Wheat stripe rust: a continuing biosecurity risk under a changing climate

NSW will likely remain highly suitable to wheat stripe rust under a changing climate, with varying suitability throughout the year at different locations.

Developing industry-informed climate planning information

Climate change is altering the biosecurity risks for many agricultural commodities across NSW. Primary producers need evidence-based information about the changing climate, and the risks and opportunities it may bring.

Through its Vulnerability Assessment Project, the NSW Department of Primary Industries is increasing the resilience of our primary industries by providing information and data to help the sector better plan for, and respond to, climate change. The project has determined climate change impacts for extensive livestock, broadacre cropping, marine fisheries, forestry, horticulture and viticulture, and important cross-cutting biosecurity risks to inform sound planning, risk management and adaptation decisions.

Wheat stripe rust in NSW

Wheat stripe rust is a fungal disease caused by the pathogen *Puccinia striiformis* f. sp. *tritici.* The pathogen was first detected in eastern Australia in 1979, where it became established and endemic to wheat production areas. Although wheat is the primary host for the disease, it can also infect barley, triticale, rye and several grass species.

The wheat stripe rust pathogen requires cool and wet conditions to infect crops. Once infected, the pathogen grows in the leaf tissue, producing orange-yellow pustules. When these pustules rupture, they release spores that become windborne and attack healthy plants.

Wheat stripe rust has caused significant loss to the wheat industry, causing up to 25% yield loss under suitable conditions. Without control strategies, the disease could cost the wheat industry an estimated $180 million[1]. Monitoring pathogen populations and establishment will help preparedness and response strategies.

[1] Wellings C. 2007. *Puccinia Striiformis* in Australia: a review of the incursion, evolution, and adaption of stripe rust in the period 1979-2006. *Aust. J. Agric. Res.*, 58, 567-575.

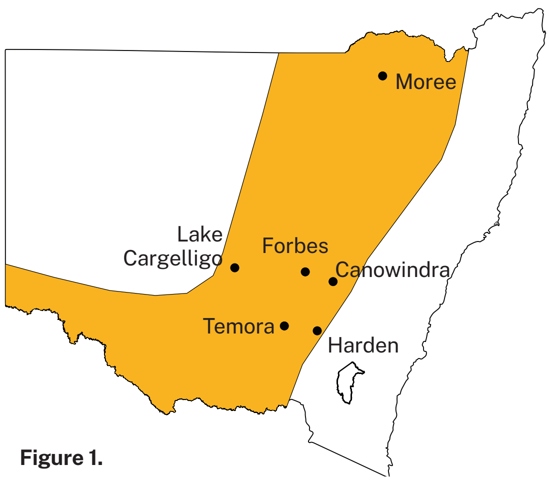

Figure 1.

Wheat belt across NSW (orange region). Locations indicate key wheat growing sites.

Climate and wheat stripe rust

Overall, the likely impacts of wheat stripe rust by 2050 under a changing climate in NSW are projected to decrease across the northern half of the wheat belt during summer. Changes in climate suitability are likely across the infection and incubation stages of the pathogen's life cycle.

Climate risks likely to impact wheat stripe rust distribution in NSW include:

Warmer temperatures and more hot days will likely reduce the potential for wheat rust stripe to survive from one crop season to the next by decreasing the summer green bridge. However, summer rainfall may allow remaining seeds to germinate and act as hosts to spread wheat rust stripe to the following year's crop.

Climate impacts: what to expect

Infection

- **Decreased climate suitability** in the wheat belt from September to May due to increased minimum temperatures (*low to high confidence*).
- **Increased climate suitability** in the wheat belt from June to August due to changes in minimum temperatures and rainfall.

Incubation

- **Decreased climate suitability** in the wheat belt from October to March (*low to high confidence*) due to an increased number of hot days.
- **Maintained historical suitability** in the wheat belt from April to September.

Impact on key NSW primary industries

While the climate suitability of wheat stripe rust in NSW may remain similar to what has been historically experienced, the climate will likely remain highly suitable in 2050. Decreased climate suitability in the north of NSW, due to warmer temperatures, may increase the effectiveness of temperature-dependent rust-resistant genes in adult plants. This may further reduce the risk of infection. Southern growers, on the other hand, may need to adopt shorter growing-season varieties to avoid the suitable window for the pathogen.

Adult, rust resistant wheat plants may be able to counteract the increase in climate suitability for the pathogen. Current strategies to manage the disease are likely to remain effective, but grain-growing industries may need to adapt by adopting earlier-maturing varieties to minimise or avoid the wheat stripe rust window or by increasing late-season fungicide applications, which carries an enhanced risk of exceeding maximum residue limits in grains prior to harvest impacts of wheat stripe rust.

Methodology and data

Climate projections were sourced from Climate Change in Australia's 'Application Ready Data'. This dataset is comprised of projections from an ensemble of 8 global climate models, each presenting a plausible future climate. The models differ in their projections, giving rise to uncertainty in our modelling. Low confidence in the projected changes due to differences between the models is noted in the text. Care should be taken when interpreting these results.

The Vulnerability Assessment Project is intended to highlight potential industry-or regional-level changes. Intermediate and high emissions scenarios were used in the assessments (RCP4.5 and RCP8.5), but these are not the only future scenarios possible. The inclusion of climate variables important to each biosecurity risk was based on published research, expert knowledge and data quality and availability.

FOR MORE INFORMATION

Please get in touch with vulnerability.assessment@dpi.nsw.gov.au

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