CROP TOLERANCE AND RATTAIL FESCUE CONTROL WITH DRY/LIQUID HERBICIDE FORMULATIONS IN DRYLAND CREEPING RED FESCUE SEED CROPS IN THE GRANDE RONDE VALLEY OF NORTHEASTERN OREGON

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Introduction

Winter annual grass weeds such as downy brome (*Bromus tectorum*) and rattail fescue (*Vulpia myuros*) are persistent problems in cool-season turfgrass seed production systems in the Grande Ronde Valley of northeastern Oregon. Research efforts continue in the region in order to identify potential herbicide products that provide improved grass weed control in fine fescue and Kentucky bluegrass seed crops (Walenta, 2017a, 2017b).

Herbicides currently registered for grass weed control in fine fescue seed crops are primarily soil-active products applied preemergence to weeds. Adequate control of winter annual grass weed species with preemergent herbicides is often difficult to achieve, especially in dryland systems, due to: (1) the lack of adequate rainfall in early fall to activate the herbicides for optimal winter annual grass weed control and (2) the presence of crop residue/ash on the field surface (following residue management with baling + propane-flaming), which interferes with the applied herbicide reaching the soil surface. A new approach to preemergence herbicide application was proposed by industry—drop-spreading granular herbicide formulations followed by mechanical disturbance (e.g., harrowing) to move the granules through the residue/ash to the soil surface, where weed control can take place.

A study was conducted during the fall of 2018 and spring of 2019 to evaluate crop tolerance and rattail fescue (RF) control with selected dry and liquid herbicide formulations in established dryland creeping red fescue (CRF) grown for seed. Note: flumioxazin + pyroxasulfone (Fierce EZ) and pendimethalin (Prowl H_2O) are registered for use in Oregon fine fescue seed production. The active ingredients triallate, trifluralin, ethalfluralin, and pyroxasulfone (applied as Zidua) are not registered for use in Oregon fine fescue seed production. Product evaluations are for experimental purposes only; therefore, mention of products used in this trial should not be considered a recommendation for commercial use.

Materials and Methods

The experiment was located in an established commercial field of ‘Fenway’ CRF in Union County. The field was seeded during spring of 2016, and the second seed crop was harvested in the summer of 2018. After baling the crop residue, the field was propane flamed in late September and was not harrowed afterwards. Environmental conditions at the time of herbicide application are summarized in Table 1. Site of action descriptions for each active ingredient are listed in Table 2.

Plots were 8 feet x 25 feet and arranged in a randomized complete block design with four replications. All liquid

Table 1. Environmental conditions at time of herbicide application.

Application timing	Oct. 18, 2018, preemergence (PRE)	Mar. 30, 2019, late post (LPOST)
CRF growth stage	Regrowth just starting	1½ to 2½ leaf, 1–2 inch height
Rattail fescue growth stage	Not emerged	Not emerged
Air temperature (°F)	64	51
Relative humidity (%)	40	56
Cloud cover	Cloudy	Clear and sunny
Wind velocity (mph)	Calm	0–4 from N
Soil temperature, surface (°F)	62	74
Soil temperature, 1 inch (°F)	62	68
Soil temperature, 2 inch (°F)	58	64
Soil temperature, 4 inch (°F)	52	53

Table 2. Site of action descriptions for herbicides included in the 2018–2019 trial.

Group #	Description[1]
3	Inhibits microtubule assembly (cell division in roots and shoots); swelling of root tips
8	Lipid synthesis inhibitor but not an ACCase inhibitor
14	Inhibits protoporphyrinogen oxidase (PPO); loss of chlorophyll; leaky cell membranes
15	Inhibits synthesis of very long chain fatty acids (VLCFA); affects seedling emergence

[1]Descriptions from the Weed Science Society of America.

herbicide treatments were applied with a hand-held CO_2 sprayer delivering 21 gpa at 35 psi. To minimize drift potential, TeeJet air-induction, extended-range (AIXR) 11002 nozzle tips were used for all applications. Granular formulations were applied with a Gandy drop spreader calibrated for each product by making two 3.5-foot-wide passes per plot. The following day the entire plot was spike tooth harrowed twice in direction with the plots (not across the reps).

