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Wheat rust situation, July 2020

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The first reports of wheat stripe rust and wheat leaf rust during the growing season have been made from New South Wales and South Australia, respectively. Wheat stem rust has not yet been reported. An update is provided on the impact of a new pathotype of the wheat stripe rust pathogen that was first detected in late 2018. Growers in the southern region especially are advised to monitor their cereal crops for rust. Samples of all rusts observed in cereal crops should be submitted for pathotype analysis to the Australian Cereal Rust Survey, details are provided at the end of this document.

Wheat stripe rust

The first detection of stripe of wheat for 2020 was made on 24th June, from Gollan, near Dubbo, in NSW.

In the 40 years that stripe rust has been present in eastern Australia, it has managed to survive the summer period and reappear every year- either in winter or spring, anytime between mid-May to the end of September. The "average" date that stripe rust has first been detected in a wheat crop in eastern Australia over the past 40 years is July 13th, so this year it has appeared a little earlier. The time of first detection is significant as it marks the onset of disease development, and the earlier this happens in a cropping cycle, the greater the epidemic potential.

Five further reports of stripe rust were received over the following week, the southern-most being Lockhart and the northern-most being Ghoolendaadi (**Table 1**).

Pathotype (pt.; aka race) analysis to date has indicated the occurrence of pt. 198 E16 A+ J+ T+ 17+ (see below) in the south. The detection of pt. 64 E0 A- in the north, some 670km away, indicates independent survival of the pathogen over the 2019-20 non-cropping summer period in at least two locations.

Pathotype 64 E0 A- was first detected by Dr Wellings in 2003. Based on whole genome sequencing, this pathotype is related to those derived from the original 1979 incursion of stripe rust from Europe. It has remained in the pathotype population for some time, often associated with cultivars carrying the resistance

gene *Yr4* (e.g. Bolac, Lincoln, DS Bennett), for which it is virulent.

Pathotype 198 E16 A+ J+ T+ 17+

Samples of stripe rust received from southern NSW have all comprised pt. 198 E16 A+ J+ T+ 17+. This pathotype was first detected near Wagga Wagga in late August 2018, and was subsequently isolated from Victoria and Tasmania that year. In 2019, it was once again isolated from these states and also from Queensland, and was in fact the most common pathotype of the wheat stripe rust pathogen isolated from eastern Australia that year.

Data collected from the field during 2019 by NSW DPI, AgVic and the University of Sydney indicated that pathotype "198" poses an increased threat to several wheat varieties (e.g. DS Bennett and LPB Trojan and to a lesser extent Devil, Illabo, DS Darwin, Emu Rock and Hatchet CL Plus), several durum varieties (e.g. DBA Artemis, DBA Bindaroi, DBA Lillaroi, DBA Spes, DBA Vittaroi and EGA Bellaroi), and several triticale varieties (Astute, Joey and Wonambi).

Detailed comparative greenhouse tests established that pathotype 198 is likely a mutational derivative of an existing pathotype (viz. 134 E16 A+ J+ T+) with added virulence for the resistance gene *Yr17* and the differential Suwon 92/3*Omar (**Figure 1**). Although the resistance of Suwon92/3*Omar has not been fully characterised, it is considered to carry the resistance gene *Yr4*, which is present in several Australian bread wheats (e.g. Bolac, Lincoln, Viking). These tests have also implicated the presence of *Yr4* in DS Bennett and possibly in Buchanan, Hatchet CL Plus, and a number of durum wheat varieties, explaining why they appear more vulnerable to the new pathotype.

More detailed field testing will be undertaken in 2020 to assess the full impact of this new pathotype on current wheat and triticale varieties. Growers can consult current cereal disease guides for their state to get the most up to date information on varietal responses to rust and other diseases. The rust ratings presented in these guides are based on the range of pathotypes that are detected in annual surveys conducted at the Plant Breeding Institute.

Wheat leaf rust

We received a single sample of wheat leaf rust from Penola SA in early April. The sample was found to comprise two pathotypes:

Pt. 104-1,3,4,5,7,9,10,12 +Lr37. This pathotype was first detected in June 2016 from Mace at Port Neill in SA. By the end of the 2016 cropping cycle, it had spread to all eastern states, and accounted for 34% of the pathotype identifications for the wheat leaf rust pathogen that year. In 2017 it was detected in WA, and in fact in all Australian states (49% of all isolates), providing yet another example of just how quickly cereal rusts can spread across Australia. It accounted for 72% of all wheat leaf rust isolates pathotyped in 2018, and in 2019 once again dominated the pathotype identifications. Our research to date suggests that this pathotype arose via somatic (asexual) hybridisation between two common pathotypes of the wheat leaf rust pathogen.

