

Evaluation of Weed Control and Crop Injury by Herbicides in North Florida Potato Production Spring 2001

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Introduction

Potato production in Florida generated cash receipts in 2000 of approximately 120 million dollars. Potatoes are planted on 35-38,000 acres statewide. North Florida potato production has averaged 20,000 acres over the last several years. Approximately 80% of the potato acreage in the Tri-County Agricultural Area (TCAA; St. Johns, Flagler, and Putnam counties) is planted in chipping varieties i.e. Atlantic and Frito Lay 1867. The remaining acreage is planted in Table or Fresh Market varieties including Red La Soda and La Chipper. The division of acreage statewide between fresh and chip varieties is approximately equal.

Although acreage planted in these varieties has remained relatively constant over the years, new varieties and clones are continually tested for their production value in the TCAA. AF1615-1 is an advanced clone from the University of Maine's potato breeding program that is under consideration as a fresh market potato for Florida production. An integral component to variety selection programs should be the evaluation of varieties and new clones with registered herbicides.

Currently, the majority of potato acreage in the Hastings area is treated with metribuzin for weed control. The combination of cultivation and metribuzin has historically provided good weed control in potato during the season. Many growers are beginning to farm year round and are experimenting with alternative vegetable crops. Another 15-20,000 acres in the TCAA are planted to other horticultural crops. Ground that once was planted exclusively to potatoes and summer cover crops is now rotated with numerous other vegetable crops. Many potential alternative crops are sensitive to metribuzin. Development and adoption of alternative weed control practices may benefit growers by reducing herbicide carry over concerns.

Methods

The trial was conducted at the Hastings Research and Education Center's Yelvington Farm. The Yelvington Farm is located seven miles east of Hastings, Florida. The Hastings REC is part of the University of Florida's/IFAS network of research and extension centers developed to conduct applied research in agriculturally unique areas of the state.

Crops in the TCAA are grown on beds consisting of sixteen rows. The rows are raised with a between row spacing of 40 inches (center to center). The ground is irrigated with seepage irrigation. The water table is controlled by the flow of water into irrigation furrows spaced between beds. Raised rows are used to facilitate drainage during rain events. All crops in this experiment were produced using this system of land management.

The experiment was arranged in a randomized complete block design with four replications. Plot size was four rows wide by 15 feet long. Atlantic, La Chipper, Red La Soda, and AF1615-1 were planted on a randomly selected row in each plot (Figure 1). The experiment was planted on February 21, 2001 and harvested June 4, 2001.

The potato crop was managed following standard production practices. Potato seed tubers were cut manually to approximately two-ounce seed pieces and planted at an eight-inch in-row spacing. Twenty-seed pieces of each variety were planted in each row of each plot. Stand counts were recorded on March 26, 2001 and April 2, 2001. Stand counts are reported as the number of emerged plants in each row. Fertilizer (14-2-12) was applied in a split application at planting (1200 lb/acre) and at the 6-10 inch growth stage (700 lb/acre).

Soil was fumigated with 1,3-dichloropropene (Telone II, 6 gal product/acre) in early January prior to planting. Aldicarb (Temik 20 lb product/acre) was applied at planting. Fungicides were applied as needed for control of early and late blight.

Herbicide treatments are listed in Table 1. Herbicide treatments were broadcast on the plots using a Weed Systems Equipment, Inc. CO₂ assisted sprayer with a four-row spray boom. The unit was attached to a Ford-New Holland 4835 tractor. Applications were made at 20 gpa and 30 psi using 8004 fan tips spaced at 20 in. Pre-emergence applications were made at hilling, March 13, 2001, before potatoes and weeds emerged. Post-emergence applications were made at the 8-10 inch potato growth stage, April 4, 2001. Weeds were approximately one inch in height or less at the post-emergence application.

