Crop Tolerance and Rattail Fescue Control with Dry/Liquid Herbicide Formulations in Dryland Creeping Red Fescue Seed Production 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 northeastern Oregon cool-season turfgrass seed production systems. Herbicides currently registered for use in fine fescue that provide grass weed control are primarily soil-active ingredients applied pre-emergence to the weeds. Adequate control of winter annual grass weed spp. with pre-emergent 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) crop residue/ash remaining on the field surface (following residue management with baling + propane-flaming) interferes with the applied herbicide reaching the soil surface.

A new approach to pre-emergence herbicide application was proposed by industry to utilize granular formulations plus mechanical disturbance (e.g. harrowing) to move the granules through the residue/ash to the soil surface for improved weed control.

Objectives

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 granular and liquid herbicide formulations in established dryland creeping red fescue grown for seed in northeastern Oregon (Figure 1).

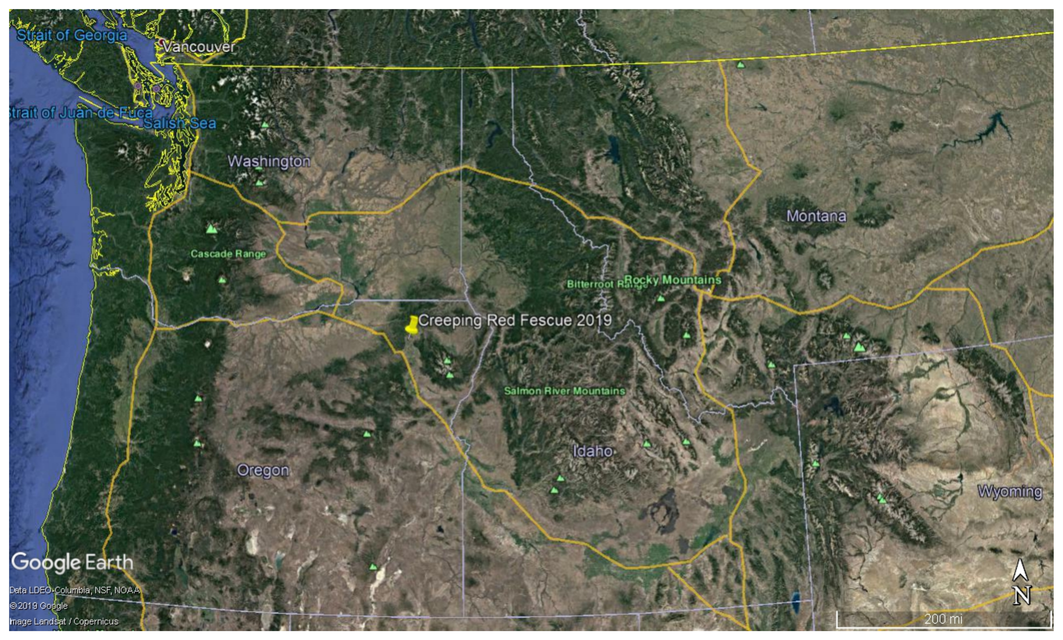

Figure 1. Grande Ronde Valley (Union County) of northeastern OR. Continental semi-arid climate at elevation 2700 – 2900 ft (823 – 884 m) and 42 cm annual precipitation.

Creeping Red Fescue:
4000 acres (1619 ha). Clean seed yield average 1000 lbs/a (1121 kg/ha)
Kentucky bluegrass:
9500 acres (3845 ha). Clean seed yield average 1160 lbs/a (1300 kg/ha).

Materials and Methods

The experiment was located in an established commercial field of 'Fenway' creeping red fescue (CRF) in the Grande Ronde Valley (GRV) of northeastern OR. The field was seeded during spring of 2016 and the second seed crop was harvested in 2018. After baling the crop residue, the field was propane-flamed late September and was not harrowed afterwards.

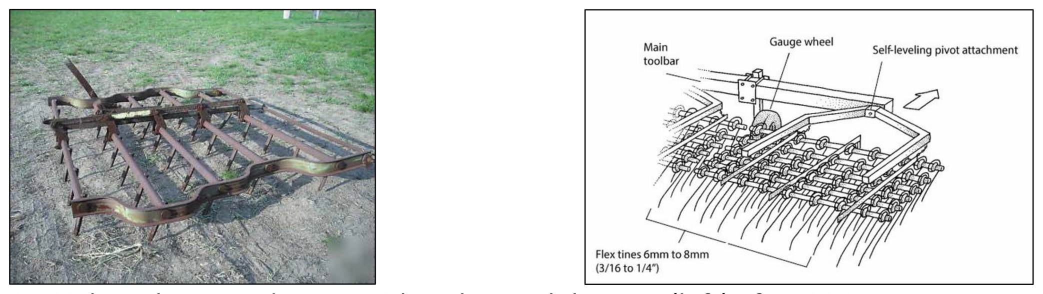

Figure 2. Trial site harrowed twice with spike tooth harrow (left) after PRE treatments applied.

