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Abstract

Sweet corn growers now have three useful HPPD (4-hydroxyphenyl-pyruvatedioxygenase) herbicides to use in their weed control program: Callisto (mesotrione), Impact (topramezone), and Laudis (tembotrione). This group of herbicides will control numerous broadleaf weeds and, depending on product, will control or suppress certain annual grass weeds. Callisto can be used either pre emergence or post emergence and Impact and Laudis are labeled for post emergence use only. Corn crops have good tolerance to these herbicides but there are label restrictions on subsequent plantings of vegetable crops. This two-year study looked at the use of Callisto, Impact, and Laudis herbicide on sweet corn and their carryover potential for injuring subsequent crops of cucumber, pepper, snap bean, and tomato.

Keywords

RFR A9001, Horticulture

Disciplines

Agricultural Science | Agriculture | Horticulture

Residual Effects of Callisto, Impact, and Laudis Herbicide on Cucumber, Pepper, Snap Bean, and Tomato

RFR-A9001

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Introduction

Sweet corn growers now have three useful HPPD (4-hydroxyphenyl-pyruvate-dioxygenase) herbicides to use in their weed control program: Callisto (mesotrione), Impact (topramezone), and Laudis (tembotrione). This group of herbicides will control numerous broadleaf weeds and, depending on product, will control or suppress certain annual grass weeds. Callisto can be used either pre emergence or post emergence and Impact and Laudis are labeled for post emergence use only. Corn crops have good tolerance to these herbicides but there are label restrictions on subsequent plantings of vegetable crops. This two-year study looked at the use of Callisto, Impact, and Laudis herbicide on sweet corn and their carryover potential for injuring subsequent crops of cucumber, pepper, snap bean, and tomato.

Materials and Methods

Planting and plot design. The trial was located in Field S-3—loamy-sand soil with 2.5% organic matter and soil pH of 6.50. Herbicide treatments described in Table 1 were applied to plots of sweet corn 15 ft by 30 ft in 2008. Herbicide plots arranged in a randomized complete block design with three replications. Spring, 2009, Strike snap bean (seeded May 10), Turbo cucumber, Alliance bell pepper, and Mountain Spring tomato (all transplanted May 19) were established in 2008 herbicide plots to test for injurious levels of residual herbicide.

Fertility and irrigation. Water applied as needed by center pivot irrigation system to supplement rainfall. Fertilizer applied preplant incorporated at a rate of 60 lb/acre nitrogen (N) and 100 lb/acre potassium (K₂O). An additional 60 lb/acre nitrogen was sidedressed on June 18.

Pest control. Weed control was accomplished by cultivation and hand hoeing. Mustang Max and Sevin XLR were used for insect control. Bravo Weather Stik was used for disease control.

Results and Discussion

This project started in 2008 when plots of BC 0805 sweet corn were treated with the post herbicide treatments described in Table 1. There were no visible injury symptoms to the sweet corn or evidence at harvest that the herbicide treatments affected yield (Table 2). Complete details of the 2008 work can be found in 2008 Annual Progress Report, Muscatine Island Research Farm, or on the web at: <http://mirdf.ag.iastate.edu/> (click on archived reports).

After harvest, the sweet corn stubble was mowed off and plots left undisturbed over the winter. The following spring the trial area was chisel plowed 8 in. deep, fertilizer applied, and disked before planting. Strike snap beans were planted on May 10 and because of cool wet weather took approximately seven to nine days to emerge. By June 11 snap beans were at the three to four leaf growth stage and showed no evidence that any of the residual herbicide treatments influenced emergence or early plant growth. Snap beans grew well and were harvested on July 9. No differences were seen in plot yield or average pod weight due to residual herbicide treatments (Table 3).

Healthy transplants having three true leaves of Alliance pepper, Mountain spring tomato, and Turbo cucumbers were transplanted into the herbicide residual plots on May 19.

Establishment and plant growth were closely observed for visual symptoms of herbicide injury – but none were seen. By June 11, all transplants had produced eight to nine leaves and the cucumbers and tomatoes were showing first flowers. Cucumbers were harvested on July 1, 6, and 10. There were no differences between herbicide treatments for number of fruit/plant or average fruit weight (Table 3). Harvest data were not collected from pepper or tomato plots because of uniform growth and no visible differences across herbicide treatments.

