

**AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2017 – 2019**

TITLE: Evaluating New Fungicides for Stem Rust Management in Perennial Ryegrass Seed Crops

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COOPERATORS: Oregon Grass Seed Industry

EXECUTIVE SUMMARY: Stem rust caused by *Puccinia graminis* subsp. *graminicola* is the most serious and widespread disease in perennial ryegrass grown for seed in western Oregon. Perennial ryegrass seed yield losses of up to 98% have been attributed to stem rust damage. Stem rust is also known to decrease thousand seed weight and biomass dry weight (seeds and straw) when moderate to severe infections occur.

Triazole and strobilurin containing fungicides are currently relied upon by grass seed producers to manage stem rust in commercial perennial ryegrass seed production fields. Applications are often repeated two or three times in May and June when the disease is active. There has been growing interest in evaluating newly available succinate dehydrogenase inhibitor (SDHI) fungicides for improved stem rust control and resistance management benefits in grass seed crops.

Preliminary studies conducted in the Willamette Valley indicate that Trivapro (Syngenta) has the potential to improve overall stem rust control and extend the time between fungicide applications. As a result, there is potential for grass seed growers to reduce their total number of fungicide applications to as few as one per season. These new fungicides also have the potential to address IPM strategies in regard to resistance management since both Trivapro and Priaxor (BASF) contain an SDHI (Group 7) active ingredient. The Oregon grass seed industry has been quite dependent on Qo1 (Group 11) fungicides in grass seed crops for some time.

Effects of Trivapro and Priaxor on seed yield, percent cleanout, and seed weight have not been evaluated on grass seed crops in Oregon until very recently. Generally the new fungicides are more expensive than the current industry standards. Therefore, it is important that these treatment effects are known so that crop benefits can be quantified and cost-effectiveness can be evaluated.

OBJECTIVES:

1. Measure effects of new fungicides on percent stem rust infections, seed yield, thousand seed weight, and percent cleanout.
2. Develop new recommendations for fungicide products, rates and timings in perennial ryegrass seed production based on research results and disseminate this information to seed growers and industry practitioners.

PROCEDURES: Field trials were initiated with the rust susceptible turf-type perennial ryegrass variety ‘Accent’ at OSU’s Hyslop Farm in Fall, 2017 (Figure 1). Routine fertilizer and herbicide sprays were applied to manage pests as needed. Two new experimental fungicides were compared to an untreated check and the current industry standard (Quilt Excel) at one and two applications per season (Figure 2). The experimental design for the trial was a randomized complete block with four replications.

Timings:

- A. May 3
- B. Approximately 30 days after first application (June 5)

Fungicide treatments will include the following treatments, application rates and timings:

- | | |
|---------------------------------------|-------|
| 1. Untreated control (no fungicide) | |
| 2. Quilt Excel 14 oz | A |
| 3. Quilt Excel 14 oz/acre | A + B |
| 4. Trivapro 18 oz/acre | A |
| 5. Trivapro 18 oz/acre | A + B |
| 6. Priaxor 6 oz/acre + Tilt 4 oz/acre | A |
| 7. Priaxor 6 oz/acre + Tilt 4 oz/acre | A + B |

Visual stem rust ratings were recorded weekly from the on-set of rust to swathing. Seed was harvested by a small-plot swather and combine, and seed was cleaned to determine clean seed yield. Seed weight was determined by counting two, 1000-seed samples with an electronic seed counter and weighing these samples on a laboratory balance.

SIGNIFICANT ACCOMPLISHMENTS TO DATE:

All fungicide treatments increased seed yield over the untreated control, but there were no statistical differences between the different fungicide products or timings (Table 1). Percent cleanout was generally lower when fungicides were applied except with two applications of Quilt Excel and Trivapro. All fungicide treatments increased seed weight over the untreated

control and the treatments that were applied twice were higher than the treatments that were applied only once.

