Clean seed and seed dressing – an essential first step to managing chickpea Ascochyta

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Key Messages

- Management of Ascochyta remains critical to growing successful chickpea crops and application of an appropriate seed dressing followed by foliar fungicide 4-6 weeks later are essential first steps

Background

Ascochyta is the main disease that needs to be managed when growing chickpea crops. It can be introduced to a crop from both infected seed and stubble from previous year's crops and is then spread further within the crop by rain splash. Best practice guidelines recommend that all chickpea seed should be treated with a fungicidal seed dressing, which should be followed by an early season (4-6 weeks after sowing) foliar fungicide to minimise seed borne Ascochyta infection. A late season spray (mid-podding) should be applied, particularly if disease levels are high and/or if seed is to be retained for the following crop, this protects the yield potential that has been grown in this season and may result in cleaner seed to be used the following year. Our observations in 2020 indicated that the majority of Ascochyta infections in grower's paddocks were seed borne, rather than entering paddocks off stubble - suggesting that best practice guidelines are not always being followed.

At present screening for variety resistance ratings for chickpea Ascochyta are performed interstate, using isolates collected from those states. Different strains of Ascochyta with varying virulence exist around Australia. It has generally been observed that many varieties perform one or two ratings better with West Australian isolates than they do with those collected interstate. Neelam is currently rated S to Ascochyta for the southern and northern regions, although it tends to perform more like an MR/MS rating in WA, meaning it may perform better than some other varieties, but will still need active Ascochyta management. DPIRD is currently running screening nurseries using West Australian Ascochyta strains and hopes to be able to provide a WA rating system soon. Suppressing the development of Ascochyta with fungicide may play a role in protecting varietal resistance that has been developed through crop breeding programs. Over-reliance on genetic resistance by not using fungicides may accelerate the break-down of the limited varietal resistance to these strains, thus the recommended management strategy for chickpea Ascochyta in WA does not change based on which variety is grown.

Aim/s

We aim to demonstrate the effectiveness of using clean seed and seed applied fungicide to minimise the amount of Ascochyta in a chickpea crop, and to demonstrate the effectiveness of early season foliar fungicides to keep disease levels at bay.

Soil Composition

Depth (cm)	pH ($CaCl_2$)	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	N (NO_3) (mg/kg)	N (NH_4) (mg/kg)	EC (ds/m)	OC (%)
0-10	7.4	41	752	2.6	5	2	0.093	0.97
10-20	7.6	8	418	2.6	1	<1	0.196	0.58
20-30	8.1	5	303	1.5	2	<1	0.234	0.45

Table 1: 2021 monthly rainfall (mm) up to and including 12 December from BOM Dalwallinu station (8297).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr-Oct	Annual
2021	1	33	115	39	80	34	114	26	5	35	44	2	306	529
Average	22	15	28	14	36	35	51	40	22	13	11	12	211	299

Table 2: Trial Details

Trial Location	Liebe Group Main Trial Site, Dalwallinu West Road, Dalwallinu
Plot size & replication	10m x 1.54m x 4 replications
Soil type	Heavy red loam
Paddock rotation	2019 barley, 2020 chemical fallow
Sowing date	11 May, into wet soil
Sowing rate	Neelam, adjusted for seed size and germination to target 45 plants/m^2. Clean seed: 90kg/ha, Infected seed: 116kg/ha.
Fertiliser	At seeding: Superphosphate 100kg/ha, (9.1P, 10.5S, 20.0Ca)
Herbicides & Insecticides	At seeding: 860 kg/ha terbuthylazine (875g/kg) + 1500mL/ha fomesafen (240g/L) + 1kg/ha propyzamide (500g/kg) + 500mL/ha chlorpyrifos (400g/L) & bifenthrin (20g/L) 5 Aug: 330mL/ha clethodim (360g/L) + 180g/ha butroxydim (250g/kg) + 500mL/100mL water non-ionic surfactant 4 Oct: 160mL/ha alpha-cypermethrin (100g/L)
Harvest Date	1 Dec

Table 3: Trial treatments

Seed source		**Seed treatment**	**Foliar fungicide**
1	Clean	Thiram + thiabendazole	Early + Podding
2	Clean	Thiram + thiabendazole	Podding only
3	Clean	None	Early + Podding
4	Clean	None	Podding only
5	Infected	Thiram + thiabendazole	Early + Podding
6	Infected	Thiram + thiabendazole	Podding only
7	Infected	None	Early + Podding
8	Infected	None	Podding only

Both clean and infected seed were collected from the same paddock near Mingenew in 2020. Clean seed was taken from a trial which received several fungicide applications and showed no signs of Ascochyta infection. Infected seed was collected from the farmer's crop which showed extensive Ascochyta, including pod lesions.

