WHEAT IN THE BIRDCAGE

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Welcome to the second edition of 'Wheat in the birdcage'.

In this update, you'll find out how the septoria trial is progressing. I've also provided some information on how the disease is sourced and how inoculum is prepared and stored in a lab environment.

Figure 1. The septoria trial in the birdcage at Waite.

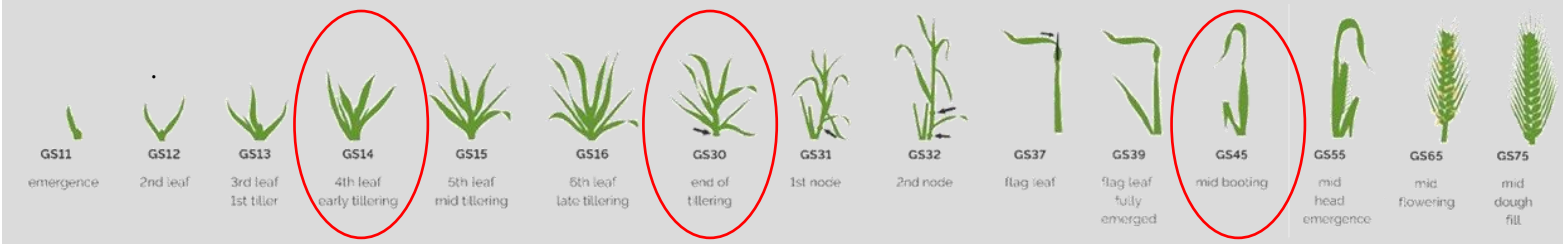
If you missed the first edition of Wheat in the birdcage, it provides some great background to the septoria project I'll be talking more about today and my work at Hart – you can read it here:
Wheat in the birdcage | Issue 1 | June 30, 2021

Digging into the science of septoria

Key wheat growth stages

Correctly identifying the developmental stages of a crop is important as a yield penalty may result if treatments are applied at the wrong time.

Within this trial, inoculations will occur at three key growth stages; GS14, GS30 and GS45. These are highlighted below.



Trial update

HOW'S THE FIRST INOCULATION TIMING LOOKING?

The first inoculation timing at GS14 has begun showing symptoms of septoria (see example in Figure 2).

As the disease continues to develop and with more rainfall, the septoria will begin to spread all over the plant.

Since sowing, the trial at Waite has received approximately 260 mm of rainfall, with a year-to-date total of 380 mm.

These very damp conditions are great for establishing and developing disease as there is a high level of moisture and humidity within crop canopies. It has also made the trial look great at this time of year.

Figure 2. Septoria tritici blotch infection on wheat (source; GRDC, 2015).

TIME FOR THE SECOND INOCULATION

You might remember from my first update that the second inoculation timing was scheduled to be applied at GS30. All varieties within our trial were at or around this milestone when the snap lockdown in South Australia occurred, courtesy of a COVID-19 outbreak. As a result, this treatment was delayed a week and actually occurred on July 28, with an average growth stage across the trial of GS31.

Crop growth stages between the various varieties are beginning to noticeably differ due to their respective maturities (Figure 3). This is more noticeable when comparing the current growth stage of the slower varieties of Illabo and Denison (GS30) and faster developing varieties, Impala and Razor CL (GS32).

To manage this difference, when the average growth stage for all varieties in the treatment block were at the target growth stage, the whole block was sprayed and inoculated with septoria.

Overall, everything in the trial is tracking as it is expected to be.

Figure 3. Infection timing block showing the different development speeds between varieties.

How do researchers get access to septoria...

Running a disease trial requires you to firstly have access to the disease. But how do researchers do that?

Samples, or isolates, of septoria are collected from around the state for pathotype testing by the SARDI cereal pathology group. A selection of those isolates are then stored for use in future pathotype tests, NVT disease trials and other specific disease projects like this birdcage trial.

WHAT IS AN ISOLATE?

Plant samples with disease are collected from a paddock or trial and taken to the lab. One spore from the sample is then isolated from the rest to obtain an *isolate* that is representative of the sample.

