/v	2in regrowth	n/a	n/a	n/a	82.5a	78a	21a	24a	16a

Means with the same letter within columns are not statistically different using the Tukey HSD mean comparison test.

Table 2. 2020 Linex 4L Treatments Applied to Alfalfa at IREC- Weed Density & Alfalfa Yield at First Cutting

Dormant trt applied on 2/11/2020
 2inch regrowth trt applied on 4/2/2020

#	Treatment	Product Rate/Acre	Timing	4/29/2020	6/11/2020	6/11/2020
				prickly lettuce density	1st cutting yield	1st cutting crop height
				# plant/plot	tons/acre	cm
1	Untreated Control	n/a	n/a	9.25a	2.52a	62a
2	metribuzin (tricolor 75df) NIS	0.67 lb .25%v/v	dormant	2bc	2.5a	61ab
3	Linex 4L	8 fl oz	dormant	7.75ab	2.54a	62a
4	Linex 4L	16 fl oz	dormant	2.25bc	2.5a	63a
5	Linex 4L	24 fl oz	dormant	2.75bc	2.59a	63a
6	metribuzin (tricolor 75df) Gramoxone SC 2.0 NIS	0.67 lb 2 pts .25% v/v	dormant	0.25c	2.56a	63a
7	metribuzin (tricolor 75df) Sharpen MSO	0.67 lb 2 fl oz 1% v/v	dormant	0.25c	2.5a	62a
8	metribuzin (tricolor 75df) Shark EW MSO	0.67 lb 2 fl oz 1% v/v	dormant	2.25bc	2.45ab	63a
9	Linex 4L Gramoxone SC 2.0 NIS	16 fl oz 2 pts .25% v/v	dormant	0.5c	2.58a	62a
10	Linex 4L Sharpen MSO	16 fl oz 2 fl oz 1% v/v	dormant	0c	2.44abc	64a
11	Linex 4L Shark MSO	16 fl oz 2 fl oz 1% v/v	dormant	4.25abc	2.52a	63a
12	metribuzin (tricolor 75df) Gramoxone SC 2.0 NIS	0.67 lb 2 pts .25% v/v	2in regrowth	0c	2.21bcd	57bc
13	metribuzin (tricolor 75df) Shark MSO	0.67 lb 2 fl oz 1% v/v	2in regrowth	1.75bc	2.06d	56c
14	Linex 4L Gramoxone SC 2.0 NIS	16 fl oz 2 pts .25% v/v	2in regrowth	0.25c	2.18cd	56bc
15	Linex 4L Shark MSO	16 fl oz 2 fl oz 1%v/v	2in regrowth	3.25abc	2.12d	57bc

Means with the same letter within columns are not statistically different using Tukey HSD mean comparison test.

Table 3. 2020 Linex 4L Treatments Applied Between 1st and 2nd Cutting at IREC- Weed Density and Alfalfa Response
 Herbicides were applied on 6/24/2020 when alfalfa had 1-2 inches regrowth after 1st cutting.

#	Treatment	Product Rate/Acre	6/30/2020	7/9/2020	7/30/2020	7/14/2020	7/14/2020
			crop injury rating		redroot pigweed density	2nd cutting yield	2nd cutting crop height
			% injury		# plants/plot	tons/acre	cm
1	Linex	8oz	6.25bc	3.75cd	42ab	1.53ab	61a
2	Linex	16oz	7.5bc	5bcd	34abc	1.57ab	61a
3	Linex	24oz	7.5bc	8.75bc	12bc	1.53ab	61a
4	Metribuzin (Tri-cor)	2/3 lb	8.75b	0d	2c	1.6ab	61a
5	Shark	1oz	21.25a	11.25b	35abc	1.42bc	56b
6	Shark	2oz	26.25a	20a	56a	1.21d	54b
7	Linex + Shark	16oz + 2oz	25a	21.25a	42ab	1.26cd	54b
8	Metribuzin + Shark	2/3lb + 2 oz	25a	20a	8bc	1.3cd	54b
9	Linex+ Roundup Powermax	16oz +22oz	25a	25a	27abc	1.2d	54b
10	untreated control	n/a	1.25c	0d	42ab	1.67a	63a

Treatments with the same letter within columns are not statistically different using Tukey HSD test.