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CHICKPEA DISEASE MANAGEMENT FACT SHEET

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NORTHERN REGION

MINIMISING CHICKPEA DISEASE RISK THROUGH INTEGRATED DISEASE MANAGEMENT

Controlling the major fungal diseases of chickpeas in the northern region requires an integrated approach to disease management and prevention.

PHOTO: GORDON CUMMING

Figure 1. Round, sunken lesions indicating ascochyta infection on chickpea pods later in the season. The fungus penetrates the pod wall and infects the seed resulting in reduced seed set and discoloured seed.

PHOTO: GORDON CUMMING

Figure 2. The concentric circles of brown-black dots in the centre of the leaf lesions are known as pycnidia. These fruiting bodies are unique to ascochyta blight and are useful in identifying the disease. Leaf death may also be caused by frost or herbicide injury but in those cases, there will be no pycnidia present.

KEY POINTS

- Integrated disease management in chickpeas involves paddock selection, variety choice, seed dressing, strategic fungicide use and hygiene.
- Paddock selection to minimise Phytophthora root rot is the first priority. Then implement an appropriate ascochyta blight strategy based on rain forecasts and the level of varietal resistance.
- The new varieties PBA HatTrick$^{\phi}$ and PBA Boundary$^{\phi}$ have improved resistance to ascochyta and require fewer or no fungicide sprays.

Five fungal diseases can impact on chickpea crops in the northern region:

- Ascochyta blight (*Phoma rabiei)* previously known as *Ascochyta rabiei;*
- Botrytis seedling disease (BSD) *Botrytis cinerea*;
- Botrytis grey mould (BGM) *Botrytis cinerea*;
- Phytophthora root rot (PRR) *Phytophthora medicaginis*; and
- Sclerotinia rot, caused by *Sclerotinia sclerotiorum* and *Sclerotina minor*.

Ascochyta blight (AB)

Ascochyta blight (*Phoma rabiei),* is a serious disease of chickpeas in Australia. The fungus can infect all above ground plant parts (See Figures 1 and 2). It is most prevalent in areas of cloudy, humid weather with frequent rain events during the crop season.

It is now endemic in all growing regions including central Queensland.

The disease is managed through crop rotation, hygiene, seed treatment, prophylactic fungicide application and growing varieties with improved resistance.

AB can develop over a wide range of temperatures (5°C to 30°C), but develops fastest between 15°C and 25°C and when relative humidity is high. It needs only three hours of leaf wetness to infect.

Control strategies for individual crops vary and are influenced by paddock history, variety and weather. Assess the risk level for each paddock and manage accordingly.

What happens in the adjacent paddock, or even several kilometres away, can impact on your crop. AB needs to be managed at the community level.

Ascochyta fungicides are protectants only. Unlike some cereal fungicides, they have no kickback effect and will not eradicate an existing infection.

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Figure 3. Phytophthora root rot yield loss trial at Warwick, 2012, showing the improved resistance to PRR of a hybrid, D318 (right) over PBA HatTrick$^{\Phi}$ (left).

Phytophthora root rot (PRR)

Phytophthora root rot is a soil and water-borne disease that can establish permanently in a paddock.

Damage is greatest in wetter than normal seasons, as occurred in 2010, or during periods of soil saturation in normal seasons, as occurred in the early part of 2012.

Only one saturating rain event is needed for infection. Once a plant or crop is infected with PRR, there is nothing a grower can do. Fungicides will not control this disease; it can only be managed with pre-planting decisions.

The most effective control strategy is to avoid high-risk paddocks, which are those with a history of:

- PRR in previous chickpea or lucerne crops;
- lucerne or annual, or perennial, medics; and
- waterlogging, although the conditions that induce waterlogging may not occur every year.

If considerations other than PRR warrant sowing in a medium to high-risk paddock, choose a variety with the best level of resistance available (See Figure 3).

Botrytis seedling disease (BSD) and Botrytis grey mould (BGM)

BSD and BGM are different diseases but are both caused by the *Botrytis cinerea* organism.

BSD is a seed-borne disease that can occur at any temperature and in any location. It is readily controlled with seed treatment.

BSD does not increase the risk of BGM but infected seedlings can lead to infection of the roots of neighbouring healthy plants and to collar rot.

BSD occurs when chickpea seed is infected with the *B. cinerea* pathogen during a BGM infection in the preceding crop. If this seed is then planted either untreated or poorly treated, BSD will occur locally, or wherever that seed is grown.

BGM is an air-borne foliar disease and active only when temperatures exceed 15°C (See Figure 4). It is controlled with foliar fungicides. Seed treatment is ineffective.

BGM is present everywhere but more prevalent in the humid, warmer regions of the north, where significant crop losses can occur in wet springs.

A combination of canopy closure, frequent rainfall events and overcast weather results in high relative humidity and rapid leaf death within the canopy. These are ideal conditions for BGM infection and spread.