Pt. 122-1,3,4,5,7,9,10,12 +Lr37. This new pathotype was present at an extremely low frequency in the sample from Penola. It is most probably a single-step mutant from the pathotype described above (viz. 104-1,3,4,5,7,9,10,12 +Lr37) with added virulence for the resistance gene *Lr2a*. This resistance gene was first deployed in Australia in the cultivar Festiguay; it is not present in any current Australian wheat cultivar and hence I believe this new pathotype does not pose any additional threat. It's occurrence does, however, underscore the propensity of rust pathogens to generate genetic variability and overcome resistance in cereal cultivars.

The success of our rust surveys depends entirely on the samples received for analysis- hence as always, growers and other stakeholders are encouraged to monitor crops closely for rust in the coming season, and to forward freshly collected samples **in paper only** to the Australian Cereal Rust Survey, at University of Sydney, Australian Rust Survey, Reply Paid 88076, Narellan NSW 2567.

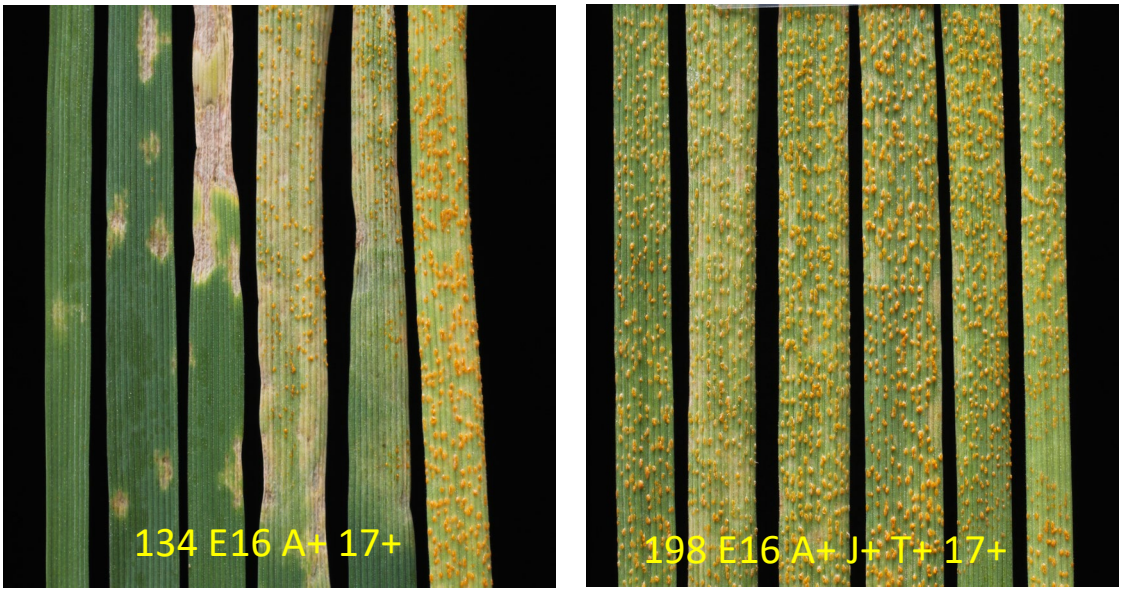
We cannot stress enough how important it is not to post samples in plastic of any kind – rust fungi do not like this!

Table 1. Details of stripe rust samples and pathotyped as at 22 July 2020

Date	Location	Collected off	Pathotype
24/06/2020	Gollan	Illabo	198 E16 A+ J+ T+ 17+
27/06/2020	Wongarbon	DS Bennett	198 E16 A+ J+ T+ 17+
29/06/2020	Lockhart	DS Bennett	198 E16 A+ J+ T+ 17+
29/06/2020	Lockhart	DS Bennett	198 E16 A+ J+ T+ 17+
29/06/2020	Henty	DS Bennett	198 E16 A+ J+ T+ 17+
?	Ghoolendaadi	DS Bennett	64 E0 A-

Figure 1: The responses of primary leaves of six wheats (*Left to right:* Suwon92/Omar, DBA Bindaroi, DBA Vittaroi, DBA Lillaroi, Gundaroi, Avocet S) infected with two different pathotypes of the wheat stripe rust pathogen.

Pathotype 198 E16 A+ J+ T+ 17+ ("198') on the right is believed to be a mutational derivative of a pathotype closely related to the one shown on the left (viz. 134 E16 A+ 17+; "134"). At seedling growth stages at least, the first five wheats are resistant to "134" but susceptible to "198", likely because the latter has acquired virulence for the resistance gene *Yr4*.



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Rusted Plant Samples

Can be mailed in paper envelopes; do not use plastic wrapping or plastic lined packages. If possible, include the latitude and longitude of the sample location, date of collection, cultivar, and your full contact details.

Direct rust samples to:

University of Sydney
Australian Rust Survey
Reply Paid 88076
Narellan NSW 2567

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