# Managing Stripe Rust in Pacific Northwest Winter Wheat

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## Introduction

In the last several years the predominant stripe rust races across the Pacific Northwest have changed. The new stripe rust races are more aggressive and cause more damage to the commonly grown wheat varieties in the region. In addition the new races are less sensitive to cold and warm temperatures. This allows them to survive through mild winters and infect the wheat crop earlier as well as continue to infect the wheat crop late into the season. In 2011, grain yield was reduced by 80-90% in susceptible varieties and 20-40% in moderately resistant varieties when stripe rust was not controlled through the use of fungicides. While breeding programs are moving rapidly to introduce more resistant wheat varieties, it is likely that growers will need to rely on fungicide applications to control stripe rust in the coming years.

## Objectives

1) To evaluate fungicide efficacy for stripe rust control on susceptible, moderately susceptible, and resistant winter wheat varieties

2) To determine the optimum timing of fungicide application(s) based on three growth stages: jointing (Feekes 6), flag leaf emergence (Feekes 8-9), and heading (Feekes 10.1-10.5)

3) To determine the effect of fungicide class on the control of stripe rust

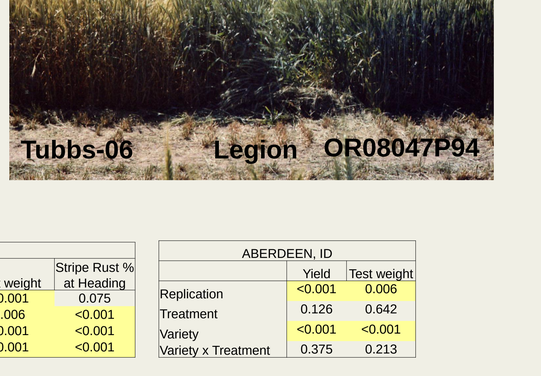
## Materials and Methods

Study sites were located throughout the tri-state region to capture a range of growing environments. Treatments were arranged in a split-plot design with four replications. Whole plots consisted of ten fungicide application timings and/or products. Subplots consisted of three wheat varieties. Prior to each fungicide application, treatments were evaluated for visual disease symptoms on a 1-100 scale (% leaf infection). At maturity, plots were harvested using a small plot combine and measurements of grain yield, test weight, and grain protein content obtained.

| Idaho Variety Treatments | |
|---|---|
| Variety Name | Stripe Rust Reaction |
| Brundage | Susceptible |
| Legion | Intermediate |
| WB-456 | Resistant |

| Washington Variety Treatments | |
|---|---|
| Variety Name | Stripe Rust Reaction |
| Xerpha | Susceptible |
| ORCF-102 | Intermediate |
| Bruehl | Resistant |

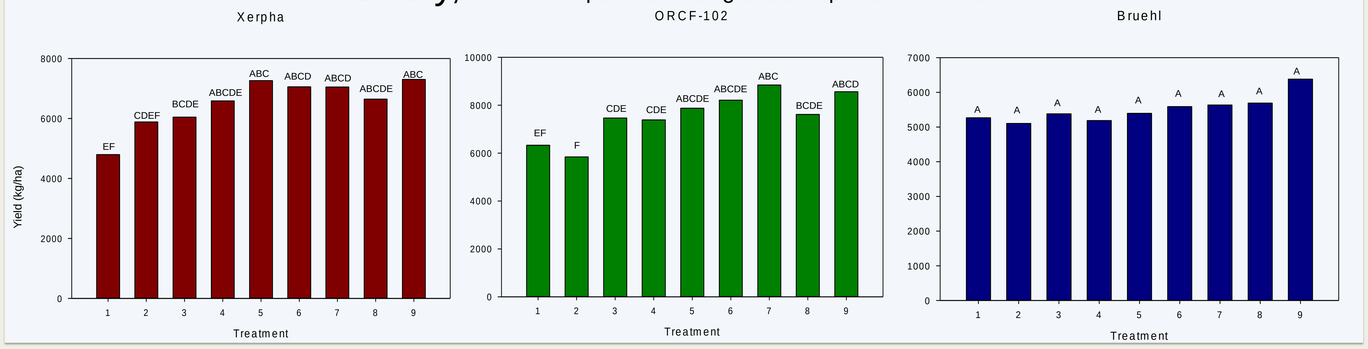
| Oregon Variety Treatments | |
|---|---|
| Variety Name | Stripe Rust Reaction |
| Tubbs 06 | Susceptible |
| Legion | Intermediate |
| OR08047P94 | Resistant |