PHOTO: GORDON CUMMING

Figure 4. Botrytis grey mould lesions can develop anywhere along the stem but are usually first found on the lower part of the stems, often starting in leaf axils. Infected seeds are usually smaller than normal and are often covered with white to grey fungal growth.

Fungicide programs for AB may help reduce BGM. However, varieties with improved resistance to AB may require a fungicide program specifically for BGM.

Sclerotinia base rot (*S. sclerotiorum, S. minor*) and Sclerotinia aerial blight (*S. sclerotiorum*)

In 2010, sclerotinia was more common than in previous years and caused serious damage in some northern paddocks. It cause 100 per cent crop failure in one kabuli crop near Dubbo.

There are two species of *Sclerotinia* that attack chickpeas. Both species cause a basal stem rot (see Figures 5 and 6) when their sclerotia germinate in soil and infect the base of the plant.

Under cool wet conditions, sclerotina can germinate to produce small cup like structures at ground level. These release airborne spores that infect above ground parts of the chickpea plant, often starting in leaf axils.

Both species of sclerotinia have wide host ranges including many broadleaf weeds and crop plants such as canola, lupins, field peas, faba beans and sunflowers, but not cotton or cereals.

Plant clean seed free of sclerotia and avoid planting chickpeas in paddocks that have had host crops, such as canola, in the past 10 years.

If this is not practical, do not plant chickpeas in paddocks that have had a

PHOTO: KEVIN MOORE

Figure 5. Sclerotinia is identified as white mycelial growth on infected plant tissue, which later produces small, black survival bodies called sclerotia. When these sclerotia germinate in the soil they release airborne spores that infect above-ground parts of the chickpea plant, often starting in leaf axils.

broadleaf crop (other than cotton) in the previous two to four years.

No fungicides are registered or under permit for sclerotinia in chickpeas.

Integrated disease management

A single disease management strategy rarely provides complete disease control. Using integrated disease management (IDM) techniques, means a grower is more likely to control the disease.

Regular crop monitoring to detect early disease outbreaks is important. The three aims of IDM are:

1. reduce inoculum (the disease-causing structures);
2. exclude pathogens through the use of clean seed and farm hygiene; and
3. protect the crop through the use of resistant varieties, seed treatments and foliar fungicides.

Reduce inoculum

Paddock selection

Paddock selection is determined by crop sequence, previous occurrence of diseases, proximity to crop residues and herbicide history.

- **Paddock history**. Aim for a break of at least three to four years between chickpea crops. Know the risk of PRR prior to planting. Avoid paddocks with a history of medics, lucerne or PRR in chickpeas.
- **Avoid poorly drained paddocks**. As well as direct effects from PRR and waterlogging, poorly drained paddocks compromise a plant's natural resistance to pathogens. This reduces the ability to manage foliar diseases with fungicides.
- **Paddock isolation**. Plant chickpeas at least 500 metres (further is better) from the previous year's chickpea paddocks.
- **Herbicide history**. Residues may increase susceptibility to disease. Observe the maximum plant-back period for residual herbicides.

PHOTO: KEVIN MOORE

Figure 6. Fungal weft of sclerotinia in the lower canopy of a chickpea crop. The disease produces a white mycelial growth, like cottonwool, that covers the infected tissue.

Control the green bridge

Volunteer chickpeas host AB, botrytis, sclerotinia, and PRR. Weeds and alternative crop hosts for botrytis, sclerotinia and PRR need to be killed and removed.

Stubble management

AB and botrytis can stay viable as long as infected stubble remains on the soil surface.

Burying stubble removes the ability of these pathogens to release spores and increases the rate of stubble breakdown.

Although burning chickpea stubble reduces inoculum, it does not ensure freedom from AB or botrytis when chickpeas are next grown in that paddock.

Stubble management is unlikely to have any beneficial effect on sclerotinia or PRR.

Exclude the pathogen

Seed quality

Planting seed should be high quality, irrespective of its source. Poor-quality seed can lead to:

- seed-borne diseases caused by AB and botrytis;
- poor establishment and crop performance;
- reduced plant vigour (which increases susceptibility to soil-borne and foliar pathogens);
- patchy, uneven plant stands (increases susceptibility to weeds, aphids and viruses);
- uneven and delayed crop maturity (resulting in problems with desiccation timing and mixed grain samples); and
- lower yields from a combination of the above.

Seed treatment

All seed, regardless of source, must be treated with a registered thiram-based fungicide prior to sowing.

These fungicides are very effective in reducing the risk from seed-borne ascochyta and botrytis.

Although metalaxyl-based fungicides are registered for the control of PRR, they are expensive and short-lived.

Hygiene

Pathogens such as AB, PRR and root lesion nematodes can be transmitted in stubble and soil, and on machinery and boots.

