EXPLORING ALTERNATIVE HERBICIDES FOR ROW SPRAYING AT PLANTING IN NEW ANNUAL RYEGRASS SEED PRODUCTION FIELDS

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Introduction

Row spraying annual ryegrass (ARG) at planting is a useful management tool for growers; however, the options for effective herbicides are very limited. Axiom DF (flufenacet + metribuzin) herbicide is commonly used in Oregon to maintain rows in ARG seed production fields. Estimates indicate that 40% of the 120,000 acres of ARG grown in the Willamette Valley are treated with Axiom DF every year (Hulting, 2013). In fields with a long history of ARG, the most common practice is to apply Axiom DF between the rows when planting new ARG stands in order to suppress volunteer ARG emergence. This practice also enables growers to plant fields earlier, since they do not need to wait for the moisture needed to effectively use preplant broadcast herbicide applications.

Since Axiom DF herbicide is used for weed management in ARG, perennial ryegrass, tall fescue, and wheat production, OSU researchers and the grass seed industry are concerned about additional continuous and widespread use of Axiom DF for row creation. Suspected resistance of ARG to Axiom DF has developed in both field crops and orchards in the Willamette Valley. In order to maintain Axiom as an effective herbicide in field crop production, a need exists to identify alternative herbicides for row spraying purposes. The objective of this study was to evaluate several herbicide products to determine row-spraying utility based on crop safety, row persistence, and seed yield.

Materials and Methods

Two field trials were established during the fall of 2015 to evaluate row spraying at planting in ARG seed fields. The trial at OSU's Schmidt Research Farm was planted to 'Bounty' on September 15, and the Red Bridge Road trial in Linn County was planted to 'Diamond T' on September 18. Experiments were arranged as randomized complete block designs with four replications. Plot size was 5 feet x 30 feet.

At planting, a spray boom was mounted on the front of a plot-sized drill in order to spray while seeding. Both the drill and nozzles (40 03) were at a 10-inch spacing, and a 7.7-inch band of herbicide was sprayed between the drill rows. The ten treatments and application rates are outlined in Table 1. Planting, spraying, and harvest details are outlined in Table 2.

Results and Discussion

The field used at Schmidt Farm did not have a history of ARG; therefore, the objective of the trial was to evaluate crop safety. The on-farm trial at Red Bridge Road was established in a field with a history of ARG seed production; however, very little volunteer ARG was observed in the trial. As a result, we were unable to effectively evaluate the row spraying treatments for control of volunteer ARG; however, plots were evaluated for control of annual bluegrass (*Poa annua*). At Schmidt Farm, most of the herbicide treatments resulted in more than 90% control of *Poa annua* by March of 2016, while average *Poa annua* control at the Red Bridge site was closer to 80% (Table 3). Everest provided the lowest weed control (18%) at Red Bridge, and Eptam provided the lowest control (0%) at Schmidt Farm.

Several of the treatments resulted in more than 20% crop injury, as observed in March 2016 (Table 3).

Table 1. Herbicide treatments used for row spraying at planting in new annual ryegrass seed fields planted in the fall of 2015. (***Note***: The majority of the listed herbicide treatments are not labeled for annual ryegrass seed production.)

Treatment	Active ingredient	Rate
		(lb ai/a)
Control	—	—
Axiom[1]	Flufenacet + metribuzin	0.425
Diuron[1]	Diuron	1.0
Metribuzin	Metribuzin	0.25
Kerb	Pronamide	0.375
Fierce	Pyroxasulfone + flumioxazin	0.095
Alion	Indaziflam	0.013
Matrix	Rimsulfuron	0.047
Everest	Flucarbazone	0.0273
Eptam	EPTC	3.5

[1]Product is labeled for row spraying in ARG seed fields in Oregon.

Table 2. Annual ryegrass planting and row spraying details for trials conducted in Benton County (Schmidt Farm) and Linn County (Red Bridge Road) in 2015–2016.