Rimsulfuron (Matrix, Dupont) and metribuzin (Sencor DF, Bayer) were applied as dry flowable formulations. The labeled rate for pre- and post-emergence applications of Matrix on potatoes is 1.0 to 1.5 oz product/acre not to exceed 2.5 oz of product/acre in a season. The labeled rate for pre-emergence applications of Sencor DF in potatoes is 1/3 to 1 1/3 lb product/acre. The labeled rate for post-emergence applications of Sencor DF is 1/3 to 2/3 lb product/acre. The total amount of Sencor DF applied in a season is not to exceed 1 1/3 lb product/acre.

Table 1. Herbicide treatment and rate information.

No.	Treatment	Herbicide		Application Rate ¹	Surfactant ²		Timing Pre/Post
		Product/acre	a.i./acre		Type	Rate	
1	Control	--	--	--	--	--	--
2	rimsulfuron	1.5 oz	0.375 oz	1.0	--	--	Pre
3	rimsulfuron	2.0 oz	0.500 oz	1.34	--	--	Pre
4	rimsulfuron	1.5 oz	0.375 oz	1.0	NI	0.25 %	Post
5	rimsulfuron	1.5 oz	0.375 oz	1.0	COC	1.0 %	Post
6	rimsulfuron	1.5 oz	0.375 oz	1.0	MSO	1.0 %	Post
7	rimsulfuron	2.0 oz	0.500 oz	1.34	NI	0.25 %	Post
8	rimsulfuron	2.0 oz	0.500 oz	1.34	COC	1.0 %	Post
9	rimsulfuron	2.0 oz	0.500 oz	1.34	MSO	1.0 %	Post
10	metribuzin	0.67 lb	0.500 lb	1.0	--	--	Pre
11	metribuzin	1.67 lb	1.250 lb	1.25	--	--	Pre
12	metribuzin	2.67 lb	2.000 lb	2.0	--	--	Pre
13	metribuzin	0.67 lb	0.500 lb	1.0	--	--	Post
14	metribuzin	1.34 lb	1.000 lb	2.0	--	--	Post
15	metribuzin	2.0 lb	1.500 lb	3.0	--	--	Post

¹Multiple of labeled rate applied. A rate of 1.0 is the labeled rate or is within the range of labeled rates. ²NI (Induce, non-ionic spray adjuvant, Setre Chemical Company, 90%); COC (DPX-YV879, crop oil concentrate, Dupont, 100%); MSO (Methylated Seed Oil, Cenex/Land of Lakes, 99.4 %).

Potato crop injury ratings were recorded seven days after pre-emergence herbicide treatment application. Post-emergence herbicide injury ratings were recorded 5, 7, 9, 13, and 16 days after herbicide application. Plant injury was rated on a 0-9 scale as listed in Table 2. “Area Under the Plant Injury Curve” (AUPIC) was calculated using the following formula:

$$\text{AUPIC} = \left(\sum_{i=1}^n (X_{i+1} + X_i) / 2 \right) (t_{i+1} - t_i) \quad X = \text{injury rating}; t = \text{time (days)}$$

AUPIC was calculated from zero days after treating (DAT) to 16 DAT. A similar formula has been used in plant pathology to calculate the “Area Under the Disease Progress Curve”.

Table 2. Herbicide Injury Rating Chart

Rating Number	Plant Appearance	Symptoms
0	Excellent	No Injury
1	--	--
2	Good	Minor Chlorosis and/or Leaf Curling
3	--	--
4	--	--
5	Fair	Moderate Chlorosis and/or Leaf/Petiole Curling
6	--	--
7	--	--
8	Poor	Severe Chlorosis and/or Dead Leaves
9	Very Poor	Dead Plant

Weed emergence ratings were taken at harvest, June 4, 2001 in two, one-meter sections from each four-row plot. Row middles were cultivated twice during the season. Therefore, total, broadleaf, and grass weed numbers were recorded from the top of each potato row. Weed Cover ratings were a subjective rating based on percent weed canopy in each four-row plot. A rating of 0 equals no weed canopy cover. A rating of 1 equals 1-10 % canopy cover. A rating of 2 equals 11-20 % coverage. All ratings follow accordingly except that a rating of nine equals 81-100 % coverage.