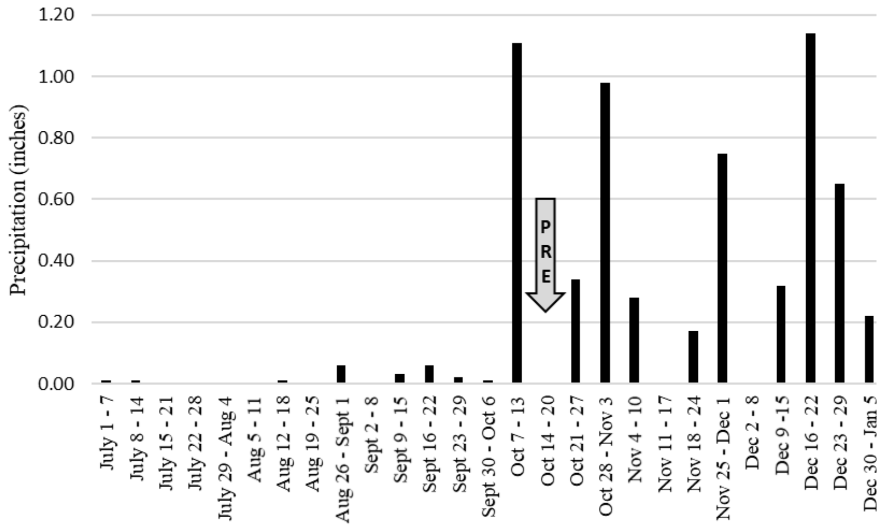

Figure 1. Weekly precipitation amounts at Imbler AgriMet station, fall 2018.

Visual evaluations of crop injury were collected only in the spring of 2019 (March 30, April 1, and May 3) due to the lack of adequate CRF regrowth in the fall of 2018. Visual evaluations of weed control were not possible due to the low RF infestation level. However, RF plant density/plot was collected on June 21 by counting all plants in each plot. The trial site was mowed in late June to comply with crop-destruct requirements for investigating potential candidate nonregistered herbicides. Seed yield was not determined in this study.

Results and Discussion

CRF regrowth and RF emergence were significantly delayed in the fall of 2018 due to persistent dry conditions that lasted until October 2 (Figure 1). Preemergence (PRE) herbicide treatments were applied October 18 to CRF at the start of regrowth, when RF had not yet emerged. Weather and soil conditions remained dry for 8 days after PRE treatment application until late October/early November, when rainfall events delivered 1.38 inches of rainfall over a 2-week period. The delay in receiving adequate rainfall to incorporate and activate herbicide treatments may have reduced grass weed control potential.

Postemergence (POST) herbicide treatments were scheduled to be applied in early November, but weather conditions delayed POST applications until late March, when snow cover finally left the site. At this time, CRF regrowth was only 1.5–2.5 inches in height, RF had not yet emerged, and no crop injury symptoms were observed (data not shown).

Visual crop evaluations were challenging to complete due to the CRF stand being weakened by poor and variable fall regrowth throughout the trial site. Under these conditions, visual crop injury evaluations taken in mid-April indicated significant injury to CRF in all treatments regardless of formulation type (Table 3). By late May, crop injury symptoms were diminished in all PRE liquid herbicide treatments (5, 6, 7, and 8). However, significant crop injury was still evident in the granular herbicide treatments (2, 3, and 4). The late POST application of flumioxazin + pyroxasulfone (treatment 9) resulted in significant crop injury early in the growing season; although diminished, crop injury was still unacceptable by late May (15%). The RF infestation level was low across the trial site and resulted in no significant differences between treatments for RF control. RF plant counts were highest in the untreated check at 0.05 plants/ft^2 (10 plants/plot).

In summary, the stressed condition of the CRF stand may have increased crop susceptibility to herbicide injury. Thus, results from this trial indicate that further investigation under more vigorous crop health and/or irrigated conditions is warranted to better understand levels of crop tolerance.

References

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Acknowledgments

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Table 3. Crop injury and rattail fescue control with dry/liquid herbicide formulations in dryland creeping red fescue seed production in the Grande Ronde Valley of northeastern Oregon, 2019.

					----- Crop injury[1] -----		
Treatment	Group	Active ingredient	Rate	Timing	Apr. 13	May 30	Rattail fescue
			(product/a)		---------- (%) ----------		(no./plot)
1		Check			6 c	0 c	10
2	8 + 3	Triallate + trifluralin	12.5 lb[2]	PRE	92 a	90 a	0
3	8	Triallate	15.0 lb[2]	PRE	91 a	85 a	0
4	3	Ethalfluralin	7.5 lb[2]	PRE	93 a	91 a	0
5	3	Ethalfluralin	2.0 pt	PRE	24 bc	0 c	7
6	8	EPTC	3.5 pt	PRE	71 a	4 bc	0
7	3/15	Pendimethalin/ pyroxasulfone	5.0 pt 1.5 oz	PRE LPOST	31 bc	4 bc	0
8	3/3	Pendimethalin/ ethalfluralin	5.0 pt 2.0 pt	PRE LPOST	19 bc	1 c	< 1
9	14 + 15	Flumioxazin + pyroxasulfone	3.0 oz	LPOST	36 b	15 b	< 1
LSD (0.05)					29.9	12.4	NS

[1]Numbers followed by the same letters are not significantly different by Tukey's HSD All-Pairwise Comparisons Test.
[2]Granular formulation