Rust severity was reduced with fungicides, but the double application of Trivapro had significantly less rust infection compared to all other treatments (Table 2). It appears that applying two applications of fungicides reduced long-term rust severity, regardless of the product used. There were no differences between one or two applications of Priaxor (+ Tilt) and Quilt Excel but Trivapro had less rust in both cases.

BENEFITS & IMPACT: While there were no significant yield differences between fungicide treatments, it does appear that one of the new SDHI containing fungicides (Trivapro) does extend the period in which rust is controlled. The current standard is to apply at least two, and sometimes three, fungicide applications to perennial ryegrass seed crops. This data shows that no more than two applications of Trivapro should be needed to provide rust control throughout the season until harvest. This has the potential to save grass seed growers a fungicide application valued at approximately \$25 per acre (cost of product plus application). Based on current perennial ryegrass acre estimates, reducing fungicide applications by one treatment is valued at approximately \$2.1M. While difficult to measure, this is also a positive step forward for resistance management in grass seed crops.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM: Fungicide product was provided by the manufacturers at no cost.

FUTURE FUNDING POSSIBILITIES: Ongoing work has been funded by Syngenta and BASF.

Table 1. Effects of fungicide treatments and timing on seed yield, percent cleanout and thousand seed weight in perennial ryegrass.

Treatment	Timing	Yield	Cleanout	Seed wt
		(lb/a)	(%)	mg seed ⁻¹
Untreated Control		1335 A	13.8% B	1.667 A
Quilt Xcel 14 fl oz/a	A	1860 BC	9.4% A	1.736 BC
Quilt Excel 14 fl oz/a	A + B	1696 B	13.8% B	1.780 CD
Trivapro 18 fl oz/a	A	1729 BC	10.4% A	1.720 AB
Trivapro 18 fl oz/a	A + B	1854 BC	11.3% AB	1.797 D
Priaxor 6 fl oz/a + Tilt 4 fl oz/a	A	1764 BC	10.4% A	1.727 BC
Priaxor 6 fl oz/a + Tilt 4 fl oz/a	A + B	1938 C	10.3% A	1.800 D
p=		0.0003	0.0311	0.0013

"A" Timing Applied 5-3-18

"B" Timing Applied 6-5-18

Table 2. Effects of fungicide treatments and timing on rust severity in perennial ryegrass.

Treatment	Timing	Rust 1-9 Scale; 9 = No Disease						
		19-Jun	22-Jun	25-Jun	27-Jun	1-Jul	2-Jul	5-Jul
Untreated Control		4.8 A	3.5 A	3.5 A	2.3 A	1.5 A	1.0 A	1.5 A
Quilt Xcel 14 fl oz/a	A	8.0 B	6.3 B	5.3 B	5.3 B	3.8 B	3.0 B	3.5 B
Quilt Excel 14 fl oz/a	A + B	7.3 B	7.3 BC	6.3 BC	7.8 C	6.5 C	5.5 C	5.5 D
Trivapro 18 fl oz/a	A	7.8 B	7.3 BC	6.8 CD	5.8 B	4.5 B	4.0 B	5.0 CD
Trivapro 18 fl oz/a	A + B	8.5 B	8.0 C	8.0 E	8.0 C	6.5 C	7.25 D	7.5 E
Priaxor 6 fl oz/a + Tilt 4 fl oz/a	A	7.0 B	6.3 B	5.8 BC	4.8 B	4.3 B	3.5 B	4.0 BC
Priaxor 6 fl oz/a + Tilt 4 fl oz/a	A + B	8.3 B	7.5 BC	7.8 DE	5.8 B	6.5 C	6.3 CD	5.5 D
p=		0.0025	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000

"A" Timing Applied 5-3-18

"B" Timing Applied 6-5-18



Figure 1. Carbon planting of 'Accent' perennial ryegrass fungicide trial at OSU's Hyslop Research Farm (October, 2017).



Figure 2. Replicated field plots show different levels of stem rust infection in perennial ryegrass seed crops.