THE COLLECTION OF ISOLATES

Collection of disease isolates can be done a couple of ways:

- The first method is to use tissue samples collected from infected crops, sent into the cereal pathology group by growers[1] and agronomists from around the state. This practice helps researchers understand what levels and what pathotypes of a disease are present within the cropping regions of South Australia.
- The second way isolates are collected is through samples from field trials. Researchers that run disease trials will collect samples of the disease present in the trial or in the surrounding paddock for pathotyping in a controlled environment at a later stage.

Now you might be asking what pathotyping actually is...? You can think of it a little like the research that identifies COVID-19 variants. We all understand that the Alpha variant acts differently to the Delta variant, but that they're both essentially the COVID disease. Septoria is like that too. Researchers will inoculate multiple host plants with septoria isolates taken from a single region or paddock. They'll then repeat that process multiple times in new trials, using the same variety of plant, but with samples collected from different paddocks or regions across the state. Plants are then assessed for disease severity and the disease itself is monitored to detect differences in the way it acts during its lifecycle. The end result is that different variants, or pathotypes, can be identified and hopefully managed.

[1]GROWERS CAN SEND IN SAMPLES TO HELP IDENTIFY DISEASES ON FARM

If you have a disease present and you're not sure what it is, you can send a sample to SARDI who will diagnose it for you.

You will also be contributing to the Crop Watch newsletter, a great resource for growers, advisors and researchers alike.

If you'd like to find out more about Crop Watch or subscribe, use this link (it's well worth a look): https://www.pir.sa.gov.au/research/services/reports_and_newsletters/crop_watch/contribute_to_crop_watch.

HOW TO SEND IN YOUR SAMPLES

It is quite easy for growers to send in samples of any disease. You can get your free collection kit from SARDI by clicking here.

Samples collected will contribute to GRDC projects that invest in disease screenings for changes in disease resistance of current cultivars and pathogen population changes for disease like ascochyta blight, sclerotinia, net form net blotch and scald in barley, septoria in oats and more.

Making the inoculant

Two samples from Catapult wheat in Maitland and Scepter Wheat in Clinton Centre have been used in this trial as the sources of septoria.

The Clinton Centre sample was sent in by an agronomist for diagnosis and the Maitland sample was collected by the cereal pathology team from a wheat crop that was surrounding a barley NVT trial (Figure 4).

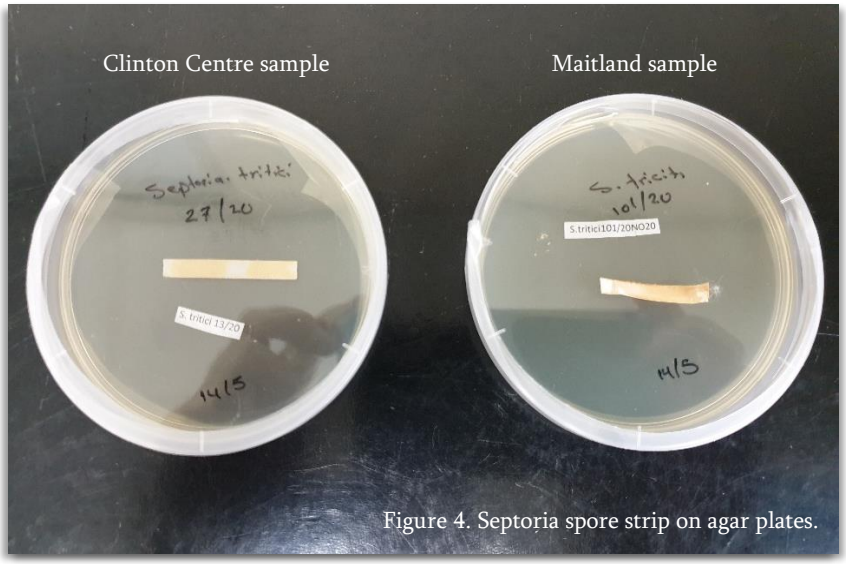


Figure 4. Septoria spore strip on agar plates.

