Minimising risk of disease in 2017 chickpea crops

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AT A GLANCE…

Seasonal conditions in 2016 were very conducive to Ascochyta, Botrytis, Phytophthora and Sclerotinia diseases in chickpea crops throughout the northern cropping region.

Large amounts of inoculum of these pathogens will be available to infect 2017 chickpea crops.

Strategies described in this article will reduce the risk of these diseases – the more strategies employed, the greater the benefit for chickpea growers in 2017.

FOLLOWING high incidences of diseases (Ascochyta, Phytophthora, Sclerotinia and Botrytis) in 2016 chickpea crops throughout NSW and Queensland, there will be large amounts of inoculum to infect 2017 chickpea crops.

This article describes strategies that will reduce the risk of each of these diseases. Some of these strategies are based on local and international field experiments – others are based on observations of reduced disease in 2016 crops. The more strategies employed, the greater the benefit for chickpea growers in 2017 and beyond.

Seasonal conditions in 2016 were ideal for large inoculum build up and carryover into 2017. As a result, chickpea crops this year will be under pressure from diseases such as Ascochyta (pictured), Sclerotinia, Phytophthora and Botrytis.

Ascochyta blight – aka AB, Asco
(fungus *Phoma rabiei* previously called *Ascochyta rabiei*)

Ascochyta inoculum will be present in four forms:

1. Ascochyta infected chickpea residue being discharged out the back of headers or spread by floods and surface water;
2. Seed internally infected by the fungus (a consequence of pod infection);
3. Seed contaminated externally with infected chickpea residue during harvest and handling; and,
4. Volunteer chickpea plants infected over summer and autumn.

Recommendations for 2017 chickpea crops:

- Grow varieties with improved AB resistance. These varieties will have less disease and require fewer fungicide sprays.
- Burn cereal stubble (this holds AB inoculum). Infected chickpea residue discharged during harvest of 2016 crops may have blown onto paddocks that are intended for chickpeas in 2017 – most of these will have had a cereal crop in 2016 (or 2015).
- Remove volunteers. Volunteer chickpea plants infected with Ascochyta will provide inoculum even if the volunteer plants are killed with herbicide. Controlling volunteers early will restrict their size and limit the amount of inoculum they can produce.
- Treat all planting seed. Proper treatment of seed with a registered fungicide will control both internally borne Ascochyta and external contamination.
- Sow later in planting window. This reduces the number of infection events.
- Wider rows 66 cm+. Wide rows improve airflow through the crop leading to more rapid drying after a rain event or dew. They also delay canopy closure and improve penetration of fungicides later in the season.
- Tyne openers rather than disc. 2016 observations of less Ascochyta where crops had been sown with tynes is thought to reflect burial and movement of Ascochyta inoculum away from the emerging seedlings.
- Double crop sorghum, cotton. Stress and high biomass favour Ascochyta. 2016 crops double cropped into sorghum or cotton residue were less affected by waterlogging and did not produce the biomass of chickpeas sown into winter cereal or long fallow paddocks.
- Apply fungicide before first post emergent rain event, even in PBA Seamer. 2016 crops that had an early preventative Ascochyta fungicide had less disease than crops that were not sprayed until after the disease was detected. Even though PBA Seamer is rated resistant to Ascochyta, growers are urged to apply a preventative fungicide because:
  (a) The large amount of inoculum will increase disease pressure;
  (b) It safeguards against changes in the Ascochyta pathogen that are more aggressive or virulent on PBA Seamer; and,
  (c) It insures against contamination of PBA Seamer crops with plants of varieties with lower or no Ascochyta resistance eg. PBA HatTrick, PBA Boundary or Kyabra (varietal purity is still a major issue in our chickpea industry).

Phytophthora root rot – aka PRR
(fungus-like Oomycete *Phytophthora medicaginis*)

Phytophthora inoculum will be present in three forms:

1. Chickpea plants that had PRR in previous seasons (up to 10 years back);
2. Other hosts eg. medics, lucerne, and other leguminous plants including sulla (*Hedysarum* spp) and sesbania (*Sesbania* spp) in which Phytophthora can survive and multiply; and,

Phytophthora root rot will be present in three forms in 2017.