Foliar fungicides applied as per treatment schedule:
16/6: 875mL/ha tebuconazole (400g/L) & azoxystrobin (20g/L)
Foliar fungicides applied as blanket applications:
30/8: 600mL/ha prothioconazole (150g/L) & bixafen (75g/L)
11/10: 875mL/ha tebuconazole (200g/L) & azoxystrobin (120g/L)

Table 4: Rating scale used to assess plots for Ascochyta.

Rating	**Description**
0	No Infection
1	Small lesions – leaf lesion or petiole infection
2	Some stem lesions – Minor stem breakage in upper foliage
3	1-2 branches broken – several girdling stem lesions at the base of branches
4	Large basal stem lesions or several branches broken near to stem
5	Half foliage dead or partly severed
6	More than half foliage dead or dying, young shoots still actively growing from base
7	Most foliage dead, some healthy stem tissue with lateral buds
8	Most foliage dead, no healthy lateral buds in leaf axils
9	Most foliage dead or completely dead

A typical Ascochyta leaf lesion. Similar lesions can appear on pods and lead to seed infection.

Results

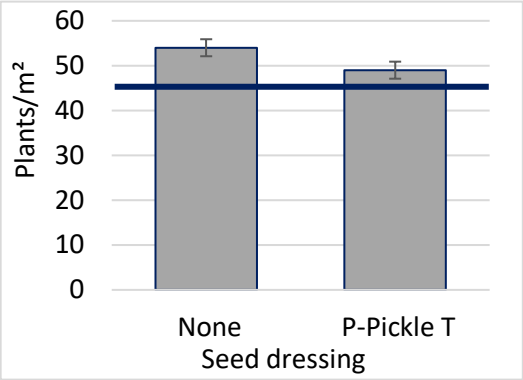

Figure One: Plant establishment at Dalwallinu in 2021. Seed dressing *p = 0.018.*

Plots that were treated with fungicidal seed dressing established at a lower density than those that were not treated with seed dressing, however both treatments exceeded the target density of 45 plants/m².

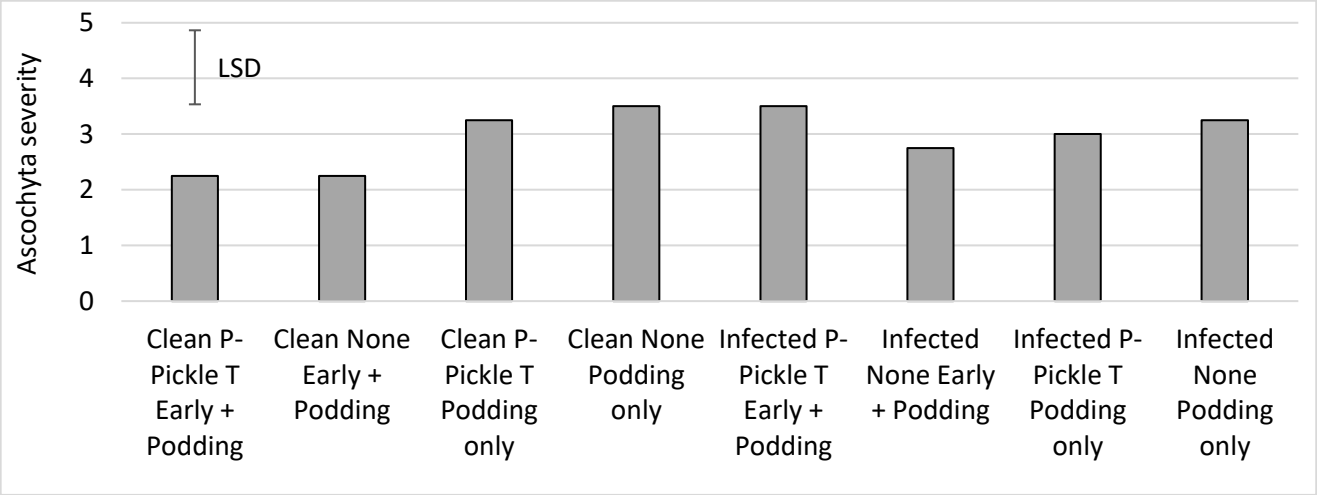

Figure Two: Ascochyta severity at Dalwallinu on 30 September, when the crop was podding. Severity was rated according to the scale in Table 4. Seed source x Seed dressing x Spray *p= not significant*.

By Spring, all treatments in this trial averaged Ascochyta ratings between 2-4 on the scale in Table 4 and there was no difference between any of the treatments (Figure Two). The plots typically showed symptoms that included stem lesions with upper canopy breakage and some branches broken lower on the stem. Within the trial there were hotspots that had considerably more disease, where plants had significant loss of foliage and even occasional plant death. Whilst there was ultimately no difference in the level of Ascochyta between treatments in this trial, there was some trends observed. The clean seed source showed less disease when both early and podding sprays were applied, compared to the clean seed plots that only got a foliar fungicide at podding. This demonstrates that the early spray did have some effect in holding disease back, even when a supposedly 'clean' seed source was used.