Tubers from each one-row plot were mechanically harvested, washed, and graded into five size classes with commercial equipment (Figure 1). Three of the four blocks were harvested for production data. Specific gravity was measured with the weight in air/weight in water method on a sample of 6 to 10 potatoes.

Results and Discussion

Potato Production and Quality. The four potato varieties selected for analysis were Atlantic, Red LaSoda, La Chipper, and AF1615-1. Atlantic is the standard potato grown in the area for the chip market. Red LaSoda is the standard red-skinned fresh market potato. La Chipper is the standard white-skinned fresh market potato. AF1615-1 is a University of Maine advanced clone that may be utilized as a white-skinned fresh market potato.

Herbicide treatment did not significantly affect total yield, marketable yield, specific gravity, or stand counts within each of the four potato varieties (Table 3a-d). Total yield over all herbicide treatments was 408, 367, 309, and 415 cwt/acre for Atlantic, Red LaSoda, La Chipper, and AF1615-1, respectively.

Herbicide Injury. Herbicide injury ratings were analyzed for each variety independently. Crop injury was only observed following post-emergence treatments.

Incidence and severity of symptoms varied with potato variety and herbicide application rate. In general, the injury ratings for potato plants in the post-emergence metribuzin treatments were higher than the post-emergence applications of rimsulfuron. The rimsulfuron injury was more transitory than the metribuzin injury. Injury ratings for rimsulfuron were lowest in Atlantic and highest in AF1615-1. Injury ratings for metribuzin were less severe in AF1615-1 and the most severe in Atlantic. Rimsulfuron treated plants were, in general, rated as good to excellent by 13 days after the post-emergence treatment. Plant injury caused by rimsulfuron was characterized by general chlorosis and a wrinkling of new leaves (mouse ear) (Figure 2). The high rate of rimsulfuron appeared to stunt potato plant growth (observation – data not taken). Metribuzin injury was characterized by leaf tip burn, necrosis, and death of sprayed leaves (Figure 3).

AUPIC values agree with field observations in that plants were generally more severely injured with metribuzin than with rimsulfuron. This technique was borrowed from plant pathology where it is used to describe disease progression. The post-applied labeled rate of metribuzin (TRT 13) was significantly more injurious than the labeled rate of rimsulfuron (TRT 4, 5, and 6) on Atlantic and Red La Soda. However, La Chipper and AF1615-1 were injured as much by rimsulfuron as by metribuzin at the labeled rates.

AUPIC was significantly less for La Chipper and AF1615-1 at the low rate of rimsulfuron using the nonionic surfactant compared to the crop oil concentrate and the methylated seed oil. Surfactant did not influence AUPIC with Atlantic or Red LaSoda. Further work needs to be conducted to determine if AUPIC is a valid method of comparing the progression of herbicide injury symptoms.

Greenhouse and field studies are planned to further document the interaction of the sulfonylurea herbicides and the carbamate insecticide/nematicide (Temik). Although it has not been reported in potato, it is hypothesized that the crop injury in the rimsulfuron treatments may have been amplified because of the application of aldicarb at planting.

Weed Control. Rimsulfuron and metribuzin significantly reduced total weed and broadleaf weed emergence compared to the no herbicide control (Table 5). There was no significant difference in grass weed emergence between the no herbicide and herbicide treatments.

All herbicide treatments except the 1.5 oz post-applied rimsulfuron/surfactant significantly reduced weed cover compared to the no herbicide control. There were no significant differences in weed cover ratings among herbicide treatments. Weed emergence occurred too late in the season to influence crop yield.