3. Soil and water containing PRR infected material and survival structures (oospores, chlamydospores).

Recommendations for 2017 chickpea crops:

- Avoid PRR high risk paddocks where annual or perennial medics have been a component of pastures and where PRR has occurred in the past – the oospores of *Phytophthora medicaginis* can survive for more than 10 years.
- Avoid paddocks with areas prone to waterlogging although the conditions which induce waterlogging may not occur every year.
- Avoid paddocks exposed to water flow from previous chickpea or medics areas; PRR infected material and survival structures can be spread though water movement to neighbouring paddock/s.
- Metalaxyl-based seed dressings are registered for PPR, but they are relatively expensive and provide only six to eight weeks protection after sowing.
- Grow a variety with the highest level of resistance, particularly in medium-high risk situations, such as where medics, chickpea or lucerne crops have been grown in the past five or six years.

Sclerotinia stem and basal rot
(fungi *Sclerotinia sclerotiorum, S. minor*)

In the northern region, Sclerotinia spp infect chickpea plants two ways:

(a) Sclerotia germinate directly in or on soil and invade the plant through root or basal stem tissue, producing Sclerotia on and within the basal stem tissues; and,
(b) Sclerotia germinate indirectly, produce apothecia at ground level and these release air borne ascospores (carpogenic germination) that infect plant parts higher in the canopy.

In most seasons we only see direct germination because carpogenic germination needs cool moist conditions.

In August–September 2016, Sclerotinia disease was very common in chickpea crops in north western NSW and southern Queensland due to high levels of canopy leaf wetness and favourable temperatures. Importantly, every case of Sclerotinia

Sclerotinia stem rot symptoms on chickpea.

involved carpogenic germination (infection at mid canopy) meaning that the Sclerotia formed on and inside the chickpea stems which would have been captured during harvest.

This led to problems at receival because the cylindrical Sclerotia formed inside the stems resembled ryegrass ergots and some loads were rejected or docked.

Sclerotinia inoculum will be present in several forms:

1. Sclerotia spread by floods and surface water;
2. Sclerotia admixed with chickpea seed and introduced into 2017 chickpea paddocks during planting;
3. Sclerotia in canola residue in paddocks intended for chickpea in 2017 – large Sclerotia can survive for up to 10 years;
4. Sclerotia in weed hosts in paddocks intended for chickpea in 2017;
5. Sclerotia already present in paddocks with a history of broadleaf crops and recent Sclerotinia outbreaks.

Recommendations for 2017 chickpea crops:

- Grow varieties with lowest susceptibility: Sclerotinia basal rot was assessed in field trials at Wagga Wagga in 2014 and 2016 which led to the following tentative ratings:
  - Very susceptible: PBA Maiden.
  - Susceptible: Ambar, Genesis 090, Neelam, PBA Slasher, PBA Striker, PBA Monarch.
  - Moderately susceptible: PBA Boundary, PBA HatTrick, PBA Seamer.
- Avoid paddocks with a history of Sclerotinia. Paddocks with a history of Sclerotinia will already have a population of viable sclerotia before the crop is sown and these are a disease risk. A frequent history of the disease also indicates that the environment is also most likely favourable for Sclerotinia to develop. Be aware that even adjoining paddocks can be at risk due to movement of air-borne ascospores of the Sclerotinia fungus.
- Avoid paddocks with a history of canola. Canola is a very good host for Sclerotinia stem rot. Experience in southern NSW has shown that the number of sclerotia in the soil can build up very quickly when canola is frequent in the cropping rotation.
- Avoid paddocks with a history of broadleaf weeds. The collective host range of the Sclerotinia fungi (*Sclerotinia sclerotiorum, S. minor*) exceeds 400 plant species, mostly broadleaf plants. Weeds can be important in maintaining sclerotial populations in paddocks, even when the frequency of broadleaf host crops in the rotation is low. Broadleaf weeds such as capeweed, shepherds purse and variegated thistle are just some common hosts for Sclerotinia.
- Sow within the planting window. Observations from field trials at Wagga Wagga suggest that early sown chickpea is more prone to developing symptoms of Sclerotinia infection – this includes both direct infection and canopy infection from air-borne spores. Plots sown within the recommended sowing window developed significantly less disease. Dense crop canopies from an early sowing also favour Sclerotinia stem rot later in the season.

Botrytis seedling disease – aka BSD (fungus *Botrytis cinerea*)

BSD and Botrytis Grey Mould (BGM) are caused by the same fungus – *Botrytis cinerea* – but they are very different diseases. BSD is a seed-borne disease that can occur at any temperature and under any conditions. BSD can only occur if pods of chickpea crops from which the seed came were affected by BGM. BSD is readily controlled with the standard chickpea seed treatments. BSD inoculum will be present in two forms:

1. Seed from pods infected with *B. cinerea* during a prior BGM outbreak.

Botrytis grey mould is more prevalent in warmer regions.

