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Chickpea Ascochyta – evidence that varieties do differ in susceptibility of pods

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Introduction

If chickpea pods get infected by Ascochyta early in their development they abort. If fully developed pods get infected near the peduncle (as many do because the calyx holds water), they will also abort. Pods with developing seeds will abort, or the seed becomes infected and is killed or the seed becomes infected, but remains viable and is a potential source of inoculum to initiate an epidemic.

Current Australian chickpea varieties and advanced breeding lines differ in susceptibility of their vegetative plant tissues to Ascochyta blight (see paper on VMP14 trial in this edition of NGRTR). However, the chickpea industry presently believes that pods of all varieties are equally susceptible to Ascochyta. A chickpea Ascochyta management trial conducted at Tamworth in 2011(VMP11), suggested that may not be the case – anecdotal evidence indicated varieties with higher levels of resistance to Ascochyta e.g. Genesis™425 also developed less disease on their pods.

Should they exist, differences in pod susceptibility among varieties would be invaluable in developing variety specific Ascochyta management recommendations. For the past three seasons we have conducted trials at Tamworth designed specifically to capture data on the susceptibility of pods of different chickpea genotypes to Ascochyta. Each season we protected the plants with fungicides until 50% podding, then waited for a rain event to inoculate the trials but no rain came.

The 2014 Tamworth chickpea Ascochyta yield loss trial, VMP14, which was inoculated before flowering, provided an opportunity to collect data on susceptibility of pods of ten genotypes consisting of released varieties and advanced breeding lines.

Key findings

Susceptibility of chickpea pods to Ascochyta Blight is important as infection can cause pod abortion and blemish or kill seed; infected seed is also an inoculum source for subsequent crops.

Field trial results indicate that, contrary to current opinion, chickpea varieties do differ in the susceptibility of their pods to Ascochyta.

The results suggest that varietal resistance of chickpea pods is similar to that of vegetative tissue.

Site and experimental details

Location:	**Tamworth Agricultural Institute, NSW DPI**
Details:	**VMP14, including disease ratings of the varieties and breeding lines based on assessments of vegetative tissue, are reported in the preceding paper in this book. The trial was inoculated on 15 July and re-inoculated on 16 August using a new isolate collected at Yallaroi on 24 July 2014. By the end of August, Ascochyta was well established throughout the trial, especially in the unprotected Nil plots (no fungicides)**
Crop development:	**Podding commenced in the second week of September**
Rainfall:	**8 mm on 24 September, 10 mm on 25 September, 16.4 mm on 13 October and 0.6 mm on 14 October in 2014**
Sampling:	**On 29 October, 5–6 plants were collected from the outer 2 rows on each side of the 4 m wide x 10 m long plots. The pods were stripped from each plant, discarding the youngest two pods on each branch (these formed after the last rain event and could not have been infected by Ascochyta)**

Ascochyta assessment: **Pods were sorted into four classes based on their Ascochyta status: Clean = no Ascochyta lesions; 1 lesion = pods with a single lesion; 2–5 lesions and >5 lesions. A lesion was not called Ascochyta unless pycnidia could be seen either with the naked eye or under a low power dissecting microscope. For each variety the number of pods falling into each of the four Ascochyta classes was analysed using ordinal regression. The model estimates (+/- SE) the 3 cut-off points between the 4 classes and gives a coefficient for each variety.**

Genotypes: **CICA0912 (C0912), CICA1007 (C1007), Genesis™425 (G425), Genesis™Kalkee (KAL), PBA HatTrick$^{\phi}$ (HAT), PBA Monarch$^{\phi}$ (MON), PBA Boundary$^{\phi}$ (BOU), Kyabra$^{\phi}$ (KYB) and Jimbour$^{\phi}$ (JIM).**

Results

We acknowledge that this Ascochyta pod data could be confounded, as the plots (JIM and KYB) with the highest levels of pod infection and the greater number of lesions per pod were also those that had the highest levels of Ascochyta development in the vegetative stage. However, we are confident there was sufficient inoculum pressure in the trial. In particular during the two rain events (25 September and 13 October), all pods in the trial would have been exposed to the same aerosol of conidia (40 unsprayed Nil plots in the trial with a combined area of 1600 m^2 and an estimated 48,000 infected plants, all with leaf and stem lesions bearing pycnidia). Hopefully, a further trial planned in 2015 will clarify the potential issue of variety effects on Ascochyta pod infection.

There were large differences in pod infection among the genotypes. Only 28.6% of JIM and 33.8% of KYB pods were clean (no disease), whereas about 96.8–98.5% of G425, C1007 and C0912 pods had no Ascochyta (Table 1). Not only did JIM and KYB have a greater proportion of Ascochyta infected pods, but these pods were more severely diseased with most of the infected pods having 2–5 or more than 5 Ascochyta lesions per pod (Table 1).