Conclusion. All herbicide treatments effectively controlled weeds. Herbicide injury for post-applied treatments may increase grower concern about crop loss. However, the injury observed after post-applied herbicide treatments did not significantly impact yield. To avoid in-season crop injury, pre-emergence treatments (crop and weed) will be recommended. In cases where early season weed pressure is apparent, post-applications of either metribuzin or rimsulfuron at a low rate will be recommended.

Table 3a. Production statistics for Atlantic potato.

#	TRT	Total cwt/acre	Marketable cwt/acre	Specific Gravity	Stand Count	
					3-26-01	4-2-01
1	Control	422	401	1.070	16.0	17.0
2	RIM - 1.5 oz – Pre	404	388	1.078	16.5	18.0
3	RIM - 2.0 oz – Pre	418	409	1.076	16.3	17.3
4	RIM - 1.5 oz – Post – NI	421	402	1.077	17.0	17.0
5	RIM - 1.5 oz – Post – COC	400	394	1.079	17.0	17.5
6	RIM - 1.5 oz – Post – MSO	368	362	1.077	17.5	17.5
7	RIM - 2.0 oz – Post – NI	439	431	1.077	--	--
8	RIM - 2.0 oz – Post – COC	339	334	1.077	17.5	17.5
9	RIM - 2.0 oz – Post – MSO	408	402	1.077	17.0	17.5
10	MET - 0.5 lb – Pre	438	428	1.077	16.0	18.0
11	MET - 1.25 lb – Pre	488	473	1.082	16.0	17.7
12	MET - 2.0 lb – Pre	425	412	1.080	17.0	18.0
13	MET – 0.5 lb – Post	422	400	1.077	--	--
14	MET – 1.0 lb – Post	375	361	1.077	16.0	16.0
15	MET– 1.5 lb – Post	358	349	1.077	17.5	17.5
LSD		NS	NS	NS	NS	NS
<i>p</i> value		0.4876	0.5900	0.1067	0.9157	0.5997

Table 3b. Production statistics for Red LaSoda potato.

#	TRT	Total cwt/acre	Marketable cwt/acre	Specific Gravity	Stand Count	
					3-26-01	4-2-01
1	Control	381	367	1.065	15.0	17.5
2	RIM - 1.5 oz – Pre	392	363	1.060	--	--
3	RIM - 2.0 oz – Pre	401	389	1.063	--	--
4	RIM - 1.5 oz – Post – NI	390	367	1.062	16.0	19.0
5	RIM - 1.5 oz – Post – COC	400	363	1.059	--	--
6	RIM - 1.5 oz – Post – MSO	319	310	1.060	16.3	18.0
7	RIM - 2.0 oz – Post – NI	343	327	1.060	15.0	17.3
8	RIM - 2.0 oz – Post – COC	360	342	1.062	13.0	18.0
9	RIM - 2.0 oz – Post – MSO	358	346	1.060	15.3	18.0
10	MET - 0.5 lb – Pre	378	340	1.061	16.0	18.0
11	MET - 1.25 lb – Pre	397	385	1.060	16.5	17.0
12	MET - 2.0 lb – Pre	338	315	1.062	14.7	17.3
13	MET – 0.5 lb – Post	363	346	1.061	15.3	17.0
14	MET – 1.0 lb – Post	334	317	1.063	16.7	18.0
15	MET– 1.5 lb – Post	375	338	1.061	16.0	18.0
LSD		NS	NS	NS	NS	NS
<i>p</i> -value		0.9638	0.9625	0.5304	0.8180	0.4789

Table 3c. Production statistics for LaChipper potato.

