Grassy Weed Control with Mesotrione (Callisto®)

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Introduction

Mesotrione (Callisto®) is a relatively new herbicide that inhibits pigment development by blocking production of the HPPD enzyme in susceptible plants. It is also the only herbicide with this mode of action that is currently registered for use in Kentucky bluegrass (*Poa pratensis*) grown for seed. The product label lists control of numerous broadleaf weeds. Anecdotal evidence suggests that mesotrione has some activity on grassy weeds. If this were the case mesotrione would be extremely useful in Kentucky bluegrass seed production. Currently primisulfuron (Beacon®) is the only herbicide registered that will selectively control problem weeds like downy brome (*Bromus tectorum*), rough bluegrass (*Poa trivialis*), and volunteer wheat (*Triticum aestivum*) during establishment of new stands of Kentucky bluegrass. Primisulfuron selectivity is narrow between Kentucky bluegrass and grassy weeds, therefore crop injury can sometimes occur. If mesotrione could control or even suppress grassy weeds it would likely help avoid some Kentucky bluegrass injury problems from primisulfuron. Therefore, the objective of this research was to evaluate control of grassy weeds with mesotrione.

Methods and Materials

A field trial was conducted at the Central Oregon Agricultural Research Center near Madras, Oregon. Two rows each of the following species were planted on September 15, 2008: Kentucky bluegrass, rough bluegrass, downy brome, rattail fescue (*Vulpia myuros*), winter wheat, and tame oat (*Avena sativa*). A pre-emergence treatment of mesotrione was applied following the first sprinkler irrigation on September 18. There were five application timings: 1) pre-emergence on September 18, 2008, 2) an early postemergence on October 17, 2008, 3) a later postemergence on December 1, 2008, 4) April 30, 2009, and 5) May 22, 2009. Application rates and plant growth stages at the time of application are noted in Tables 1 through 3. Plots were 10 ft by 20 ft with 3 replications arranged as randomized complete blocks. Treatments were applied with a CO_2 backpack sprayer delivering 20 gal/acre operating at 40 psi and 3 mph. Crop injury and weed control were determined by making visual evaluations on a percentage scale.

Results and Discussion

Kentucky bluegrass vigor was low throughout the duration of the trial, probably because the planting date was too late for this species given the declining temperatures heading into winter. The low vigor resulted in the crop injury from primisulfuron noted in Tables 1 and 2. With a more appropriate planting date and growth stage at application, this much injury would not likely occur.

The pre-emergence and early postemergence treatments were evaluated on November 17, 2008 (Table 1). Grassy weed control with mesotrione was not excellent. However, all of the species planted were less tolerant to mesotrione than was Kentucky bluegrass. In particular, downy

brome seemed to be the most susceptible, more from the pre-emergence than postemergence treatments. Weed control consisted of a reduced population of plants and stunting of surviving plants. Grass control was better with primisulfuron than mesotrione; however primisulfuron caused more crop injury as noted above. Also, primisulfuron was slightly antagonized from tank-mixing with mesotrione.

Shortly after the later postemergence application on December 1, 2008 the grasses went dormant for the winter, so that treatment could not be evaluated until spring, which was done on May 7, 2009 (Table 2). The later postemergence treatment consisted 0.094 lb ai/acre (3 fl oz/acre) that was applied 6 weeks after a prior application of 0.094 lb ai/acre. The addition application on December 1 had almost no effect on the grassy weeds.

In general, plants that were injured from fall applications of mesotrione and primisulfuron did not grow out of the injury during the spring. Most of the surviving grassy weeds that were evaluated on May 7, 2009 were beginning to make seed; however their tiller number and plant height were greatly reduced. These data are not specifically shown but are accounted for in the control evaluation.

Spring applications of mesotrione were made when the grasses entered reproductive growth stages. This was done with the prospect of blanking seed heads. Evaluations made on June 3, 2009 suggest that applying the full rate of mesotrione at the boot stage may reduce 50 percent of the heading of downy brome and 47 percent of volunteer wheat (Table 3). Furthermore, this application has not resulted in reduced Kentucky bluegrass seed yield in other research (Affeldt et al. 2007).

Pre- and postemergence applications of mesotrione controlled most of the broadleaf weeds that germinated during winter and spring: flixweed (*Descurainia sophia*), tumble mustard (*Sisymbrium altissimum*), and prickly lettuce (*Lactuca serriola*) (Tables 2 and 3). However, for grassy weed control pre- or early postemergence applications of mesotrione were most effective.

References

Affeldt, R., C. Campbell, M. Butler, J. Carroll, and B. Holliday. 2007. Bluegrass tolerance to mesotrione applied in the spring. Central Oregon Agricultural Research Center 2006 Annual Report. Special Report 1072:1-3. http://extension.oregonstate.edu/catalog/html/sr/sr1072-e/04.pdf

Table 1. Kentucky bluegrass injury and weed control from herbicides at Madras, OR, evaluated November 17, 2008.