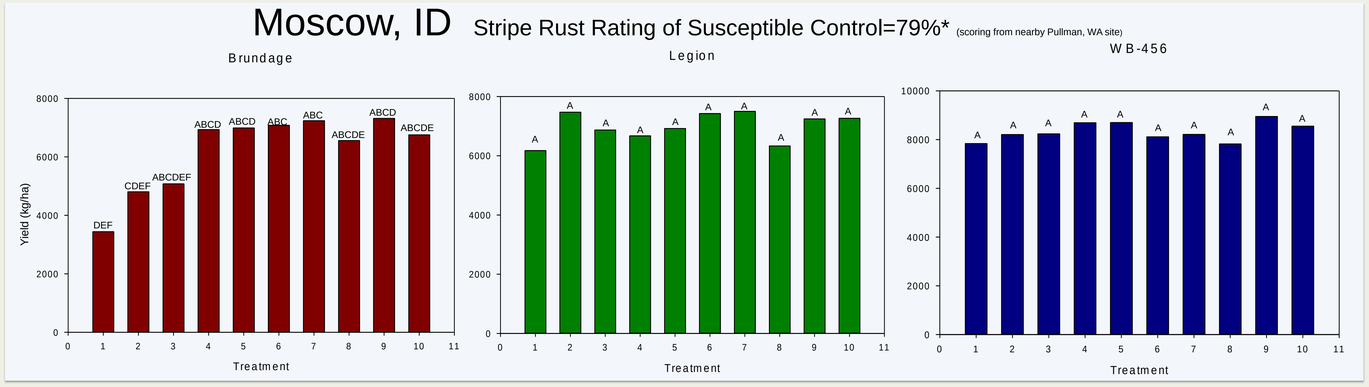

**Experiment Locations:**
1: Corvallis, OR; 2: Forest Grove, OR; 3: Hermiston, OR; 4: Pendleton, OR; 5: Dusty, WA; 6: St. John, WA; 7: Mayview, WA; 8: Pullman, WA; 9: Moscow, ID; 10: Aberdeen, ID

| Fungicide Treatments | | | |
|---|---|---|---|
| Treatment | Feekes 6 | Feekes 8-9 | Feekes 10.1-10.5 |
| 1 | 0 | 0 | 0 |
| 2 | 4 oz Tilt | 0 | 0 |
| 3 | 14 oz Quilt Xcel | 0 | 0 |
| 4 | 0 | 4 oz Tilt | 0 |
| 5 | 0 | 14 oz Quilt Xcel | 0 |
| 6 | 4 oz Tilt | 4 oz Tilt | 0 |
| 7 | 14 oz Quilt Xcel | 14 oz Quilt Xcel | 0 |
| 8 | 4 oz Tilt | 4 oz Tilt | 4 oz Folicur or 6.5 oz Prosaro |
| 9 | 14 oz Quilt Xcel | 14 oz Quilt Xcel | 4 oz Folicur or 6.5 oz Prosaro |
| 10 | 4 oz Tilt | 14 oz Quilt Xcel | 0 |

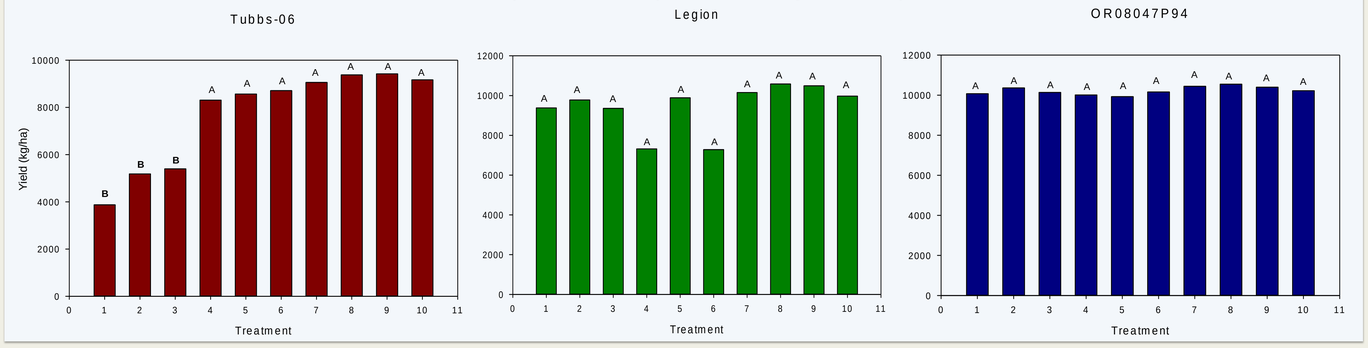
## Dusty, WA — Stripe Rust Rating of Susceptible Control=83%




