CARRYOVER EFFECTS OF PRIMISULFURON TO ROTATIONAL CROPS IN EASTERN OREGON

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Primisulfuron (Beacon) is registered for use in seedling and established Kentucky bluegrass under an Oregon Special Local Needs registration (24c). In Eastern Oregon, Beacon is used to control downy brome and quackgrass. Kentucky bluegrass crop injury can be avoided with proper application timing. (Ball and Walenta, 1996). Beacon is a sulfonylurea class of herbicide and has soil residual properties which may affect subsequent crops grown in rotation with grass seed. Studies were conducted to identify feasible crop rotation options following KBG seed production where Beacon is used for downy brome management. Soil persistence of Beacon and possible carryover to sweet corn, potatoes, onions and winter wheat was studied under irrigated field conditions in the lower Umatilla Basin of Oregon and Columbia Basin of Washington. Also, sugarbeets and mint were grown in crop rotation after Kentucky bluegrass in the Grande Ronde Valley to evaluate Beacon carryover effects on those crops.

Sweet Corn & Onion

Beacon treatments were applied to an established Kentucky bluegrass stand in two commercial field locations near Paterson, WA in fall 1996 and spring 1997. Plots were 15 x 50 ft with four replications arranged in a randomized complete block design. Soil at location #1 was loamy sand (86% sand, 8% silt, and 6% clay) with 0.8 % organic matter, pH 6.7, and CEC of 9.9 meq/100g. Soil at location #2 was also loamy sand (86% sand, 8% silt, and 6% clay) with 0.73 % organic matter, pH 7.0, and CEC of 6.4 meq/100g. After Kentucky bluegrass harvest, both locations were rotated into sweet corn (var. *Golden Jubilee*) in July 1997. Plots were relocated and sweet corn was evaluated for possible carryover effects from Beacon. No significant differences in sweet corn plant height and visible crop injury (August 6, 1997) were observed from Beacon treatments applied to Kentucky bluegrass and compared to untreated check. These results were expected since Beacon is registered for use in many corn cultivars.

Both locations were subsequently rotated to dehydrating onions (March, 1998) after commercial sweet corn harvest. Plots were relocated to evaluate the influence of Beacon treatments on dehydrating onions. No visible crop injury was observed on dehydrating onions at either location. Dehydrating onion plant stand count was unaffected by Beacon treatments applied to Kentucky bluegrass compared to untreated check. No dehydrating onion yields were obtained at these two locations.

Beacon treatments were also applied to a seedling Kentucky bluegrass stand in a commercial field at a third location near Prosser, WA in fall 1996 and spring 1997. Soil at the site was silt loam (40% sand, 51% silt, and 10% clay) with 1.1% organic matter, pH 6.3, and CEC of 18.6 meq/100g. After Kentucky bluegrass harvest, the field was rotated into fresh market onions (var. *Tamara*) in April 1998. Plots were relocated and onions were evaluated for possible carryover effects. No visible injury symptoms from Beacon treatments were observed. Beacon treatments did not affect onion stand counts or ungraded onion yield.

Potatoes

Beacon treatments were applied in fall 1996 and spring 1997 to an established Kentucky bluegrass stand in a commercial field near Paterson, WA. Plots were 15 x 50 ft with four replications arranged in a randomized complete block design. Soil at the site was sandy loam (76% sand, 17% silt, and 7% clay) with 0.86% organic matter, pH 7.5, and CEC of 7.2 meq/100g. After Kentucky bluegrass harvest, the field was rotated into sweet corn in July 1997 and subsequently into potatoes (var. *Rangers*) in April 1998. Plots were relocated and potatoes were evaluated for possible carryover effects.

No visible injury symptoms from Beacon treatments were observed. Two 10 feet rows of potatoes from the middle of the plot were harvested, weighed and graded. In the 2X rate of Beacon (1.5 oz/a) treatment applied in spring, the Cwt/a of 4-12 oz sized potatoes was reduced compared to untreated check. However, the Cwt./a of the 12-oz or larger size in the same treatment was higher than untreated check (Table 1). The high rate of Beacon applied in spring probably reduced the number of tubers, either by reducing the plant stand or by affecting the formation of tubers. Fewer tubers had reduced competition, either at plant level or between the tubers, thus potentially leading to larger tubers.

Winter Wheat

Beacon treatments were applied to an established Chewings fescue stand in 1996-97 near Echo, OR. The plots were 10 x 40 ft with four replications arranged in a randomized complete block design. Soil at the site was a sandy loam (68% sand, 23% silt, and 9% clay) with 1.4% organic matter, pH 6.7, and CEC of 10.7 meq/100g. After Chewings fescue harvest, the field was rotated into winter wheat (var. *Stephens*) in October 1997. Plots were relocated and winter wheat was evaluated for possible carryover effects. No visible injury symptoms from Beacon treatments were observed. In the 2X rate of fall Beacon treatment (1.5 oz/a) winter wheat yield was reduced compared to untreated check (Table 2).

