MANAGEMENT OF ANNUAL RYEGRASS CONTAMINATION IN TALL FESCUE AND ORCHARDGRASS GROWN FOR SEED

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Introduction

Annual ryegrass contamination is a serious management issue in the production of tall fescue and orchardgrass grown for seed. Annual ryegrass seed is very similar in size to tall fescue seed, making cleaning nearly impossible. In orchardgrass, there is a seed size differential, but cleaning losses and competitive losses in the field can be substantial. Two studies in commercial plantings of tall fescue and orchardgrass documented management of annual ryegrass populations in these cropping systems. Study 1 was located in a commercial planting of tall fescue just north of Forest Grove, OR, and utilized sequential herbicide treatments to manage a population of annual ryegrass. Study 2 was conducted in a commercial planting of orchardgrass, located east of Adair, OR, and utilized a similar set of sequential treatments to attempt management of an annual ryegrass population.

Materials and Methods

Both the Forest Grove study and the Adair study utilized randomized complete block designs with four replications. Plot size in both studies was 8 feet x 25 feet. Herbicide treatments were applied with a research sprayer calibrated to deliver 20 gpa at 20 psi. Visual crop injury and visual percent control of both volunteer crop seedlings and annual ryegrass were evaluated at both locations. The seed from both studies was harvested by first swathing plots with a modified JD 2280 swather, followed by thrashing with a Wintersteiger Nursery Master combine in the tall fescue study and a Hege 180 combine in the orchardgrass study. Seed was cleaned using a Clipper Cleaner, and yield results were analyzed using ANOVA and means separated by LSD.

Study 1

Study 1 was initiated in an established commercial tall fescue seed production field going into its fifth harvest near Forest Grove. Originally, the intent of the study was to attempt to manage annual bluegrass, but annual bluegrass did not emerge. Annual ryegrass did emerge, and treatment differences were observed and quantified.

The site had received precipitation totaling 1.2 inches just prior to marking out the site on October 1, but at this time weeds had not emerged. A uniform crop area was located for the study, and a decision was made to apply herbicide treatments just prior to the next rain event. Initial treatments consisted of Axiom (flufenacet/metribuzin), Axiom + diuron, Axiom + Goal (oxyfluorfen), Fierce (pyroxasulfone/flumioxazin), Fierce + diuron, and Fierce + Goal (Table 1). Initial treatments were made on October 9, 2014 (Table 2) and were incorporated with rainfall from October 11 through October 15, with more than an inch of precipitation.

A second sequence of treatments was applied on November 20 (Tables 1 and 2). Treatments included Axiom and Fierce applied alone to previously treated plots of either Axiom + Goal or Fierce + Goal, Outlook (dimethenamid-P) + Rely (glufosinate) applied to initial treatments of Axiom + Goal or Fierce + Goal, and a mixture of Fierce + Rely + Nortron (ethofumesate) + Sharpen (saflufenacil) applied to an Axiom initial treatment. Rainfall continued in a normal pattern, providing good soil moisture steadily through the fall and winter.

Table 1. Treatments for management of grass weeds in tall fescue grown for seed, 2014–2015.

Treatment[1]	Rate	Timing[2]
	(lb ai/a)	
Untreated	0	A
Axiom	0.55	A
Axiom + diuron	0.55 + 1.0	A
Axiom + Goal	0.55 + 0.06	A
Axiom + Goal fb	0.55 + 0.06	A
Fierce	0.14	B
Fierce	0.14	A
Fierce + diuron	0.14 + 1.0	A
Fierce + Goal	0.14 + 0.06	A
Fierce + Goal fb	0.14 + 0.06	A
Axiom	0.55	B
Axiom + Goal fb	0.55 + 0.06	A
Outlook + Rely	0.98 + 0.3	B
Fierce + Goal fb	0.14 + 0.06	A
Outlook + Rely	0.98 + 0.3	B
Axiom fb	0.55	A
Fierce + Nortron	0.14 + 1.0	B
+ Rely + Sharpen	0.3 + 0.04	B

[1]fb = followed by
[2]A = Oct. 9, 2014; B = Nov. 20, 2014

Study 2

A study was established in a 7-year-old commercial orchardgrass seed production field (located east of Adair) during the fall of 2017 to target annual ryegrass control. Following a meeting with the grower and a field representative from a local ag service provider, an area of the field was located to establish the study where the grower suspected annual ryegrass pressure.