#	TRT	Total cwt/acre	Marketable cwt/acre	Specific Gravity	Stand Count	
					3-26-01	4-2-01
1	Control	313	307	1.068	15.5	15.5
2	RIM - 1.5 oz – Pre	313	308	1.069	16.5	18.0
3	RIM - 2.0 oz – Pre	255	252	1.069	17.5	17.5
4	RIM - 1.5 oz – Post – NI	300	294	1.067	17.0	18.0
5	RIM - 1.5 oz – Post – COC	284	283	1.068	18.0	18.0
6	RIM - 1.5 oz – Post – MSO	323	323	1.064	-.	-.
7	RIM - 2.0 oz – Post – NI	370	364	1.069	16.7	17.3
8	RIM - 2.0 oz – Post – COC	288	287	1.066	18.0	18.0
9	RIM - 2.0 oz – Post – MSO	253	249	1.065	-.	-.
10	MET - 0.5 lb – Pre	391	383	1.066	18.0	18.0
11	MET - 1.25 lb – Pre	310	301	1.067	-.	-.
12	MET - 2.0 lb – Pre	309	307	1.067	18.0	18.0
13	MET – 0.5 lb – Post	377	368	1.069	17.0	17.7
14	MET – 1.0 lb – Post	246	242	1.068	-.	-.
15	MET– 1.5 lb – Post	305	292	1.066	-.	-.
LSD		NS	NS	NS	NS	NS
<i>p</i> -value		0.2322	0.2145	0.2088	0.5988	0.2536

Table 3d. Production statistics for AF1615-1 potato.

#	TRT	Total cwt/acre	Marketable cwt/acre	Specific Gravity	Stand Count	
					3-26-01	4-2-01
1	Control	376	362	1.070	18.0	18.0
2	RIM - 1.5 oz – Pre	470	455	1.068	14.0	17.0
3	RIM - 2.0 oz – Pre	432	414	1.069	17.0	17.0
4	RIM - 1.5 oz – Post – NI	393	375	1.069	13.0	16.0
5	RIM - 1.5 oz – Post – COC	420	390	1.071	16.0	17.0
6	RIM - 1.5 oz – Post – MSO	351	333	1.071	16.0	18.0
7	RIM - 2.0 oz – Post – NI	471	434	1.068	-.	-.
8	RIM - 2.0 oz – Post – COC	393	380	1.068	17.0	18.0
9	RIM - 2.0 oz – Post – MSO	414	394	1.067	17.0	18.0
10	MET - 0.5 lb – Pre	436	420	1.070	17.5	18.0
11	MET - 1.25 lb – Pre	450	431	1.067	18.0	18.0
12	MET - 2.0 lb – Pre	428	406	1.066	-.	-.
13	MET – 0.5 lb – Post	422	393	1.066	-.	-.
14	MET – 1.0 lb – Post	384	371	1.069	16.0	17.0
15	MET– 1.5 lb – Post	382	357	1.067	16.5	18.0
LSD		NS	NS	NS	NS	NS
<i>p</i> -value		0.2685	0.2205	0.4370	0.8811	0.9774

Table 4a. Herbicide injury ratings for Atlantic potato.

#	TRT	Injury Rating					AUPIC
		5 DAT	7 DAT	9 DAT	13 DAT	16 DAT	
1	Control	0.0 d	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
2	RIM - 1.5 oz – Pre	0.0 d	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
3	RIM - 2.0 oz – Pre	0.0 d	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
4	RIM - 1.5 oz – Post – NI	0.0 d	0.8 d-f	0.5 de	0.0 b	0.0 b	3.0 de
5	RIM - 1.5 oz – Post – COC	0.0 d	1.8 cd	1.8 bc	0.0 b	0.0 b	8.8 cd
6	RIM - 1.5 oz – Post – MSO	0.0 d	1.5 c-e	1.3 cd	0.5 b	0.3 b	8.9 cd
7	RIM - 2.0 oz – Post – NI	0.0 d	2.5 bc	2.5 ab	0.3 b	0.0 b	13.4 c
8	RIM - 2.0 oz – Post – COC	0.0 d	1.3 de	2.3 b	0.3 b	0.0 b	10.1 cd
9	RIM - 2.0 oz – Post – MSO	0.0 d	2.5 bc	2.5 ab	0.3 b	0.0 b	13.4 c
10	MET - 0.5 lb – Pre	0.0 f	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
11	MET - 1.25 lb – Pre	0.0 f	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
12	MET - 2.0 lb – Pre	0.0 f	0.0 f	0.0 e	0.0 b	0.0 b	0.0 e
13	MET – 0.5 lb – Post	3.5 c	3.5 b	1.8 bc	1.0 b	0.3 b	28.4 b
14	MET – 1.0 lb – Post	4.5 b	5.0 a	3.3 a	2.5 a	1.5 a	46.5 a
15	MET– 1.5 lb – Post	5.3 a	5.8 a	3.3 a	2.5 a	1.5 a	50.6 a
LSD		0.5	1.0	0.8	1.0	0.5	7.3
<i>p</i> -value		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Table 4b. Herbicide injury ratings for Red LaSoda potato.