Peppermint

Beacon treatments were applied to an established Kentucky bluegrass stand in 1996-97 in a commercial field near Imbler, OR. The plots were 8 x 40 ft with four replications. Soil at the site was sandy loam (59% sand, 30% silt, and 11% clay) with 3.56% organic matter, pH 6.5 and CEC of 17.9 meq/100g. After Kentucky bluegrass harvest, the field was rotated into peppermint (var. *Blackmitchim*) in November 1997. Plots were relocated and peppermint was evaluated for possible carryover effects. No visible crop injury symptoms from Beacon were observed. Fresh biomass samples were taken from 5 x 40 feet area with a plot swather from the middle of the plot. The established peppermint stand was highly variable which resulted in highly variable fresh biomass samples. Beacon treatments applied in Kentucky bluegrass had no significant influence on fresh biomass of peppermint compared to untreated control.

Sugarbeet

Beacon treatments were applied to a established Kentucky bluegrass stand in 1996-97 in a commercial field near Imbler, OR. Plots were 8 x 40 ft with four replications. Soil at the site was sandy loam (60% sand, 30% silt, and 10% clay) with 3.46% organic matter, pH 7.7 and CEC of 6.9 meq/100g. The field was rotated into sugarbeet (var. *Betaseed 8088*) in April 1998. Plots were relocated and sugarbeet was evaluated for possible carryover effects. Crop stand of sugarbeet in this field was quite variable. In the Beacon treatments significant visible crop injury was observed (Table 3). Unfortunately the field had to be harvested prematurely, so root yield was less than normal. Two 10 feet wide rows of sugarbeet were dug for sample per plot to determine tuber yield. Sugarbeet yields from Beacon treatments were not statistically different from untreated control due to the high variability in crop stand, and early harvest.

In conclusion, the soil persistence of Beacon did not greatly affect crop rotation opportunities investigated in these studies, with the exception of sugarbeets. None of the other crops (sweet corn, onions, winter wheat, potatoes, nor peppermint) showed significant carryover effects from Beacon applied at normal use rates. A slight carryover effect observed on potatoes and winter wheat was observed only at 2X use rate of Beacon.

References

Ball, D. A. and D. L. Walenta. 1996. Preliminary Evaluations of Primisulfuron for Downy Brome Control in Eastern Oregon Bluegrass Seed Production. 1995 Seed Prod. Res. OSU Ext/CrS 106 pg 66-67.

Table 1. Response of potato to Beacon treatments applied in Kentucky bluegrass the previous year.

Treatment*	Product rate	Date of application	Size grade of potatoes: Unders	Culls	2 oz	4-12 oz	>12 oz	Total yield	Specific gravity
	(oz/a)		---------- (Cwt/a)----------						
Beacon	0.375	Oct 2, 1996	90	31	22	378	74	616	1.085
Beacon	0.750	Oct 2, 1996	91	25	15	386	61	620	1.084
Beacon	1.500	Oct 2, 1996	96	20	23	370	45	579	1.083
Beacon	0.375	Feb 21, 1997	64	36	36	378	84	618	1.084
Beacon	0.750	Feb 21, 1997	91	25	18	368	55	578	1.084
Beacon	1.500	Feb 21, 1997	90	25	25	289	90	533	1.082
Beacon/Beacon	0.375/0.375	Oct 2/Nov 9, 1996	83	23	28	410	89	663	1.084
Untreated			113	37	29	381	41	603	1.083
LSD 0.05			NS	NS	NS	59	36	NS	NS

* Beacon applied with 1 qt/a crop oil concentrate (MorAct).
NS = Statistically non-significant at 5% level.

Table 2. Response of winter wheat to Beacon treatments applied in Chewings fescue the previous year.

Treatment*	Product rate	Date of application	Yield	Test wt
	(oz/a)		(bu/a)	(lb/b)
Beacon	0.375	Oct 8, 1996	102	60
Beacon	0.500	Oct 8, 1996	102	59
Beacon	0.750	Oct 8, 1996	88	59
Beacon	1.500	Oct 8, 1996	82	59
Beacon	0.750	Nov 11, 1996	104	60
Beacon	0.750	Feb 20, 1997	94	60
Beacon/Beacon	0.375/0.375	Oct 8, 1996/Nov 11, 1996	104	60
Beacon/Beacon	0.375/0.375	Oct 8, 1996/Feb 20, 1997	105	59
Beacon/Beacon	0.375/0.375	Nov 11, 1996/Feb 20, 1997	91	59
Untreated			99	59
LSD 0.05			16	NS

* Beacon applied with 1 qt/a crop oil concentrate (MorAct).
NS = Statistically non-significant at 5% level.

Table 3. Response of sugarbeet to Beacon treatments applied in Kentucky bluegrass the previous year.

Treatment*	Product rate	Date of application	Visible crop injury		Yield
			June 3, 1998	Aug 12, 1998	Aug 13, 1998
	(oz/a)		---------- (%) ----------		(ton/a)
Beacon	0.375	Oct 2, 1996	52	0	14
Beacon	0.750	Oct 2, 1996	32	7	11
Beacon	1.500	Oct 2, 1996	71	35	9
Beacon	0.375	Feb 21, 1997	22	0	15
Beacon	0.750	Feb 21, 1997	35	5	13
Beacon	1.500	Feb 21, 1997	50	0	15
Beacon/Beacon	0.375/0.375	Oct 2/Nov 9, 1996	48	28	10
Untreated			0	0	16
LSD 0.05			22	NS	NS

* Beacon applied with 1 qt/a crop oil concentrate (MorAct).
NS = Statistically non-significant at 5% level.