2. Primary infections of BSD (ie. from *B. cinerea* infected seed); primary infections lead to secondary infection of initially healthy seedlings through root contact.

Recommendations for 2017 chickpea crops:

- Treat all planting seed. Field trials conducted in 2011 at Moree, Narrabri and Breeza using two *B. cinerea* infected seed lots from the 2010 BGM epidemic, showed treating chickpea seed with registered seed dressings controlled BSD, improved crop establishment and increased yield but proper coverage and rate were essential.
- Avoid using *B. cinerea* infected seed. Even though seed treatment controls BSD, Botrytis infected seed will have lower vigour than non-infected seed.

Botrytis grey mould – aka BGM
(fungus *Botrytis cinerea*)

BGM is an air-borne foliar disease active only when temperatures warm up towards spring (around 15°C). It is more prevalent in the warmer regions of the north, where significant crop losses can occur in wet winters and springs as occurred in 2016. BGM is controlled with foliar fungicides – seed treatment is ineffective.

Testing chickpea seed from the 2016 harvest at Tamworth has found that around half the seed lots are internally infected with Botrytis. Not treating this seed will lead to BSD (but will have no impact on BGM in 2017).

Botrytis cinerea is ubiquitous, has a wide host range (over 138 genera in 70 families) and is a good saprophyte, meaning it can survive, grow and sporulate on just about any dead plant tissue. The fungus readily produces air borne spores and some isolates form sclerotia. This means that inoculum of BGM is always present and if conditions favour BGM, it will occur irrespective of what has happened earlier in the chickpea season.

Recommendations for 2017 chickpea crops:

- Paddock selection. Avoid planting chickpeas next to paddocks where BGM was an issue the previous season. As for Ascochyta blight, chickpeas should be grown as far away from paddocks in which BGM was a problem as is practically possible. But under conducive conditions, this practice will not guarantee that crops will remain BGM free because of the pathogen's wide host range, ability to colonise dead plant tissue, and the airborne nature of its spores.
- Sow later. If long-term weather forecasts suggest a wetter-than-normal 2017 season (La Niña) consider sowing in the later part of the planting window as this will reduce biomass production; BGM is favoured by dense canopies.
- Wider rows 66 cm+. Wide rows improve airflow through the crop leading to more rapid drying after a rain event or dew. They also delay canopy closure and improve penetration of fungicides later in the season.
- Foliar fungicide. In areas outside central Queensland, spraying for BGM is not needed in most years. But in seasons and situations favourable to the disease, a preventative spray of a registered fungicide immediately prior to canopy closure – followed by another application two weeks later – will assist in minimising BGM development in most years. If BGM is detected in a district or in an individual crop, particularly during flowering or pod fill, a fungicide spray should be applied before the next rain event. None of the fungicides currently registered or under permit for chickpea BGM have eradicant activity, so their application will not eradicate established infections. Consequently, timely and thorough application is critical.

Waterlogging

Waterlogging (waterlogging) and other stresses can reduce disease resistance and efficacy of management. Plants exposed to environmental stresses have altered architecture, metabolism and elongation – these reduce the plant's ability to maintain resistance and re-shoot post disease infection. This was evident across chickpea crops in 2016 with increased severity of AB on resistant lines (including PBA HatTrick, MR) when under waterlogging stress. Preventative fungicide spray application on stressed, disease prone areas is critical to reducing yield loss.

There are currently no released varieties with significantly improved waterlogging tolerance. Further studies are currently being carried out to exploit potential for improvement in conjunction with PRR resistance. During the 2016 season the northern growing region reported significant crop losses due to PRR. Surveying and quantitative PCR testing of soil samples collected from a number of sites across this region concluded that both PRR and waterlogging were involved in plant death at various growth stages. Differentiating waterlogging and PRR crop damage is difficult, and waterlogging is often incorrectly identified as PRR.

The following will reduce the risk of waterlogging in 2017 chickpea crops:

- Avoid poorly drained paddocks and those prone to waterlogging.
- Sow later if the weather forecast for 2017 predicts a wetter-than-normal early-to-mid season. Evidence suggests that in chickpea and other crops, early vigour associated with plants in the early vegetative phase will re-shoot and recover root growth more efficiently, reducing plant death.

Further information on chickpea disease management can be found at the Pulse Australia website www.pulseaus.com.au and in the NSW DPI 2017 Winter Crop Variety Sowing Guide.

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