## Moscow, ID — Stripe Rust Rating of Susceptible Control=79%* (scoring from nearby Pullman, WA site)




## Forest Grove, OR — Stripe Rust Rating of Susceptible Control=41%




## Conclusions

-Planting a resistant variety is the best way to manage stripe rust

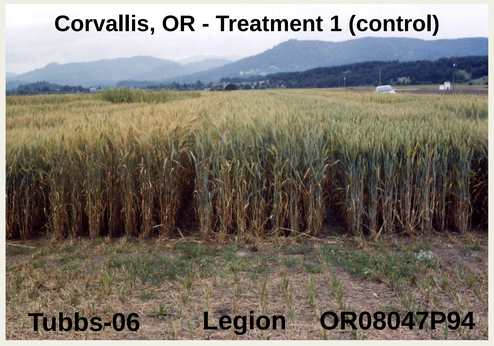
-On susceptible varieties a fungicide application at flag leaf emergence (Feekes 8-9) maximized grain yield and test weight

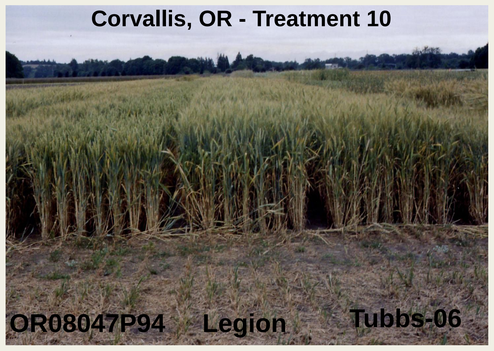
-On susceptible varieties, multiple fungicide applications did not increase grain yield or test weight compared to a single fungicide application at flag leaf emergence

-The timing of fungicide application is more important than the class of fungicide applied

-On resistant varieties, fungicide applications did not increase grain yield or test weight compared to the untreated control




## p-values by Treatment and Location

**Significance at α=0.05 designated by highlight**

| PENDLETON, OR | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | 0.016 | 0.45 | 0.213 |
| Treatment | <0.001 | <0.001 | <0.001 |
| Variety | <0.001 | <0.001 | <0.001 |
| Variety x Treatment | <0.001 | <0.001 | <0.001 |

| CORVALLIS, OR | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | <0.001 | <0.001 | 0.506 |
| Treatment | <0.001 | <0.001 | <0.001 |
| Variety | <0.001 | <0.001 | <0.001 |
| Variety x Treatment | <0.001 | <0.001 | <0.001 |

| MAYVIEW, WA | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | 0.175 | 0.775 | 0.027 |
| Treatment | <0.001 | <0.001 | <0.001 |
| Variety | 0.252 | <0.001 | 0.048 |
| Variety x Treatment | 0.464 | 0.303 | 0.043 |

| PULLMAN, WA | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | <0.001 | <0.001 | 0.075 |
| Treatment | <0.001 | 0.006 | <0.001 |
| Variety | <0.001 | <0.001 | <0.001 |
| Variety x Treatment | 0.013 | <0.001 | <0.001 |

| ABERDEEN, ID | Yield | Test weight |
|---|---|---|
| Replication | <0.001 | 0.006 |
| Treatment | 0.126 | 0.642 |
| Variety | <0.001 | <0.001 |
| Variety x Treatment | 0.375 | 0.213 |

| DUSTY, WA | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | <0.001 | 0.011 | 0.227 |
| Treatment | <0.001 | <0.001 | <0.001 |
| Variety | <0.001 | <0.001 | <0.001 |
| Variety x Treatment | 0.078 | 0.03 | <0.001 |

| ST. JOHN, WA | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | 0.188 | 0.347 | 0.027 |
| Treatment | 0.029 | <0.001 | <0.001 |
| Variety | 0.018 | <0.001 | <0.001 |
| Variety x Treatment | 0.392 | <0.001 | <0.001 |

| FOREST GROVE, OR | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | 0.018 | 0.142 | 0.237 |
| Treatment | <0.001 | 0.148 | 0.091 |
| Variety | <0.001 | 0.424 | 0.068 |
| Variety x Treatment | <0.001 | 0.231 | 0.1 |

| HERMISTON, OR | Yield | Test weight | Stripe Rust % at Heading |
|---|---|---|---|
| Replication | <0.001 | 0.008 | 0.402 |
| Treatment | <0.001 | 0.008 | 0.039 |
| Variety | <0.001 | <0.001 | 0.001 |
| Variety x Treatment | 0.335 | 0.151 | 0.014 |

| MOSCOW, ID | Yield | Test weight |
|---|---|---|
| Replication | 0.013 | <0.001 |
| Treatment | <0.001 | 0.185 |
| Variety | <0.001 | 0.596 |
| Variety x Treatment | 0.022 | 0.582 |