***Table 1**. Percentages of pods in each of four Ascochyta categories for ten genotypes in VMP14 trial*

Genotype	% clean	% 1 lesion	% 2–5 lesions	% >5 lesions
C0912	98.5	1.0	0.3	0.3
C1007	97.2	1.5	1.0	0.3
G425	96.8	2.5	0.3	0.5
KAL	86.7	7.5	5.5	0.3
HAT	86.2	9.3	4.0	0.5
MON	86.2	7.8	3.3	2.8
BOU	84.3	5.5	6.3	4.0
C1211	67.2	13.8	14.5	4.5
KYB	33.8	15.5	30.5	20.3
JIM	28.6	21.8	31.3	18.4

Analysis showed that the varieties can be separated into four groups with no differences between varieties within a group but significant differences between varieties in different groups. The four groups from least to most susceptible were (C1007, C0912, G425), (BOU, HAT, KAL, MON), (C1211) and (JIM, KYB) (Figure 1).

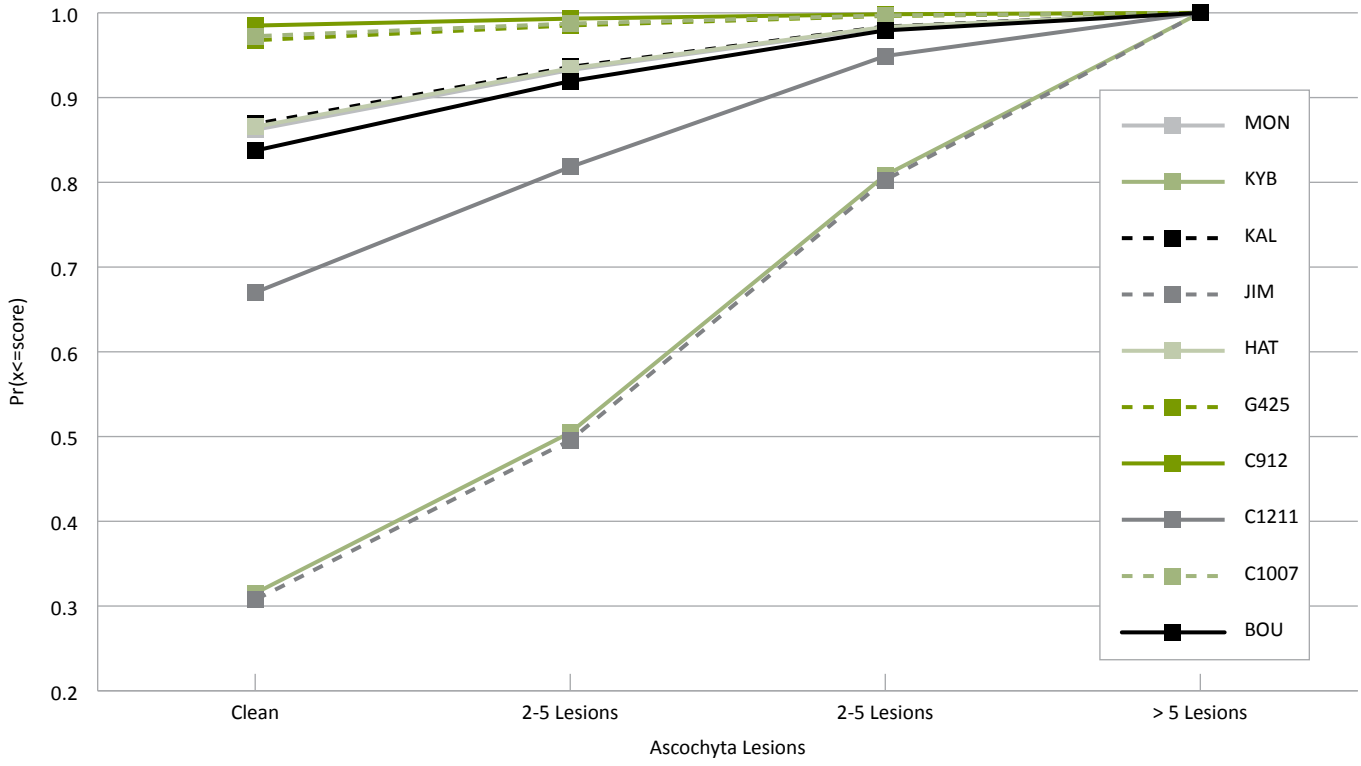

***Figure 1**. Predicted cumulative proportions of pods for each of four categories of Ascochyta lesions for ten chickpea genotypes in VMP14 trial*

Key pod infection findings of VMP14 were:

- Genotypes differed in the number of pods which became infected with Ascochyta.
- Genotypes differed in the severity of Ascochyta on infected pods (i.e number of lesions/pod).
- The ten genotypes fell into four significantly distinct groups in the four pod disease categories with pod resistance from highest to lowest being: C1007, C0912 and G425 > BOU, HAT, KAL and MON > C1211 > JIM and KYB).
- These pod resistance groupings agree closely with current Ascochyta ratings based on the infection of vegetative tissues.

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