

Managing chickpea diseases after the drought

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Key words

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Take home messages

- Do not underestimate disease risks after a drought – pathogens survive longer and can still threaten your 2020 chickpea crops
- Unless you are in a high risk Ascochyta situation, it is unlikely there will be a cost benefit applying a foliar fungicide to 2020 crops until after the disease is detected
- However, if you are at a high risk of Ascochyta, apply a foliar fungicide before the first post emergent rain event
- High risk situations include planting into paddocks with active Ascochyta inoculum and planting seed that has not been properly treated
- Recent research has shown the Ascochyta fungicides Aviator Xpro and Veritas are rain fast (up to 100 mm rain in 150 minutes)
- Phytophthora and Sclerotinia levels will not have declined much during the drought and pose a medium to high risk in 2020
- Root Lesion Nematodes may have declined during the drought but if numbers at the start of the drought exceeded 10/g soil, it may still be sufficient to cause damage in 2020 chickpea crops.

How drought affects plant diseases

- Drought reduces the breakdown of plant residues. This means that inoculum of some diseases does not decrease as some might expect and will carry over for more than one growing season. The expected benefits of crop rotation may not occur
- Bacterial numbers decline in dry soil. Some bacteria are antagonists of soil borne fungal diseases. These diseases can be more severe after drought
- Abandoned, or drought stressed crops still set seed. Summer/autumn rains can lead to large numbers of volunteers. Low stock numbers make it difficult to control these volunteers, which can host Ascochyta, viruses and virus vectors, and other pathogens
- Weeds that are stressed by drought may be harder to kill and can harbour pathogens
- Soil water and nitrogen may be unbalanced and these are likely to impact diseases in 2020 and beyond.

Chickpea disease risks after the drought and advice for 2020 chickpea farmers

- Ascochyta is unlikely to cause widespread problems in 2020 unless it is wetter than average as inoculum levels have not increased in past two seasons and even if infected with Ascochyta, all varieties recover well during dry conditions. For these reasons, unless you are in a high risk situation, there will be no cost benefit applying Ascochyta fungicides until the disease is detected. High risk situations include planting into paddocks where active inoculum is known to

be present (see following examples at Tulloona and Moree) and planting seed of unknown pathogen status that has not been properly treated. In these situations, apply an Ascochyta fungicide before the first post-emergent rain event, then monitor the crop 10-14 days after rain.

- If Ascochyta is detected, apply a registered fungicide before the next rain event. This is especially important during the reproductive stage as Ascochyta on pods causes abortion, seed infection and seed defects. If you miss a spray; fungicides with limited curative activity are now available however they have a limited time of use and tight intervals for application after an infection event occurs. (<https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2019/02/chickpea-ascochyta-research-what-if-i-miss-a-spray-are-there-salvage-options-with-new-chemistry-how-long-do-fungicides-persist>)
- Under drought conditions, some plant pathogens survive longer than normal; Ascochyta inoculum for 2020 chickpea crops may have originated in 2017 or even 2016. In August 2019, volunteer chickpeas in a crop of wheat at Tulloona had Ascochyta lesions. That paddock had grown chickpeas in 2016 (under high Ascochyta pressure); wheat in 2017 and chickpeas in 2018 (crop abandoned due to drought). Rain in Oct/Nov 2018 allowed Ascochyta to develop on abandoned plants, and seed left in the paddock germinated on rain in March 2019 to produce the volunteers that got infected during rain events in May, June and July 2019. Another example of how drought can prolong survival of inoculum was provided in August 2019, when we received chickpea stubble from a paddock at Moree that had grown chickpeas in 2017. The stubble contained fungal fruiting bodies. We soaked the stubble in water for several hours then applied the water suspension to chickpea seedlings; 7 days later symptoms and pycnidia of Ascochyta developed on the seedlings, proving that the inoculum had persisted on the nearly two-year old chickpea residue. Both the Tulloona and Moree paddocks are considered high risk if planted to chickpeas in 2020.
- Remember, the Ascochyta fungus is evolving: In our 2010 Tamworth disease management trial, unprotected PBA HatTrick[®] (then rated moderately resistant (MR)), lost 37% yield to Ascochyta; while in the 2016 trial, unprotected PBA HatTrick[®] lost 97% yield to Ascochyta. PBA HatTrick[®] is now rated moderately susceptible (MS) and will require fungicide under conditions that favour Ascochyta. The good news is that whilst Ascochyta can now cause more damage on unprotected PBA HatTrick[®], it is just as easy to manage as when PBA HatTrick[®] was rated MR.
- Phytophthora root rot (soil borne) and Sclerotinia diseases (soil borne and air borne) are considered moderate to high risk in 2020 because although inoculum loads are unlikely to have increased, their survival will have been prolonged by the drought.
- Botrytis seedling disease (BSD, seed borne) is only likely in crops planted with seed produced in the 2016 (and possibly 2017) crop year. In any case proper seed treatment provides 100% control of BSD.
- Botrytis grey mould (BGM, air borne); the BGM fungus is ubiquitous, has a very wide host range and is a good saprophyte - if conditions favour BGM i.e. dense canopies, warm humid weather, it will occur.
- Root lesion nematodes (RLN, *P. thornei* soil borne) can survive dry periods. Recent research has shown it takes a double break of 40 months free of host plants to reduce numbers to a minimum threshold (2/g soil) so it is unlikely the current drought will have reduced RLN numbers if they started high (40/g) which was likely in the 2016 season. Even starting numbers of 10/g still need a break of 30 months <https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2016/02/how-long-does-it-take-to-reduce-pratylenchus-thornei-populations-in-the-soil>.