#	TRT	Injury Rating					AUPIC
		5 DAT	7 DAT	9 DAT	13 DAT	16 DAT	
1	Control	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
2	RIM - 1.5 oz – Pre	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
3	RIM - 2.0 oz – Pre	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
4	RIM - 1.5 oz – Post – NI	1.0 ef	1.0 e	1.0 c	0.0 b	0.0 c	8.5 f
5	RIM - 1.5 oz – Post – COC	0.5 fg	3.0 c	2.0 b	0.0 b	0.0 c	13.8 ef
6	RIM - 1.5 oz – Post – MSO	1.0 ef	3.0 c	2.0 b	0.0 b	0.0 c	15.5 d-f
7	RIM - 2.0 oz – Post – NI	1.0 ef	3.8 b	2.5 ab	0.0 b	0.0 c	18.5 de
8	RIM - 2.0 oz – Post – COC	1.5 de	2.8 cd	2.3 b	0.5 b	0.0 c	19.3 de
9	RIM - 2.0 oz – Post – MSO	2.0 cd	3.8 b	3.3 a	1.3 a	0.3 bc	29.0 bc
10	MET - 0.5 lb – Pre	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
11	MET - 1.25 lb – Pre	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
12	MET - 2.0 lb – Pre	0.0 g	0.0 f	0.0 d	0.0 b	0.0 c	0.0 g
13	MET – 0.5 lb – Post	2.8 c	2.3 d	1.0 c	1.3 a	0.8 ab	22.6 cd
14	MET – 1.0 lb – Post	4.5 b	3.3 bc	2.0 b	1.5 a	0.5 a-c	34.3 b
15	MET– 1.5 lb – Post	6.3 a	5.5 a	2.0 b	1.5 a	1.0 a	45.6 a
LSD		1.0	0.6	0.8	0.7	0.5	7.2
<i>p</i> -value		0.0001	0.0001	0.0001	0.0001	0.0045	0.0001

Table 4c. Herbicide injury ratings for La Chipper potato.

#	TRT	Injury Rating					AUPIC
		5 DAT	7 DAT	9 DAT	13 DAT	16 DAT	
1	Control	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
2	RIM - 1.5 oz – Pre	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
3	RIM - 2.0 oz – Pre	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
4	RIM - 1.5 oz – Post – NI	0.5 cd	0.8 e	0.8 cd	0.0 e	0.0 c	5.5 ef
5	RIM - 1.5 oz – Post – COC	0.0 d	2.8 bc	2.3 b	1.5 a-c	0.5 a-c	18.3 cd
6	RIM - 1.5 oz – Post – MSO	1.0 b-d	2.3 c	2.3 b	1.3 b-d	0.3 bc	19.5 cd
7	RIM - 2.0 oz – Post – NI	2.0 b	3.3 b	2.8 ab	0.8 c-e	0.3 bc	24.8 bc
8	RIM - 2.0 oz – Post – COC	1.5 bc	2.8 bc	3.3 a	2.3 a	0.5 a-c	29.1 b
9	RIM - 2.0 oz – Post – MSO	1.8 bc	3.0 b	2.8 ab	2.0 ab	0.8 ab	28.5 b
10	MET - 0.5 lb – Pre	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
11	MET - 1.25 lb – Pre	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
12	MET - 2.0 lb – Pre	0.0 c	0.0 f	0.0 d	0.0 e	0.0 c	0.0 f
13	MET – 0.5 lb – Post	1.8 bc	1.5 d	0.5 cd	0.5 de	0.3 bc	12.8 de
14	MET – 1.0 lb – Post	4.5 a	3.0 b	1.0 c	1.0 cd	0.3 bc	28.6 b
15	MET– 1.5 lb – Post	5.5 a	4.5 a	2.0 b	1.5 a-c	1.0 a	41.0 a
LSD		1.3	0.7	0.8	0.8	0.6	8.3
<i>p</i> -value		0.0001	0.0001	0.0001	0.0001	0.0234	0.0001

