

Project Title: Northern Agribusines Trial Extension Network Cultivar Crown Rot Tolerance 2013

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Objectives:

- Assess the relative disease incidence and yield performance of pre-release varieties for Crown Rot tolerance.
- Provide feedback to GRDC and co-operating wheat breeding companies (AGT, Longreach and Heritage Seeds) regarding disease incidence and resultant yield performance of their submitted cultivars.
- Gather data to validate the potential use of a Crown Rot tolerance ranking system to be introduced as an industry standard.

Background:

- Traditionally Crown Rot resistance ratings have been based on whitehead assessments. Whilst whiteheads are one method of assessment they are strongly influenced by environmental factors and do not necessarily give a true reflection of its relative ability to perform in the field in the presence of known levels of inoculum.
- By engaging with commercial seed companies, namely AGT, Longreach Plant Breeders (plus Pacific Seeds by association), our proposal was to use this assessment method across a number of suitable sites over a number of years in northern NSW to “road-test” a number of their elite cultivars before they are released to the market. This objective data will assist these seed companies to reliably select and promote the most suitable cultivars for a region. Similarly it should give consultants and growers more confidence to choose cultivars with a documented history of performance in the presence of Crown Rot.
- AGT and Longreach gave financial support for these trials.

Methodology

- The trial was conducted over three locations in Northern NSW, Bellata, Moree and Mungindi to give a regional spread of soil type and climate. The sites were selected with the understanding they had low background levels of Crown Rot inoculum based on rotation and historical management.
- Five existing varieties were chosen as industry standard varieties in the trial. These were Gregory, Bellaroi, Strzelecki, Sunco and Wylie. These varieties provided a base to compare the pre-release varieties. Two companies, namely AGT and Longreach/Pacific Seeds each submitted new generation varieties as listed below.

AGT:	Suntop, Sunguard, QT15046, Sun633A, QT14381
Longreach:	LPB08 0079, Spitfire, Dart, Impala, Lancer (formerly LPB07-0548).
- Crown Rot inoculum was prepared by growing the fungus (*Fusarium pseudograminearum*, mixture of 5 isolates) on sterilised White French Millet seed and adding it to the seed furrow of the inoculated plots at a rate of 2g/m row. This assessment method was devised by Dr Simpfendorfer to test the field tolerance of cultivars +/- known levels of added inoculum on selected clean sites. This was replicated four times per trial site in a randomised complete block design.
- Each of these plots were measured based on emergence, percentage biomass, NDVI, whitehead count, disease incidence and severity (basal browning assessment), grain yield and grain quality.

Results

There was a statistically significant inoculum x variety response at all sites. In other words, the added inoculum significantly increased the disease pressure. Disease expression was shown as Crown Rot Index (a function of basal browning incidence and severity at GS89). There was considerable variation this season between Crown Rot Index, the varieties CR resistance rating (as shown in the 2014 NSW DPI Winter Crop Sowing Guide) and the measured % Yield Loss.

A number of varieties showed statistically significant Yield Loss as a result of Crown Rot. Relative yield Results at the Moree site were slightly compromised by a major frost event during flowering, causing more damage to the earlier maturing varieties.

Yield results and responsiveness (excluding Bellaroi)

A new measure of varietal performance was introduced – responsiveness. Responsiveness is the relative yield performance of a variety with added crown rot, relative to the regression line. In other words – it is how a variety performs relative to expectation for the amount of disease expressed. Lancer, Suntop, Impala, QT15046 and Sunguard had the highest responsiveness scores.

Lancer and Suntop consistently performed in excess of expectation given the level of basal browning expressed. More work needs to be done with these varieties to examine the physiological features that underpin this tolerance.

Conversely Gregory, Strzelecki and surprisingly Wylie under-performed in the presence of Crown Rot despite showing less basal browning than some other varieties. Spitfire and Dart were inconsistent - they performed relatively poorly at Bellata but as expected at Mungindi.

Impala again yielded well and performs in line with expectation according to its disease expression. Sunguard consistently performed well in the presence of Crown Rot – in line with expectation.

Implications

- The breeders and associated seed marketing companies (AGT and Longreach/Pacific Seeds) have closely scrutinised the data for their relevant varieties. Longreach/Pacific Seeds used this CAS data in their management brochure for Lancer.
- These trials continue to re-affirm an industry requirement for a Crown Rot tolerance rating system to be run in tandem with the current Crown Rot resistance ratings. Resistance ratings provide valuable information regarding disease expression and % Yield Loss, but do not take into account the ability of a variety to perform in the presence of known levels of crown rot. Growers and Advisors would benefit greatly from knowing how a variety will perform, relative to its competitors, under Low, Medium or High crown rot pressure.

Recommendations

- Keep striving to establish a Crown Rot tolerance rating system.
- Encourage research regarding the physiological drivers for yield loss at varying levels of Crown Rot infection – why did Suntop perform so well despite expressing significant basal browning?
- All companies to release a new variety should be encouraged to submit seed to be objectively tested for Crown Rot for at least 3 years prior to being released into northern NSW / southern Qld.
- Devise a Crown Rot App – How to assess the Risk Rating for a Paddock.

Extension & Field Days

- Penagcon Field Day at “Lochearn” Bellata 11th September 2013. Approximately 160 attendees comprising of growers, agronomists, consultants, bankers, marketers and other various industry people. This trial day has basically doubled in size each season for the past 4 years.
- Continual inspections throughout the season by various breeders and interested industry people including AGT, Longreach, Pacific seeds, DPI and GRDC.