The site had received 1.5 inches of rainfall just prior to this meeting, and at this time no weed seedlings had emerged. The area was staked the following week, and the first set of herbicide applications was made on October 6, 2017 prior to anticipated rainfall. Herbicide treatments were incorporated with rainfall starting October 10, with 1.18 inches by October 14. At this timing, both volunteer crop and annual ryegrass had begun to emerge. Orchardgrass sprout was at 1 leaf, and annual ryegrass was at 1.5 to 2 leaf.

The treatments at this timing were residual preemergent herbicides applied separately or with postemergent components of Goal and metribuzin (Table 3). Three additional applications were made (Table 3). The second set of applications consisted of a residual preemergent herbicide plus the postemergent herbicides Goal and metribuzin and was made on October 17. The third and fourth applications were either a combination of three residual herbicides, Outlook, Dual Magnum and Kerb, or a single application of Alion. These applications were made November 27, 2017 and January 3, 2018. Conditions at the time of application are shown in Table 4.

Table 2. Application conditions, tall fescue, Forest Grove, OR, 2014–2015.

Application date	Oct. 9, 2014	Nov. 20, 2014
Crop growth stage	Multi-tillered	Multi-tillered
Annual ryegrass growth stage	Preemergence	2–4 leaf
Air temperature (°F)	60	45
Soil temperature at 2 inches (°F)	60	42
Relative humidity (%)	90	90
Wind	Calm	Calm
Cloud cover (%)	100	100
First moisture (inches)	Oct. 11 (0.14)	Nov. 20 (0.29)
Soil texture: Woodburn silt loam		

Table 3. Treatments for management of grass weeds in orchardgrass grown for seed, 2017–2018.

Treatment[1]	Rate	Timing[2]
	(lb ai/a)	
Untreated	0	A
Axiom fb	0.55	A
Alion	0.02	D
Zidua fb	0.09	A
Alion	0.02	D
Fierce fb	0.14	A
Alion	0.02	D
Axiom + Goal + metribuzin fb	0.55 + 0.13 + 0.17	A
Outlook + Kerb	0.98 + 0.39	D
Fierce + Goal + metribuzin fb	0.14 + 0.13 + 0.28	A
Outlook + Kerb	0.98 + 0.39	D
Axiom + Goal + metribuzin fb	0.55 + 0.13 + 0.17	B
Outlook + Kerb	0.98 + 0.39	D
Fierce + Goal + metribuzin fb	0.14 + 0.13 + 0.28	B
Outlook + Kerb	0.98 + 0.39	D
Fierce + Goal + metribuzin fb	0.14 + 0.13 + 0.28	B
Outlook + Kerb	0.98 + 0. 39	C
Zidua + Goal + metribuzin fb	0.1 + 0.13 + 0.28	B
Outlook + Kerb	0.98 + 0.39	C
Fierce + Goal + metribuzin fb	0.14 + 0.13+ 0.28	B
Dual Magnum + Kerb	1.27 + 0.39	C

[1]fb = followed by

[2]A = Oct. 6, 2017; B = Oct. 17, 2017; C = Nov. 27, 2017; D = Jan. 3, 2018

Table 4. Application conditions, orchardgrass, Adair, OR, 2017–2018.

Application date	Oct. 6, 2017	Oct. 17, 2017	Nov. 27, 2017	Jan. 3, 2018
Crop growth stage: Multi-tillered				
Annual ryegrass growth stage	1–2 leaf	2–2.5 leaf	2–3 leaf	3 leaf–3 tillers
Air temperature (°F)	52	53	54	40
Soil temperature at 2 inches (°F)	46	50	49	38
Relative humidity (%)	87	87	82	77
Wind (mph, direction)	Calm	0–3 SW	Calm	Calm
Cloud cover (%)	5	80	10	40
First moisture (inches)	Oct. 7 (0.03)	Oct. 19 (0.66)	Nov. 28 (0.35)	Jan. 4, 2018 (0.05)
Soil texture: Amity silt loam				

Results and Discussion

Study 1

A visual evaluation conducted on October 31, 2014 compared herbicide treatments to the untreated area (data not shown). No crop injury was apparent. No treatments were providing greater than 60% control of the seedling flush. An evaluation 2 weeks after the second sequence of treatments (applied on November 20) indicated substantial injury with the treatments containing Rely. Sprout control ratings improved slightly, to 75% in most treatments, with the exception of the Fierce + Nortron + Rely + Sharpen treatment, which improved to 80% (data not shown).