Herbicide persistence in soil is dependent on the type of herbicide used and a complex list of environmental factors such as soil type, soil pH, temperature, and moisture. Under the circumstances of this trial, post applications of Callisto, Impact, or Laudis to sweet corn provided good weed control during season of application but did not carry over and cause injury to cucumber, snap bean, bell pepper, or tomato planted the next spring. Not even when

rates were doubled. It is possible above normal rainfall in 2008 and 2009 lessened the effect of herbicide carryover. During 2009, monthly rainfall totals for April through August were 4.8, 7.0, 8.5, 5.2, and 10.2 in., respectively. Constantly moist soil and excessive rainfall might have promoted herbicide breakdown or leaching below the crop root zone. If this trial was repeated under different weather conditions we might expect some of the residual herbicide treatments to cause injury to subsequent vegetable plantings.

Growers should follow herbicide label directions. This trial provided no evidence that the crop rotation restrictions listed on the labels of Callisto, Impact, or Laudis are too short and there should be no fear of carryover crop injury when directions are followed. Research in 2005–2006 at the Horticulture Research Station, Ames, demonstrated that Callisto may carry over and cause injury to cucumber, muskmelon, and snap beans when label instructions aren't followed (see Callisto Residual Evaluation, 2006 Annual Progress Report, Horticulture Research Station).

Table 1. Postemergence herbicide treatments applied to sweet corn on June 25, 2008. Dual II Magnum applied preplant at 1.3 pint/acre to all treatments.

Herbicide treatment ^a	Rate/acre
1. Control – no post herbicide	---
2. ½ X rate Impact	0.38 oz
3. 1X rate Impact	0.75 oz
4. 2X rate Impact	1.50 oz
5. 1X rate Impact + Aatrex 4L	0.75 oz + 1.0 pint
6. 2X rate Impact + Aatrex 4L	1.5 oz + 2.0 pint
7. 1X rate Callisto + Aatrex 4L	3.0 fl oz + 1.0 pint
8. 2X rate Callisto + Aatrex 4L	6.0 fl oz + 2.0 pint
9. 1X rate Laudis + Aatrex 4L	3.0 fl oz + 1.0 pint
10. 2X rate Laudis + Aatrex 4L	6.0 fl oz + 2.0 pint

^aAll postemergence treatments applied with crop oil concentrate at 1.0% v/v.

Table 2. Effect of postemergence herbicide treatments on yield and ear size of sweet corn, cv. BC0805, harvest August 13, 2008.

Treatment	Yield dozen ears/acre	Yield cwt/acre	Husked ear length (in.)	Husked ear diameter (in.)
1. Control	1,984	164.91	8.50	1.73
2. ½ X rate Impact	2,032	183.67	8.62	1.76
3. 1X rate Impact	2,000	172.45	8.53	1.72
4. 2X rate Impact	2,096	184.05	8.62	1.75
5. 1X Impact + Aatrex 4L	2,000	180.38	8.72	1.75
6. 2X Impact + Aatrex 4L	2,112	184.44	8.57	1.77
7. 1X Callisto + Aatrex 4L	1,920	171.49	8.62	1.77
8. 2X Callisto + Aatrex 4L	1,952	179.03	8.53	1.78
9. 1X Laudis + Aatrex 4L	1,968	172.07	8.66	1.75
10. 2X Laudis + Aatrex 4L	1,920	180.19	8.71	1.74
LSD 5%	n.s.	n.s.	n.s.	n.s.

Table 3. Yield of Turbo cucumber and Strike snap bean grown in herbicide residual plots.

Treatment	Turbo cucumber ^a		Strike snap bean ^b	
	# fruit/plant	Avg fruit wt (oz)	Plot yield (lb)	Avg pod wt (grams)
1. Control – no post herbicide	6.5	9.2	14.5	6.3
2. ½ X rate Impact	5.9	9.4	14.1	6.0
3. 1X rate Impact	6.0	9.6	16.6	5.9
4. 2X rate Impact	6.0	9.2	14.7	5.8
5. 1X Impact + Aatrex 4L	5.1	9.1	11.5	5.5
6. 2X Impact + Aatrex 4L	5.9	9.3	14.5	5.9
7. 1X Callisto + Aatrex 4L	7.9	9.2	13.5	5.9
8. 2X Callisto + Aatrex 4L	6.1	9.2	14.3	6.2
9. 1X Laudis + Aatrex 4L	6.1	10.6	13.1	5.9
10. 2X Laudis + Aatrex 4L	5.2	10.0	11.1	5.8
LSD 5%	n.s.	n.s.	n.s.	n.s.

^aTurbo cucumber total yield of 6 in. long fruit from harvest on July 1, 6, and 10, 2009.

^bStrike snap bean once-over harvest of all pods 3 in. long or more on July 9, 2009.