Treatment[1]	Application timing	Rate	Kentucky bluegrass	Rough bluegrass	Downy brome	Rattail fescue	Winter wheat	Tame oat
		(lb ai/A)	% injury	---------- % control ----------				
Mesotrione	PRE[2]	0.188	0	47	88	75	60	0
Mesotrione	EPOST[3]	0.094	0	16	71	34	59	16
Mesotrione	EPOST[3]	0.188	0	33	75	77	73	25
Mesotrione + Primisulfuron	EPOST[3]	0.094 + 0.018	13	82	82	73	75	63
Primisulfuron	EPOST[3]	0.018	13	87	88	82	80	73

[1]Applied with methylated seed oil at 1.0% v/v. Mestrione = Callisto (4 lb ai/gal). Primisulfuron = Beacon (75% w/w).
[2]PRE = pre-emergence, applied September 18, 2008.
[3]EPOST = early postemergence, applied October 17, 2008 when Kentucky bluegrass had 1 to 2 leaves; rough bluegrass had 1 to 3 leaves; downy brome and rattail fescue had 2 leaves to 1 tiller; winter wheat had 3 leaves to 2 tillers; and tame oat had 1 to 3 tillers.

Table 2. Kentucky bluegrass injury and weed control from herbicides in vegetative growth stages at Madras, OR, evaluated May 7, 2009.

Treatment[1]	Application timing	Rate	Kentucky bluegrass	Rough bluegrass	Downy brome	Rattail fescue	Winter wheat	Tame oat	Flixweed	Tumble mustard	Prickly lettuce
		(lb ai/A)	% injury	% control							
Mesotrione	PRE[2]	0.188	10	33	85	72	47	20	100	77	100
Mesotrione	EPOST[3]	0.094	0	16	60	29	34	16	100	92	100
Mesotrione	EPOST[3]	0.188	2	27	80	55	53	40	100	99	100
Mesotrione	EPOST[3] + POST[4]	0.094 + 0.094	3	18	75	40	60	7	100	100	100
Mesotrione + Primisulfuron	EPOST[3]	0.094 + 0.018	95	95	96	87	87	100	100	100	100
Primisulfuron	EPOST[3]	0.018	95	98	100	95	99	100	100	100	60

[1]Applied with methylated seed oil at 1.0% v/v. Mestrione = Callisto (4 lb ai/gal). Primisulfuron = Beacon (75% w/w).

[2]PRE = pre-emergence, applied September 18, 2008.

[3]EPOST = early postemergence, applied October 17, 2008 when Kentucky bluegrass had 1 to 2 leaves; rough bluegrass had 1 to 3 leaves; downy brome and rattail fescue had 2 leaves to 1 tiller; winter wheat had 3 leaves to 2 tillers; and tame oat had 1 to 3 tillers.

[4]POST = post-emergence, applied December 1, 2008 when Kentucky bluegrass had 2 to 4 tillers; rough bluegrass had 4 to 7 tillers; downy brome was 6 inches in diameter; rattail fescue was 4 inches in diameter; winter wheat was 8 inches in diameter; tame oat was 12 inches in diameter.

Table 3. Kentucky bluegrass injury and weed control from herbicides in reproductive growth stages at Madras, OR, evaluated June 3, 2009.

Treatment[1]	Application timing	Rate	Kentucky bluegrass	Rough bluegrass	Downy brome	Rattail fescue	Winter wheat	Tame oat	Flixweed	Tumble mustard	Prickly lettuce
		(lb ai/A)	% injury	% control							
Mesotrione	April 30[2]	0.094	0	3	23	13	22	0	100	100	100
Mesotrione	April 30[2]	0.188	0	10	50	25	47	0	100	100	100
Mesotrione	May 22[3]	0.094	0	0	3	0	0	0	100	100	100
Mesotrione	May 22[3]	0.188	0	17	17	5	0	0	57	87	70

[1]Applied with methylated seed oil at 1.0% v/v. Mestrione = Callisto (4 lb ai/gal).

[2]At time of application Kentucky bluegrass, rough bluegrass, downy brome, and tame oat were in the boot stage; rattail fescue was 16 inches tall; winter wheat was 24 inches tall; flixweed and tumble mustard were 6 inches tall; and prickly lettuce was 4 inches tall.

[3]At time of application Kentucky bluegrass, rough bluegrass, downy brome, and tame oat were heading; rattail fescue and winter wheat were in the boot stage; flixweed and tumble mustard were flowering; and prickly lettuce was 6 inches tall.