Annual ryegrass control was visually assessed on March 25, 2015 (Table 5). Axiom + Goal followed by Fierce, Fierce + Goal followed by Axiom, and Fierce + diuron were controlling over 90% of the sprout. Rely treatments were controlling the sprout at 98% and above. These same treatments were controlling annual ryegrass at 89–93%.

Visual assessment data show that the postemergent treatments with Rely, in combination with a residual preemergent herbicide, provided the highest level of control of the annual ryegrass. Postemergent treatments are able to kill or severely injure emerged annual ryegrass, depending on growth stage. Combining a preemergent herbicide with a postemergent herbicide inhibits the recovery of partially controlled annual ryegrass. It is possible that the early rainfall prior to the first application triggered germination of a portion of the annual ryegrass population, which was not seen at

Table 5. Crop injury, volunteer crop sprout, annual ryegrass control, and yield following herbicide applications in tall fescue, 2014–2015.

Treatment[1]	Timing[2]	Tall fescue[3]	Volunteer sprout[3]	Annual ryegrass[3]	Clean seed
		(% injury)	---- (% control) ----		(lb/a)
Untreated	A	0	0	0	736
Axiom	A	0	53	50	671
Axiom + diuron	A	0	73	48	840
Axiom + Goal	A	0	78	69	620
Axiom + Goal fb	A	4	91	85	758
Fierce	B				
Fierce	A	0	80	73	722
Fierce + diuron	A	0	93	78	653
Fierce + Goal	A	0	65	70	764
Fierce + Goal fb	A	0	93	79	746
Axiom	B				
Axiom + Goal fb	A	5	98	89	915
Outlook + Rely	B				
Fierce + Goal fb	A	4	100	91	783
Outlook + Rely	B				
Axiom fb	A	13	100	93	783
Fierce + Nortron	B				
+ Rely + Sharpen	B				
LSD ($P = 0.05$)		5	15	13	400
CV		187	14	13	37

[1]fb = followed by
[2]A = Oct. 9, 2014; B = Nov. 20, 2014
[3]Evaluated March 25, 2015

the first visit to the site. Later flushes of annual ryegrass were controlled to varying degrees by the application of preemergent herbicides, depending on product efficacy.

Yields were not affected by treatments, probably due to the inability to clean the annual ryegrass seed out of the tall fescue seed, making the averages a combination of both species.

Study 2

The second study looked at timings of postemergent treatments in conjunction with treatments of preemergent herbicides (Table 6). The best annual ryegrass control in the orchardgrass study generally occurred when the initial application was made at the second timing and the second application was made at the third timing. It is possible that the earlier application of Kerb had better conditions (wet and cold) than the fourth application, which was followed by a dry, warm spell.

Table 6. Crop injury, annual ryegrass control, and yield in orchardgrass following herbicide treatments, 2017–2018.

Treatment[1]	Timing[2]	Orchardgrass[3]	Annual ryegrass[3]	Clean seed yield
		(% injury)	(% control)	(lb/a)
Untreated	A	0	0	465
Axiom fb	A	4	80	709
Alion	D			
Zidua fb	A	1	76	638
Alion	D			
Fierce fb	A	3	80	588
Alion	D			
Axiom + Goal + metribuzin fb	A	5	83	655
Outlook + Kerb	D			
Fierce + Goal + metribuzin fb	A	6	96	739
Outlook + Kerb	D			
Axiom + Goal + metribuzin fb	B	4	89	752
Outlook + Kerb	D			
Fierce + Goal + metribuzin fb	B	5	95	719
Outlook + Kerb	D			
Axiom + Goal + metribuzin fb	B	0	94	853
Outlook + Kerb	C			
Fierce + Goal + metribuzin fb	B	5	100	662
Outlook + Kerb	C			
Zidua + Goal + metribuzin fb	B	11	98	685
Outlook + Kerb	C			
Fierce + Goal + metribuzin fb	B	5	93	618
Dual Magnum + Kerb	C			
LSD ($P = 0.05$)		8	14	228
CV		131	12	24

[1]fb = followed by
[2]A = Oct. 6, 2017; B = Oct. 17, 2017; C = Nov. 27, 2017; D = Jan. 3, 2018
[3]Evaluated April 25, 2018

Conclusion

Preemergent herbicides can provide partial control of annual ryegrass contamination in tall fescue and orchardgrass crops, but sequential programs utilizing both preemergent and postemergent herbicides are necessary for more complete control. The postemergent herbicides need to be applied after the annual ryegrass has emerged but before it has developed tillers.

References

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