Chickpea Phytophthora root rot – 2015 varietal rankings and yield losses

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Introduction

Phytophthora medicaginis (*Pm*), the cause of Phytophthora root rot (PRR) in chickpea, is endemic and widespread in southern Qld and northern NSW, where it carries over from season to season on infected chickpea volunteers, lucerne, native medics and as resistant structures (oospores) in the soil. Although registered for use on chickpeas, metalaxyl seed treatment is expensive, does not provide season-long protection and is not recommended. There are no in-crop control measures for PRR and reducing losses from the disease are based on avoiding risky paddocks and choosing the right variety.

Detailed information on control of PRR in chickpea is available in the Australian Pulse bulletin Chickpea: Managing phytophthora root rot.

Current commercial varieties differ in their resistance to *Pm*, with Yorker and PBA HatTrick having the best resistance and are rated MR (moderately resistant). Historically, Yorker has been slightly better than PBA HatTrick, while Jimbour is MR–MS (moderately resistant to moderately susceptible), Flipper and Kyabra are MS and PBA Boundary has the lowest resistance of S (susceptible).

From 2007 to 2015, PRR yield loss trials at the DAF Qld Hermitage Research Station at Warwick in Queensland have evaluated a range of varieties and advanced PBA breeding lines.

Key findings

In a wet season, substantial yield losses (94%) from Phytophthora root rot (PRR) occurred in susceptible chickpea varieties such as PBA Boundary$^{\phi}$.

Varieties with improved resistance to PRR (PBA HatTrick$^{\phi}$ and Yorker$^{\phi}$) can also have large yield losses (68–79%) in a season highly conducive to PRR.

Although yield losses will occur in seasons highly conducive to PRR, crosses between chickpea and wild *Cicer* species, such as the PBA breeding line CICA1328, currently offer the best levels of PRR resistance.

Site details

Location: **Hermitage Research Station, Warwick, QLD**

Disease and yield loss prediction

All plots inoculated with *Pm* at sowing

PRR level manipulated with and without the fungicide metalaxyl

Three replicates

Calculating yield loss caused by PRR

% loss = 100 x (average yield of metalaxyl-treated plots – average yield of nil metalaxyl plots)/Average yield of metalaxyl treated plots

Treatments

Genotypes	CICA0912 CICA1007 CICA1328 (=D06318>F3BREE2AB016) D06344>F3BREE2AB027 PBA Boundary$^{\phi}$ PBA HatTrick$^{\phi}$ Yorker$^{\phi}$
PRR protection	(i) seed treatment with thiram, thiabendazole and metalaxyl plus regular soil drenches with metalaxyl (ii) seed treatment with thiram + thiabendazole only with no soil drenches

Results

- In the absence of PRR (metalaxyl seed + soil), yields were close to commercial crop averages for the 2015 season – the lowest yielding lines and varieties (CICA1328, Yorker and PBA HatTrick) achieving close to 2.5 t/ha (Table 1).

- The level of PRR in the trial was considerably higher than in previous seasons such as 2014 (Table 2). For example, yield losses were greater than 40% for CICA1328 in 2015, but only 1.8% in 2014 and yield losses for PBA Boundary were 94% in 2015 and 74% in 2014. However, the 2015 trial again confirmed that Yorker and PBA HatTrick have better resistance than PBA Boundary (Table 1), which is consistent across previous trials.
- Under high PRR disease pressure (2015), susceptible varieties sustained substantial yield losses from PRR, but MR varieties had reduced losses. The 2015 trial again confirmed the superior PRR resistance of the PBA breeding line CICA1328, a cross between a chickpea (*Cicer arietinum*) line and a wild *Cicer* species.
- CICA1007 was included in the 2015 trial because it has high yield potential and large seed size in a Yorker background. In the absence of PRR it was the highest yielding entry (2.93 t/ha) with a yield loss similar to Yorker (Table 1).

Table 1. *Yield of commercial chickpea varieties and breeding lines protected from Phytophthora root rot (PRR), and % yield losses from PRR – Warwick, QLD 2015. (P Yield<0.001; LSD yield = 0.46)*

Variety/line	Yield (t/ha) in absence of Phytophthora infection	Yield (t/ha) in presence of Phytophthora infection	% yield loss due to Phytophthora infection
CICA1328 [A]	2.64	1.54	41.7
D06344>F3BREE2AB027 [A]	2.52	1.05	58.4
PBA HatTrick	2.50	0.81	67.7
Yorker	2.61	0.57	78.7
CICA1007	2.93	0.71	75.9
CICA0912	2.76	0.37	86.6
PBA Boundary	2.88	0.17	94.0
[A] These lines are crosses between chickpea (*C. arietinum*) and a wild *Cicer* species			

Table 2. *Yield of commercial chickpea varieties and breeding lines protected from Phytophthora root rot (PRR), and % yield losses from PRR – Warwick, QLD 2014. (P Yield<0.05; LSD yield = 0.80)*

Variety/line	Yield (t/ha) in absence of Phytophthora infection	Yield (t/ha) in presence of Phytophthora infection	% yield loss due to Phytophthora infection
CICA1328 [A]	2.76	2.71	1.8
Yorker	3.01	2.69	10.4
D06344>F3BREE2AB027 [A]	2.93	2.13	27.4
PBA HatTrick	2.94	1.98	32.8
CICA0912	3.23	1.79	44.6
PBA Boundary	2.79	0.73	73.8
[A] These lines are crosses between chickpea (*C. arietinum*) and a wild *Cicer* species			

Summary

Under conditions that are highly conducive to PRR, substantial yield losses (94%) occurred in susceptible varieties such as PBA Boundary. However, significant losses (68–79%) can also occur in varieties with improved resistance to PRR (PBA HatTrick and Yorker). Crosses between chickpea and wild *Cicer* species, such as the PBA breeding line CICA1328, currently offer the best levels of resistance to PRR.

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