Soil and stubble can be moved by machinery, during windy and/or wet weather, and in floodwater.

If possible, clean headers and sowing equipment to remove grain, soil and stubble before moving from property to property. Spray rigs should also be cleaned to reduce the risk of disease transmission.

Protect the host

Variety

Current chickpea varieties in eastern Australia are susceptible to sclerotinia (both species) and botrytis. However, they differ in their susceptibilities to AB and PRR.

Disease reactions of individual varieties may vary with location, season and disease pressure.

Weather conditions affect the host (for example, stress) and the pathogen (for example, survival, multiplication and spread).

Varietal choice depends on location, disease risk, harvestability, yield and marketing options. Choose a variety with the highest levels of resistance to the major pathogens in your area.

Row spacing and density

Consider wider rows (50 centimetres to one metre) to increase air movement through the crop and lower humidity in the canopy. This reduces the number and duration of infection events for AB, botrytis and sclerotinia.

Wider rows are unlikely to have much impact on PRR and nematodes, but may reduce inter-row spread. They also reduce

TABLE 1 Disease resistance rating[A] of some chickpea varieties.

Variety	Ascochyta blight		Phytophthora root rot	Botrytis grey mould
	Foliage/stem	Pod		
Desi				
PBA Boundary[Φ]	MR[B]	S	S	S
PBA Pistol[Φ]	S	S	S	S
PBA HatTrick[Φ]	MR[B]	S	MR	S
Flipper[Φ]	MR-MS[B]	S	MS	S
Yorker[Φ]	MS	S	MR	S
Howzat[Φ]	S[B]	S	MS	MS
Jimbour	S	S	MS-MR	S
Kyabra[Φ]	S	S	MS	S
Moti[Φ]	S	S	MS	MS
Kabuli				
Genesis™ Kalkee	MS[B]	S	VS	S
Genesis™ 090	R	S	VS	S
Genesis™ 425	R	S	S	S
Almaz	MS[B]	S	VS	S

Note: In a season when repeated cycles of infection occur, such as 2010, even MR varieties can have yield-reducing levels of disease.
[Φ] Varieties displaying this symbol beside them are protected under the *Plant Breeders' Rights Act* 1994.
[A] National ratings as supplied by Pulse Breeding Australia (PBA) 2012: **R** – resistant, **MR** – moderately resistant, **MS** – moderately susceptible, **S** – susceptible.
[B] Note ascochyta blight ratings revised for these varieties 2012.

the impact of such diseases as plants are less likely to be stressed from lack of water in spring.

However; wider row spacings may limit yield potential in good seasons for crops that have a yield potential in excess of two tonnes per hectare.

Aim for plant populations of 20 to 30 plants per square metre. Lower densities reduce yield and increase the risk of viruses.

In-crop fungicides

There are no in-crop fungicides registered on chickpeas for PRR or sclerotinia, but several are registered for BGM and AB management.

Sprays need to be applied immediately prior to rain. Of the fungicides currently registered for AB, chlorothalonil is better than mancozeb under high disease pressure.

None of the fungicides currently registered for chickpea AB or BGM will stop established infections. They are protectants and have no curative activity. Consequently, it is critical that applications are timely and provide thorough coverage.

Fungicide control of AB

Detailed spray strategies have been developed for AB based upon the varietal reaction. However, the goal for all varieties is to prevent or delay establishment in the crop and then minimise its spread. In susceptible varieties like Jimbour or Kyabra[Φ], this is critical. In a year that favours AB, missing a fungicide spray can mean the difference between a profitable crop and crop failure.

For varieties with improved resistance such as PBA HatTrick[Φ] or PBA Boundary[Φ], the consequences of missing a spray in conducive seasons are less dire.

The pods of all varieties, regardless of the foliage resistance rating, are susceptible to AB infection.

Therefore, protective sprays will be needed if AB is present in the crop or neighbourhood once pod set has commenced. See Useful Resources for spray strategies in different varieties.

Fungicide control of BGM

If there is a risk of BGM, apply a registered fungicide immediately prior to canopy closure followed by another application two weeks later. If BGM is detected in a district or an individual crop, spray before the next rain event.

Varieties

Yield and marketability, along with disease resistance, are the major factors to consider in variety choice (See Table 1).

USEFUL RESOURCES

Pulse Breeders Australia
www.grdc.com.au/pba

Chickpea: Ascochyta blight management
www.pulseaus.com.au

Chickpea: Botrytis grey mould management
www.pulseaus.com.au

Chickpea: Integrated disease management
www.pulseaus.com.au

Chickpea – disease management
www.daff.qld.gov.au/26_4501.htm

Chickpea Disorders: the Ute Guide
www.grdc.com.au/GRDC-UteGuide-ChickpeaDisorders

FURTHER INFORMATION

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