Table 4d. Herbicide injury ratings for AF1615-1 potato.

#	TRT	Injury Rating					AUPIC
		5 DAT	7 DAT	9 DAT	13 DAT	16 DAT	
1	Control	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
2	RIM - 1.5 oz – Pre	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
3	RIM - 2.0 oz – Pre	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
4	RIM - 1.5 oz – Post – NI	0.5 de	1.0 d	1.3 ef	0.0 c	0.0 b	7.5 e
5	RIM - 1.5 oz – Post – COC	1.0 d	3.3 c	2.5 cd	0.8 b	0.3 b	20.5 cd
6	RIM - 1.5 oz – Post – MSO	2.0 c	3.0 c	2.5 cd	0.0 c	0.0 b	20.5 cd
7	RIM - 2.0 oz – Post – NI	2.5bc	4.3 ab	3.5 ab	0.0 c	0.0 c	27.8 b
8	RIM - 2.0 oz – Post – COC	2.3 c	3.3 c	2.8 bc	0.0 c	0.0 b	22.6 bc
9	RIM - 2.0 oz – Post – MSO	2.3 c	3.8 bc	3.8 a	0.0 c	0.0 b	26.6 bc
10	MET - 0.5 lb – Pre	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
11	MET - 1.25 lb – Pre	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
12	MET - 2.0 lb – Pre	0.0 e	0.0 e	0.0 g	0.0 c	0.0 b	0.0 f
13	MET – 0.5 lb – Post	3.3 b	1.8 d	0.3 g	0.0 c	0.0 b	15.6 d
14	MET – 1.0 lb – Post	5.3 a	3.3 c	0.8 fg	0.3 bc	0.0 b	28.0 b
15	MET– 1.5 lb – Post	4.5 a	5.0 a	1.8 de	1.5 a	1.0 a	37.8 a
LSD		0.9	0.9	1.0	0.6	0.5	6.8
<i>p</i> -value		0.0001	0.0001	0.0001	0.0004	0.0070	0.0001

Table 5. Weed emergence in herbicide treated plots rated June 6, 2001 (harvest).

#	TRT	Weed Cover Rating	Emerged Weeds · m ⁻¹	Emerged Grass · m ⁻¹	Emerged B-leaf · m ⁻¹
1	Control	5.3 a	13.8 a	4.8	9.0 a
2	RIM - 1.5 oz – Pre	1.8 bc	3.3 b	2.5	0.8 b
3	RIM - 2.0 oz – Pre	2.0 bc	4.0 b	1.0	3.0 b
4	RIM - 1.5 oz – Post – Surf	3.5 ab	5.3 b	3.5	1.8 b
5	RIM - 1.5 oz – Post – COC	1.5 c	4.3 b	2.5	1.8 b
6	RIM - 1.5 oz – Post – MSO	2.0 bc	3.3 b	2.8	0.5 b
7	RIM - 2.0 oz – Post – Surf	1.0 c	0.8 b	0.8	0.0 b
8	RIM - 2.0 oz – Post – COC	1.0 c	2.5 b	2.5	0.0 b
9	RIM - 2.0 oz – Post – MSO	1.0 c	0.8 b	0.3	0.5 b
10	MET - 0.5 lb – Pre	0.8 c	0.8 b	0.3	0.5 b
11	MET - 1.25 lb – Pre	0.5 c	0.5 b	0.5	0.0 b
12	MET - 2.0 lb – Pre	0.8 c	3.8 b	3.3	0.5 b
13	MET – 0.5 lb – Post	0.3 c	0.0 b	0.0	0.0 b
14	MET – 1.0 lb – Post	0.5 c	0.3 b	0.3	0.0 b
15	MET– 1.5 lb – Post	0.5 c	0.3 b	0.0	0.3 b
LSD		1.8	6.4	NS	4.2
p-value		0.0001	0.0153	0.2314	0.0129

