# Impact of inoculum loads on in crop disease risk from Septoria tritici blotch (STB) in wheat


## Authors

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### Background

Stubble is the primary source of STB inoculum. Therefore, the physical amount of the stubble has the potential to determine the disease pressure in wheat crops. Large areas under susceptible varieties and adoption of stubble retention systems in the medium and low rainfall zones of the southern region have raised STB inoculum levels unprecedently causing increased disease prevalence and severity. However, there is limited information on the amount of inoculum required and its interaction with different environments to develop STB epidemics. This information where available is critical to improve integrated disease management strategies for STB control in this region. Therefore, the impact of increasing inoculum loads on disease severity and grain yield in the MRZ was evaluated in this study.

### Aim

To determine the impact of inoculum loads of STB on wheat grain yield and quality.

### Methods

One field experiment was conducted in the MRZ at Longerenong, Victoria during 2023 to evaluate the impact of increasing inoculum levels on disease severity and grain yield. Six treatments including different amounts of inoculum and a control with minimum disease were applied to a susceptible to very susceptible variety, LRPB Impala (SVS). Treatments were separated by double-buffers of a non-host (barley) to reduce inter-plot disease spread. Plots were visually assessed for disease severity and harvested for grain yield.

### Trial details

**Location:**

| Location | Rainfall zone | Soil type | Growing season rainfall (mm) |
|---|---|---|---|
| Wallup (VIC) | MRZ | Clay | 231 |

**Treatments:**

1. Minimum disease
2. Zero stubble

3. Quarter kilogram stubble / plot
4. Half kilogram stubble / plot
5. One Kilogram stubble / plot
6. Two kilogram stubble / plot

**Variety:** LRPB Impala (SVS)
**Trial design:** Randomized complete block design
**Replicates:** 6

**Sowing and harvest details:**

| Location | Rainfall zone | Sowing date | Sowing rate (plants/$m^2$) | Harvest date | Trial average yield (t/ha) |
|---|---|---|---|---|---|
| Wallup (VIC) | MRZ | 2rd May 2023 | 150 | 17th December 2023 | 5.3 |

**Trial inputs:** UREA and MAP applied and managed as per best practice and kept weed and pest free.

**Chemical applications:**

| Fungicide application timing | Product | Active ingredient (gai/L)# | Rate |
|---|---|---|---|
| Seed | Jockey Stayer® | Fluquinconazole 167g/L | 300 mL/100 kg seed |
| Foliar at Z31 | Soprano® | Epoxiconazole 500 g/L | 125 mL/ha |
| Foliar at Z39 | Elatus Ace® | Benzovindiflupyr 40g/L + Propiconazole 250 g/L | 500 mL/ha |

*# gai = grams active ingredient*

**Results**

Stubble application significantly increased STB severity and caused grain yield loss (11%) in wheat variety LRPB Impala (Table 1) demonstrating the importance of stubble management in wheat as part of an integrated STB control strategy. Stubble retention and quantities influence how much inoculum is available to infect wheat crops from one year to the next. As shown in this study, yield losses in wheat can increase if higher stubble loads are present, so wheat-on-wheat should be avoided where possible to reduce yield losses. When wheat is sown into wheat stubble, stubble management techniques that aim to reduce stubble load provides a potential option to manage early epidemics, noting STB infection will also come from wind-borne spores from adjacent paddocks.

**Table 1: Septoria tritici blotch severity (% leaf area affected) and grain yield of wheat variety LRPB Impala (SVS) in response to variable loads of stubble inoculum at Wallup, Victoria during 2023**

| Stubble treatments | Stubble loads (t/ha) | Disease severity (% leaf area affected) | | Grain yield (t/ha) | Yield loss % |
|---|---|---|---|---|---|
| | | Z31 2nd Aug# | Z61 21st Sep | | |

| | | | | | |
|---|---|---|---|---|---|
| Minimum disease | - | 4[a] | 3[a] | 5.60[c] | - |
| Zero stubble (0) | 0 | 7[b] | 13[b] | 5.33[b] | - |
| Quarter kilogram stubble (0.25kg) | 0.14 | 8[bc] | 16[bc] | 5.40[b] | - |
| Half kilogram stubble (0.5kg) | 0.28 | 9[bc] | 17[bc] | 5.30[b] | - |
| One kilogram stubble (1kg) | 0.56 | 8[bc] | 15[bc] | 5.30[ab] | - |
| Two kilogram stubble (2kg) | 1.11 | 9[c] | 18[c] | 5.03[a] | 11 |
| **P** | | 0.002 | <0.001 | 0.002 | |
| **LSD (P=0.05)** | | 2.36 | 4.09 | 0.25 | |

[#]*Within a column, means with one letter in common are not significantly different at 0.05.*

**Conclusion**

The results demonstrated that managing stubble would alleviate the risk of STB. Lowering stubble quantities reduced grain yield losses due to STB in 2023 and should be considered as part of integrated control strategy. There are significant agronomic benefits with stubble retention systems but on the other side they encourage carry over of inoculum and increase disease risk in-crop. In seasons with significant wet conditions, management of stubble loads might prove beneficial to reduce carry over of inoculum and early disease epidemics in the following season.

Alternatively, when susceptible cultivars are sown away from stubble, other control options should be considered to reduce the chances of infection due to wind borne spores from adjacent wheat paddocks.

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