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Impact of common root rot and crown rot on wheat yield – Tamworth 2015

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Introduction

Crown rot (CR), caused by the stubble-borne fungus *Fusarium pseudograminearum* (*Fp*), is a significant disease of winter cereals across the northern grains region. Considerable research has established the impact of CR on the yield of commonly grown wheat, barley and durum varieties across environments and seasons.

Common root rot (CRR), caused by the fungus *Bipolaris sorokiniaina* (*Bs*), is a widespread pathogen of winter cereal crops throughout Australia, which is often found in association with CR. *Bs* survives as mycelium inside winter cereal and grass weed residues, but also has a thick-walled spore structure (conidium) that allows it to survive in soil for around two years. *Bs* infects the sub-crown internode where it causes complete or partial dark brown to black discolouration of the tissue. CRR symptoms are fairly indistinct in the paddock, with severely infected plants having reduced thrift and decreased tiller numbers.

CRR is generally considered a less significant pathogen of winter cereals across the northern grains region compared with CR and root lesion nematodes. A 15% yield loss from CRR under severe levels of infection is often quoted, but there is limited published data to support this value. The prevalence of CRR has increased across the region in recent seasons, usually associated with deeper sowing where growers are forced to moisture seek at planting due to diminishing soil water in the surface layers. This practice unfortunately lengthens the sub-crown internode, which appears to be exacerbating CRR infection.

This study aimed to compare the relative impact of CRR and CR on wheat yield and determine if mixed infection exacerbates losses.

Key findings

A medium level of common root rot infection reduced the yield of LRPB Gauntlet$^{\phi}$ by 11% with a high level of infection resulting in 20% yield loss.

Crown rot infection had around double the impact on yield loss with a medium level of inoculum reducing yield by 23% and a high level of crown rot infection resulting in 41% yield loss.

Combined infection with both pathogens further exacerbated yield loss which equated to 31% and 52% with a medium or high level of inoculum of both pathogens, respectively.

Site details

Location:	**Paddock 25, Tamworth Agricultural Institute**
Sowing date:	**12 June 2015**
Fertiliser:	**100 kg/ha urea and 50 kg/ha Granulock® 12Z at sowing**
Harvest date:	**19 November 2015**

Treatments

- One variety, LRPB Gauntlet$^{\phi}$, which is rated moderately susceptible–susceptible (MS–S) to both CRR and CR.

Pathogen treatments

- Added CRR inoculum at sowing using sterilised durum grain colonised by at least three different isolates of *Bs* at three rates to create nil (0 g/m row), medium (1.0 g/m row) or high (2.0 g/m row) infection levels.
- Added CR inoculum at sowing using sterilised durum grain colonised by at least five different isolates of *Fp* at three rates to create nil (0 g/m row), medium (1.0 g/m row) or high (2.0 g/m row) infection levels.
- Different inoculum rates of the two pathogens added alone or in combination at sowing with viable LRPB Gauntlet$^{\phi}$ seed with four replicates of each treatment.
- A control uninoculated nil treatment consisted of nil (0 g/m row) for both pathogens.

Results

- A medium level of CRR (*Bs*) inoculum reduced the LRPB Gauntlet yield by 0.41 t/ha (11%) with a high level of inoculum reducing yield by 0.73 t/ha (20%) compared with plants not inoculated with either fungal pathogen (Figure 1).

- A medium level of CR (*Fp*) inoculum reduced the yield of LRPB Gauntlet by 0.86 t/ha (23%) with a high level of inoculum reducing yield by 1.50 t/ha (41%) compared with plants not inoculated with either fungal pathogen (Figure 1).

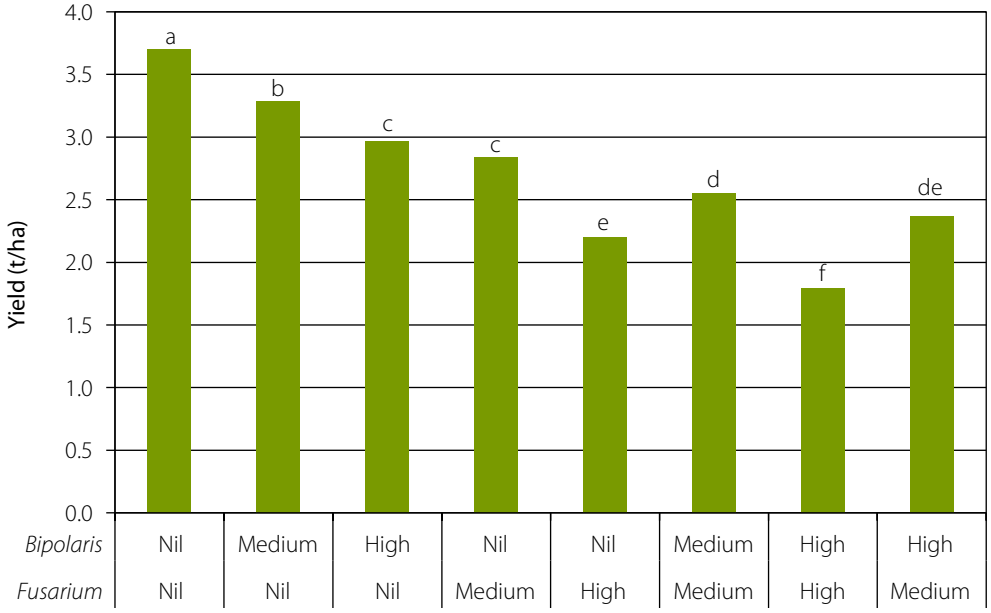

Figure 1. *Varying inoculum rate effect of CRR (Bs) and/or CR (Fp) on the yield of LRPB Gauntlet – Tamworth 2015*

- A medium level of CR (*Fp*) inoculum reduced yield to a similar extent as a high level of CRR (*Bs*) inoculum (Figure 1).
- A medium level of inoculum of both CRR (*Bs*) and CR (*Fp*) reduced the yield of LRPB Gauntlet by 1.15 t/ha (31%). A high level of inoculum of both pathogens reduced yield by 1.91 t/ha (52%). The yield effect from a combination of inoculation with both pathogens was significantly higher than inoculation with either pathogen alone at the same inoculum rates (Figure 1).

Conclusions

CR infection was shown to cause around double (23–41%) the extent of yield loss as CRR (11–20%) in the MS–S bread wheat variety LRPB Gauntlet. Although causing a lower level of yield loss, CRR is still a significant pathogen of wheat. It appears to be increasing in prevalence in the NSW northern grains region in association with deeper seeding to capture diminishing soil moisture in the surface layer around sowing. The potential importance of CRR in the farming system is intensified by its interaction with CR, with yield losses appearing to be exacerbated by the presence of both pathogens. CRR infects the sub-crown internode, which is believed to reduce the efficacy of the primary root system. Yield loss from CR is known to be associated with increased moisture/evapotranspiration stress during grain filling. A reduced ability of the primary root system to extract soil moisture at depth, as a result of CRR infection, could potentially be increasing the expression of CR and hence yield loss from these diseases. Growers using integrated management strategies aimed at reducing losses from CR should also consider their effect on CRR and the interaction between these two pathogens.

Acknowledgements

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