Despite the very wet winter in 2021, low levels of disease were seen in this trial until the end of July. Ascochyta grows best at temperatures between 15-25°C. It was likely too cold during the earlier part of the season for the disease to progress. From the middle of August, as temperatures became warmer, disease development was quite rapid, and it became more easily detectable in trial plots. By the end of the season low-moderate levels of disease were seen although there was a lot of variation throughout the trial. Disease was seen even in plots that used clean seed and followed our recommended 2 foliar spray fungicide program. The trial differs from a farmer's crop in that there were plots nearby that were sown with infected seed and received no Ascochyta management at all. These infected plots may have had the opportunity to spread disease in to the 'clean' plots despite our efforts to minimise this by sowing faba bean buffers in between, thus the lack of difference in disease between seed sources in this trial.

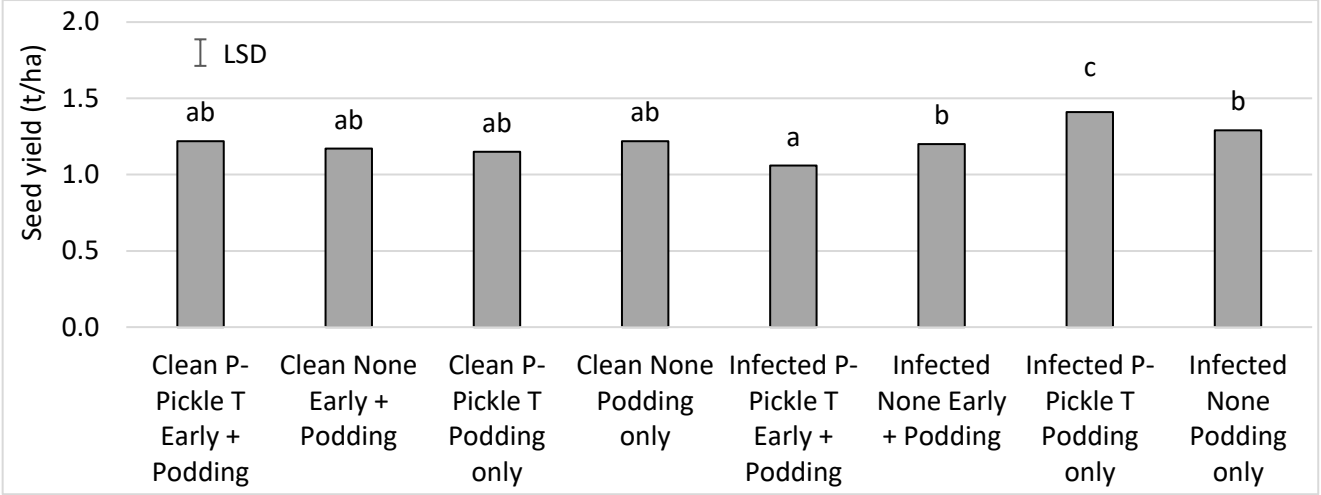

Figure Three: Seed yield (t/ha) from Dalwallinu. Seed source x Seed dressing x Spray *p= <0.001*. Treatments that share a common letter are not significantly different.

As discussed above, there was not a significant difference in disease levels between treatments in this trial, however we did see some minor differences in seed yield (Figure Three). The plots that were sown with Ascochyta infected seed with no seed dressing and only received one foliar fungicide at podding yielded more than any of the other treatments. This is unexpected and could be due to the large variation in disease levels within replicates of the same treatments. If a whole paddock was sown with such a poor Ascochyta management strategy we would expect it to show more disease and yield less than a paddock of certified clean seed sown with a robust fungicide regimen (seed dressing followed by early and podding foliar sprays).

Comments

Ascochyta has the potential to cause very large yield loss in chickpea crops. Foliar fungicides cannot be used to 'cure' an Ascochyta infection, they will only protect new growth from becoming infected, therefore Ascochyta management needs to be a priority for all chickpea growers. Once an infection is established in a crop, regular fungicides may need to be applied to prevent infection spreading up the canopy. As such, keeping disease levels low from the beginning of the season with the critical first steps of using a quality seed dressing and applying a foliar fungicide 4-6 weeks later is key to ensuring that large crop losses do not occur.

We have previously observed that using a seed dressing alone can make a difference to disease levels during the vegetative stage, however it is not enough to hold disease at bay for the season and needs to be followed by foliar fungicide applications. In a similar trial at Mingenew in 2020, a 500kg/ha yield benefit was achieved with a fungicidal seed dressing plus two fungicide spray strategy compared to no foliar fungicides, despite lower-than-average rainfall occurring. This demonstrates the large impact that Ascochyta can have, even in a below average rainfall year.

If you are concerned that your seed source may be contaminated with Ascochyta, it can be tested at an accredited laboratory. Further information on DDLS Seed Testing and Certification and request forms can be accessed at https://www.agric.wa.gov.au/plant-biosecurity/seed-testing.

Acknowledgements

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