Trial	Seeding date	Seeding rate	Spray width	Swathing date	Harvest date
		(lb/a)	(in)		
Schmidt Farm	Sep. 15	22	7.7	June 30	July 14
Red Bridge Road	Sep. 18	22	7.7	June 21	July 7

Table 3. *Poa annua* control, crop injury, and clean seed yield results at the two sites harvested in 2016.

	-- *Poa annua* control[1] --		----- Crop injury[1] -----		-------- Seed yield[2] --------	
Treatment	Schmidt	Red Bridge	Schmidt	Red Bridge	Schmidt	Red Bridge
	---------- (%) ----------				---------- (lb/a) ----------	
Control	0	0	0	0	1,284 a	3,047 a
Axiom	67	93	27	38	1,041 a	2,605 a
Diuron	100	81	1	0	1,217 a	2,682 a
Kerb	100	73	3	0	1,210 a	2,467 a
Metribuzin	99	86	5	0	1,331 a	2,472 a
Fierce	100	94	15	20	1,311 a	2,872 a
Alion	81	86	50	13	1,149 a	2,900 a
Matrix	99	91	3	0	1,404 a	2,539 a
Everest	100	18	3	3	1,367 a	2,882 a
Eptam	0	70	95	3	1,367 a	2,718 a
LSD ($P = 0.05$)					372	495
CV					20	13

[1]Percent control and crop injury evaluated March 17, 2016 at Schmidt Farm and March 23, 2016 at Red Bridge Road.
[2]Means followed by the same letter within the same column are not significantly different at LSD ($P = 0.05$).

Fierce resulted in a similar amount of injury at the two sites (about 20%), while Axiom, Alion, and Eptam behaved differently at the two sites. The Axiom treatment resulted in about 10% more crop injury at the Red Bridge Road site, while Alion and Eptam resulted in drastically more injury at Schmidt Farm. Differences may be explained by planting conditions: the Schmidt Farm trial was planted and sprayed into very dry soil and received nearly an inch of rain the following day; the Red Bridge Road trial was planted into moist and compacted soil. The rain received after planting at Schmidt Farm may have caused the Eptam to move and suppress the ARG stand.

It is important to note there was little-to-no ARG volunteer emerging in either field, and therefore crop injury may not be as severe with added volunteer plants. Also, the spray width of 7.7 inches is aggressive and was used intentionally in order to observe potential injury.

The observed crop injury did not correspond to seed yield differences between treatments. There were no significant differences between any of the treatments at either site for clean seed yield (Table 3). Interestingly, the Eptam treatment at Schmidt Farm had 95% crop injury in March, but yielded just as high as the other treatments. This implies that a new crop of ARG successfully emerged in late spring. Average clean seed yield at Schmidt Farm ranged from 1,041 to 1,404 lb/acre, and from 2,467 to 3,047 lb/acre at Red Bridge Road. Based on the first year of data, row spraying at planting did not increase seed yield over the untreated control, and no row spraying herbicide treatments stood out over others.

Conclusions and Future Work

Axiom application at planting is a common practice for ARG growers that is likely to continue, especially since it allows growers to plant their fields earlier in the fall. Whether the practice is advantageous in terms of input costs per pound of seed is yet to be determined. If growers are to continue the practice of row spraying at planting, it is wise to find other suitable herbicides beyond Axiom so that products can be used in rotation.

Based on the first year of data, there was no difference in yield between any of the treatments, including the untreated control. However, there was very little ARG volunteer pressure in the 2015–2016 trials, and therefore it is not a fair comparison to the reality of Axiom application at planting. Two additional trials with the same treatments were established in the fall of 2016 on fields with heavy ARG volunteer pressure, and these will be evaluated throughout the year and taken to harvest in 2017.

References

Hulting, A.G. 2013. Managing herbicide resistance in annual ryegrass seed production systems. Oregon Seed Magazine, Spring 2013.

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