Plots were 8 ft by 25 ft (2.4 m by 7.6 m) in size and arranged in a randomized complete block design with 4 replications. Seed yield was not determined in this study. The trial site was mowed in late June to comply with crop-destruct requirements for investigating potential candidate non-registered herbicides.

Materials and Methods

All liquid herbicide treatments were applied with a hand-held CO2 sprayer delivering 21 GPA (196 L/ha) 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 (Fig. 3) calibrated for each product by making two 3.5 ft (1.1 m) wide passes/plot. Environmental conditions at time of herbicide application are summarized in Table 1. Site of action descriptions for each active ingredient are listed in Table 2.

Pre-emergence (PRE) herbicide treatments were applied to CRF at the start of re-growth and RF not emerged yet. Weather and soil conditions remained dry for 8 days after PRE treatment application then received 1.38 in (3.5 cm) rainfall over a two week period (Fig. 4). Post-emergence herbicide treatments were scheduled to be applied in early Nov. but weather conditions delayed POST applications until late March when snow-cover finally melted.

Figure 3. Gandy® drop spreader used to apply dry granular treatments in October 2018 (top). Trial site (left) and field surface (right) after spike tooth harrowing twice after PRE herbicide application.

Table 1. Environmental conditions at time of herbicide application.

Application Timing	18 October 2018 Pre-emergence (PRE)	30 March 2019 Late Post (LPOST)
CRF growth stage	re-growth just starting	1 ½ to 2 ½ leaf, 1 to 2" height
Rattail Fescue growth stage	not emerged	not emerged
Air temperature (F)	64	51
Rel. humidity (%)	40	56
% Cloud cover	cloudy	clear and sunny
Wind velocity (mph)	calm	0 – 4 from N
Soil temp surface (F)	62	74
Soil temp 1 inch (F)	62	68
Soil temp 2 inch (F)	58	64
Soil temp 4 inch (F)	52	53

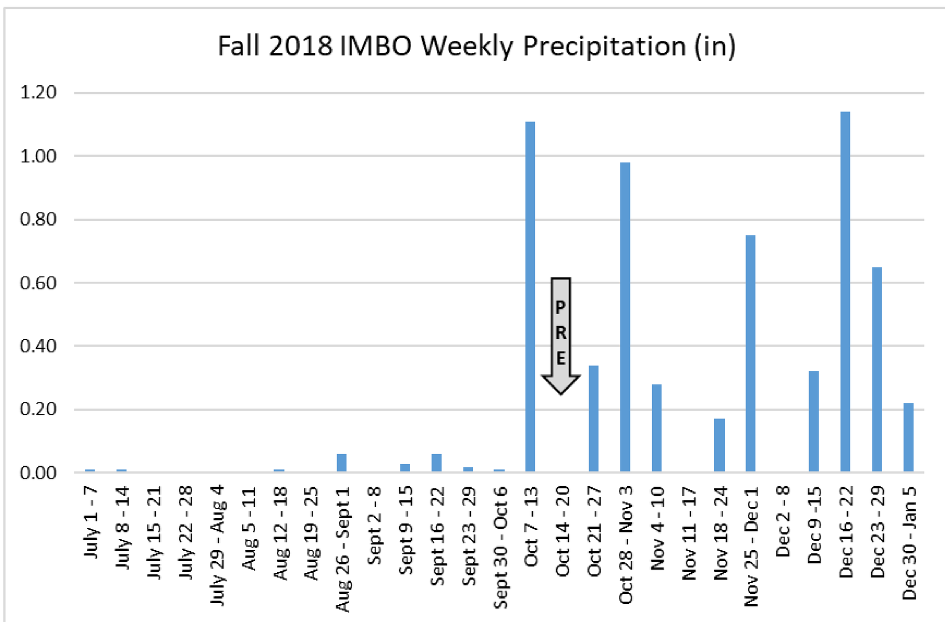

Figure 4. Weekly precipitation amounts at Imbler, OR AgriMet station (IMBO) during fall 2018. https://www.usbr.gov/pn/agrimet/

Table 2. Site of action descriptions for herbicides.