Figure 1. PLOT MAP - Herbicide Trial Bed 16 NL

12 ft plots with 3 ft breaks

8" in-row row spacing

N[^]

Plot	Block 1				Block 2				Block 3				Block 4				ft
				13				2				15				4	223
15	A	C	B	D	A	D	C	B	D	A	B	C	C	B	A	D	210
				14				7				12				1	207
14	D	A	B	C	D	C	B	A	A	C	B	D	C	D	A	B	195
				11				4				13				5	192
13	C	A	D	B	D	B	C	A	D	B	C	A	A	D	B	C	180
				15				11				2				14	177
12	C	B	D	A	D	A	B	C	D	A	C	B	D	A	C	B	165
				10				5				10				3	162
11	D	C	B	A	C	D	A	B	C	A	D	B	A	C	D	B	150
				12				8				1				13	147
10	D	A	B	C	D	B	C	A	A	D	B	C	A	D	B	C	135
				3				9				7				12	132
9	C	D	A	B	C	B	D	A	D	B	C	A	D	C	B	A	120
				9				10				11				9	117
8	C	B	A	D	B	D	A	C	D	B	A	C	D	A	C	B	105
				7				15				3				10	102
7	A	C	B	D	C	D	A	B	B	C	A	D	C	B	A	D	90
				2				6				5				7	87
6	B	D	A	C	D	B	A	C	B	A	D	C	A	D	C	B	75
				8				12				4				8	73
5	B	C	A	D	C	A	B	D	D	C	A	B	D	B	C	A	60
				5				13				6				2	58
4	B	D	C	A	A	C	B	D	C	D	B	A	D	B	C	A	45
				4				1				8				11	42
3	C	A	D	B	D	C	A	B	B	A	D	C	B	D	A	C	30
				6				14				9				15	27
2	C	B	A	D	C	B	A	D	D	B	A	C	C	A	B	D	15
				1				3				14				6	12
1	A	B	C	D	D	A	C	B	A	B	D	C	D	A	C	B	0
	1--4				5--8				9--12				13--16				
	Row																

Code	TRT	Rate a.i.	Application
1	Control		
2	Matrix	0.375 oz	pre
3	Matrix	0.500 oz	pre
4	Matrix + Surf	0.375 oz 0.25%	post
5	Matrix + COC	0.375 oz 1.00%	post
6	Matrix + MSO	0.375 oz 1.00%	post
7	Matrix + Surf	0.500 oz 0.25%	post
8	Matrix + COC	0.500 oz 1.00%	post
9	Matrix + MSO	0.500 oz 1.00%	
10	Metribuzin	0.5 lb	pre
11	Metribuzin	1.25 lb	pre
12	Metribuzin	2.0 lb	pre
13	Metribuzin	0.5 lb	post
14	Metribuzin	1.0 lb	post
15	Metribuzin	1.5 lb	post

No.	Variety
A	Atlantic
B	Red La Soda
C	La Chipper
D	AF-1615-1



Figure 2. Rimsulfuron injury on La Chipper seven days after application.



Figure 3. Metribuzin injury on Red LaSoda seven days after application.