- Viruses are an unknown threat after a drought. Most need green plants as reservoirs (some are seed borne) and hosts for their vectors. However, as vectors can fly or be blown in from regions that have not experienced drought, viruses are still a risk to 2020 chickpea crops.

Seed quality

Obtaining good quality seed after a drought may be an issue in 2020. In Nov/Dec 2019, we tested seed from as far back as 2016 and whilst germination of all lots exceeded the Pulse Australia (PA) minimum standard of 70%, some lots were slow getting there, indicating possible loss of vigour. All planting seed should be germination tested and if it meets the PA standard, we recommend it be treated and 'test planted' into paddocks intended for chickpeas in 2020, and the number that emerge counted – this is your best indicator of seed and seedling vigour and may assist identify herbicide residues, but should not be relied on as the sole indicator for this, as symptoms of residual herbicides can in some situations be slow to develop. Paddock emergence tests are best done in March/April.

If you are sourcing seed from outside your region e.g. interstate, be sure the variety is suitable for your farming system and have the seed germination and pathogen tested.

Irrespective of age and origin, all planting seed should be treated with a registered seed dressing – these control seed borne Ascochyta (internal and external), seed borne Botrytis (BSD) and protect seedlings from a range of opportunistic soil organisms that can reduce seedling vigour and establishment under less than favourable conditions e.g. cold or wet soils, deep planting. Planting quality, treated seed is your best bet of healthy seedlings – these will have a rapidly growing root system to obtain nutrient and moisture, be more competitive with weeds and less susceptible to disease.

Predicta®B for assessing Ascochyta risk

The value of Predicta®B as an Ascochyta management tool has not been determined because we do not know what the numbers mean in terms of risk or management. Predicta®B results that are positive for Ascochyta on samples collected after the drought should not be surprising given the persistence of inoculum under drought conditions. On the other hand, a negative result does not mean your Ascochyta risk is nil or low as the test is only as good as the sampling method and inoculum can arrive in your paddock after sampling via wind, machinery, vehicle, animals, surface water flows or untreated seed.

Chickpea Ascochyta Research Update: Is efficacy of Aviator Xpro and Veritas reduced by rain after application?

Previous research (2007) at Tamworth using a rainfall simulator showed that efficacy of the fungicides Barrack720® (720g/L chlorothalonil) and Dithane® Rainshield® (750g/kg mancozeb) on chickpea Ascochyta on cultivar Jimbour was not significantly reduced by 50mm rain in 10 minutes. 150mm in 30 minutes also did not reduce efficacy of Barrack720 but did reduce slightly the efficacy of Dithane. Such rainfall intensities are not common in chickpea crops grown in eastern Australia. From these experiments we concluded that plant tissue sprayed with these fungicides would still be largely protected if rain fell after application (new growth after application would not be protected as both products are protectants only). The 2010 chickpea season (that had frequent rain events) supported this conclusion.

The recent registrations of Aviator Xpro® and Veritas® (both in 2018) for chickpea Ascochyta (with restrictions on number of applications and timing – see labels for details) raised the question of how rain fast are these products.

Two experiments were conducted at Tamworth Ag Institute in December 2019 - January 2020 to determine the effect of simulated rain on the efficacy of Aviator Xpro and Veritas on Ascochyta;

Unite®720 (720g/L chlorothalonil) and water were the control treatments. The first experiment (4 reps) was with cv Kyabra[Ⓟ] and the second (4 reps) with cvs Kyabra[Ⓟ] and PBA Seamer[Ⓟ].

As the results were the same, we report here the second experiment. Plants were sprayed with water, Unite, Aviator Xpro or Veritas using a backpack sprayer with a 1m boom fitted with 110/015 flat fan nozzles at 50cm spacing and a walking pace of approximately 6kph. The fungicide treatments were allowed to air dry for 2hr when the 'rain' plants were placed in the rainfall simulator and exposed to 50mm over 75 minutes or 100mm over 150min (recorded by two rain gauges at each side of the simulator pad). After removal from the simulator, plants were allowed to air dry for 2h, arranged on racks in replicate boxes (55L plastic with clear lids), inoculated to run off with a cocktail (2,000,000 conidia/mL) of 20 *Ascochyta* isolates obtained from commercial chickpea crops and the boxes placed in a controlled environment facility operating at 12h/12h day/night 15C/20C. Leaf wetness was maintained with ca 50mm depth water in the base of the boxes and firm fitting lids. After 48h the lids were removed and plants were examined for *Ascochyta*. Five days after inoculation (DAI) first symptoms (petiole wilting) were evident and at 9 DAI, *Ascochyta* was assessed by counting the numbers of petioles, leaves and stems with symptoms.

The only plants that developed *Ascochyta* were those sprayed with water; PBA Seamer[Ⓟ] had less disease than Kyabra[Ⓟ].

We conclude from this experiment that efficacies of chickpea *Ascochyta* fungicides Veritas and Aviator Xpro with a 2 hour dry period after spraying and prior to rain occurring, are not affected by simulated rainfall of 50mm in approximately 75min or 100mm in approximately 150min. As such intensities are uncommon during chickpea seasons in areas of Australia where *Ascochyta* occurs, it is reasonable for growers to be confident that once these fungicides have dried on plant tissues, those tissues will remain protected.

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