Group #	Description (Weed Science Society of America)
3	Inhibits microtubule assembly (cell division in roots & 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

Results

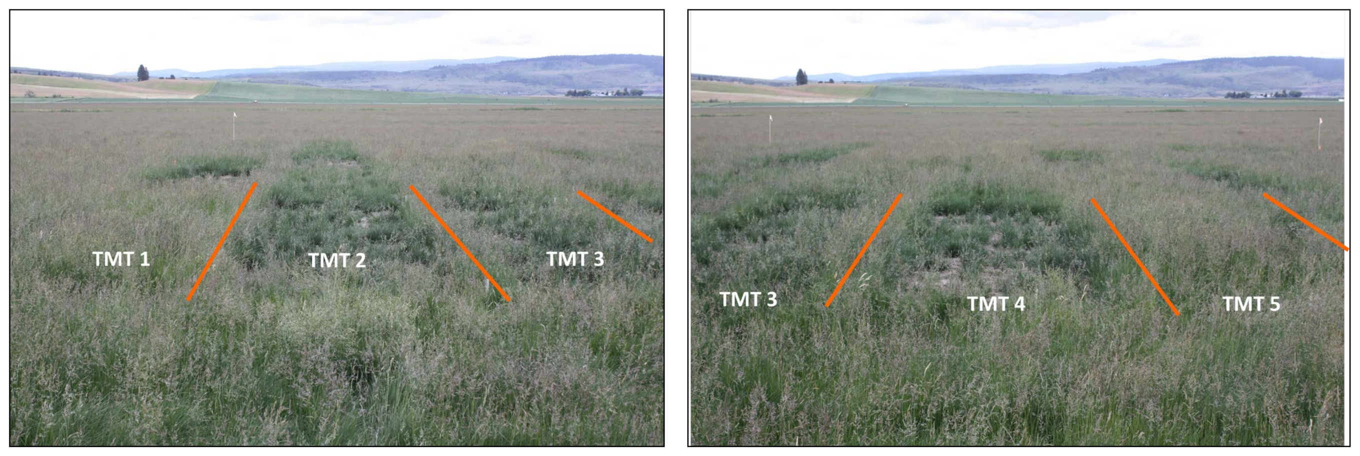

Figure 5. Creeping red fescue crop injury on 21 June 2019 prior to crop destruction in the trial.

Table 3. Crop injury and rattail fescue control with dry/liquid herbicide formulations in dryland creeping red fescue seed production (2019).

TMT #	SOA Group	A.I.	Product Rate (per acre)	Product Rate (per ha)	Timing	Crop Injury 13-Apr (%)	Crop Injury 30-May (%)	Rattail Fescue (#/plot)
1		check				6 c	0 c	10
2	8 + 3	triallate + trifluralin	12.5 lb	14.1 kg	PRE	92 a	90 a	0
3	8	triallate	15 lb	16.8 kg	PRE	91 a	85 a	0
4	3	ethalfluralin	7.5 lb	8.4 kg	PRE	93 a	91 a	0
5	3	ethalfluralin	2 pt	2.3 L	PRE	24 bc	0 c	7
6	8	EPTC	3.5 pt	4.1 L	PRE	71 a	4 bc	0
7	3 / 15	pendimethalin / pyroxasulfone	5 pt 1.5 oz	5.8 L 105 g	PRE LPOST	31 bc	4 bc	0
8	3 / 3	pendimethalin / ethalfluralin	5 pt 2 pt	5.8 L 2.3 L	PRE LPOST	19 bc	1 c	<1
9	14 + 15	flumioxazin + pyroxasulfone	3 oz	210 g	LPOST	36 b	15 b	<1
LSD (0.05)						29.9[b]	12.4[b]	ns

[a]granular formulation.
[b]Numbers followed by the same letters are not significantly different by Tukey's HSD All- Pairwise Comparisons Test.

Summary

CRF re-growth and RF emergence was significantly delayed in fall 2018 due to persistent dry conditions (Fig. 4). Visual crop evaluations were challenging due to the CRF stand being weakened by poor and variable fall re-growth throughout the trial site.

- Evaluations in mid-April indicated significant injury to CRF in all treatments regardless of formulation-type.
- 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) until late June (Fig. 5).
- The late POST application of flumioxazin + pyroxasulfone (tmt 9) resulted in significant crop injury early in the growing season and, although diminished, crop injury was still unacceptable by late May (15%).
- 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/ft2 (10 plants/plot).

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

Note: flumioxazin + pyroxasulfone (Fierce EZ®), pendimethalin (Prowl H2O®), and EPTC (Eptam 7E®) are registered for use in Oregon fine fescue seed production. The active ingredients triallate, trifluralin, ethalfluralin, and pyroxazulfone 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.

Project support provided by: Gowan