To begin the process of creating more septoria, both isolates are removed from their glass tubes and placed onto agar plates. The agar plates are petri dishes that have a jelly like substance called agar that supply food, and act as a host for the disease, allowing the septoria to grow and spore population to spread and increase. This is where they collect the initial fresh spores to bulk up the quantity needed for this trial.

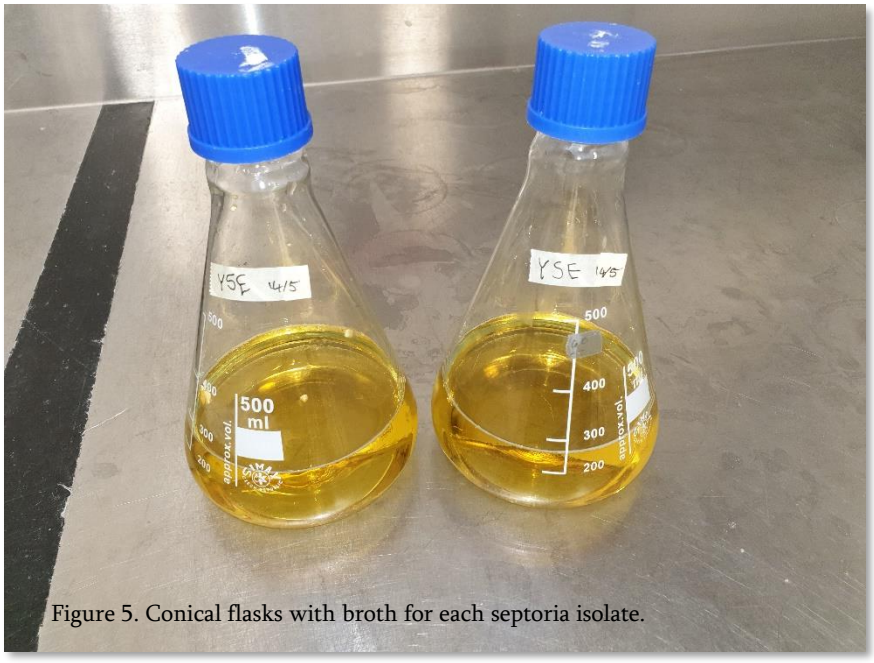


Figure 5. Conical flasks with broth for each septoria isolate.

To get a solution of septoria spores to spray on the crop, a broth needs to be made. The large broth gives the space and nutrients needed to create a large, high density population of spores (Figure 5).

After four days, the broth is strained to remove the liquid solution and spores from the rest of the fungal growth. This gives a concentrated solution of septoria spores.

The spore solution is then sampled again and put into another mix of broth with the solution allowed to grow for another seven days. It's then strained, with the quantity of spores now adequate for use in the trial.

This whole inoculum making process is repeated for each inoculation timing involved in the trial, while still using the same sources of septoria.

Application of inoculum

The mix of spores that have been collected are now ready to be applied to the trial. The solution is diluted with water, along with a surfactant for better leaf coverage. In this trial, three litres of solution are used, allowing us to apply two even spray passes on each plot.

For application, the solution is placed into a backpack sprayer to individually spray each treatment plot (Figure 6).

On a larger scale field trial, like those featured at Hart, we utilise trial sprayers like a hand boom or a shielded sprayer for larger individual plots.

Figure 6. Spraying inoculant on trial plots.

Ideal conditions for inoculating crops with septoria are damp, humid, cool, and overcast days as this prolongs the time available for the spore to begin infecting the leaf tissue of a plant. If conditions are too wet or followed by any significant rain, there is the risk that the spores will be washed off the leaves of plants.

What's next for this trial?

We'll continue to monitor plant growth in this trial so the third and final treatment can be applied at GS45 (mid-booting).

After that, disease severity scoring will be done to assess the level of infection for each variety and timing of inoculation.

My next 'Wheat in the birdcage' newsletter will feature the disease severity assessments from each timing.

Watch out for that soon!