NSW GOVERNMENT | Department of Primary Industries

Managing ascochyta blight in chickpeas in 2020

Questions have emerged on how to manage ascochyta blight, the most damaging disease of chickpeas, in 2020 after the prolonged drought. There is uncertainty over the disease status of paddocks and how the new fungicides with some curative activity fit into the management package.

Key points

- **Ascochyta persists on stubble through drought**. Disease inoculum for 2020 chickpea crops may have originated in 2017 or even 2016. If you can see intact chickpea stubble, assume that ascochyta is viable.
- **Understand disease risk for each paddock** – is it high or low (see *Paddock risk assessment* on page 2).
- Avoid planting chickpeas in the same paddock for at least three years or next to last year's chickpea crop.
- **Ascochyta is unlikely to cause widespread problems in 2020 unless it is wetter than average**. Inoculum levels have not increased in the past two seasons.
- **Control all volunteer chickpea plants** over summer/autumn. Ascochyta has been found in autumn 2020 on volunteers in paddocks that had chickpeas in 2019, even though no ascochyta was detected in those 2019 crops.
- **Test all seed for pathology, germination and vigour**.
- **Treat all planting seed with a registered fungicide**, applied properly and thoroughly as per label instructions.
- **High risk of ascochyta** – apply foliar fungicide ahead of the first post emergent rain event.
- **Low risk of ascochyta** - it is unlikely there will be a cost-benefit of applying a foliar fungicide to 2020 crops until after the disease is detected.
- **Do not rely on curative fungicide sprays** as part of your 2020 ascochyta management plan – aim to spray crops prior to rainfall events.
- **Monitor the crop 10 to 14 days after each rain event**.

The disease

The ascochyta pathogen survives and spreads in infected seed, stubble and on volunteers. Under ideal conditions, it can reproduce as fast as five to seven days. The disease can develop over a wide range of temperatures (5–30°C) and needs 3–10 hour of leaf wetness to infect. The disease develops quickest when temperatures are 15–25°C and humidity is high. **The longer the leaf wetness and higher the humidity the more severe the infection**.

It is not a soil borne pathogen and does not survive long in contact with or buried in the soil. The wetter and warmer the soil, the shorter the survival, perhaps less than one month in a wet summer.

The effects of the drought on chickpeas

Under drought conditions some plant pathogens survive longer than normal. Drought slows the breakdown of plant residues resulting in the disease inoculum levels not decreasing as expected and carrying over for more than one season.

Ascochyta inoculum for 2020 chickpea crops may have originated in 2017 or even 2016.

High risk: *ascochyta can develop quickly and kill large areas of crop, starting with a small patch as seen here.*

The number of bacteria antagonistic to soil-borne and stubble-borne pathogens declines in dry soil and this can reduce the bacteria's ability to reduce pathogen numbers.

Wind and dust storms can disperse ascochyta infected residue great distances and dust on plant surfaces can reduce efficacy of pesticides including fungicides.

Abandoned, or drought stressed crops still set seed. The good summer/autumn rains of 2019/20 may have resulted in large numbers of chickpea volunteers. These volunteers may host ascochyta, viruses and virus vectors along with other pathogens.

Paddock risk assessment

If you can see intact chickpea stubble assume that ascochyta is viable

High risk

Paddock

- Viable inoculum is known to be present
- Chickpeas have been grown in the last three years – 2017, 2018 or 2019

Seed

- Seed of unknown pathogen status
- Seed not properly treated with fungicide

Management

- Grow variety with the highest level of ascochyta resistance suitable for your area
- Treat all planting seed with a registered fungicide, applied properly
- Apply an ascochyta fungicide before the first post-emergent rain event
- Monitor the crop 10–14 days after rain

Low risk

Paddock

- No infected chickpea residue has entered the paddock: via header (which has previously harvested chickpeas), wind or surface water flow
- Chickpeas not grown for three years (after 2016)
- Chickpeas not grown in adjacent paddocks in 2019

Seed

- Seed tested for pathogens with nil detected
- Seed properly treated with fungicide dressing

Management

- Treat all planting seed with a registered fungicide, applied properly
- Regularly monitor crop throughout the season, especially 10–14 days after rain
- Apply foliar fungicide if ascochyta detected

Many growers will be using seed in 2020 that is a number of years old. It is vital to test this seed for both germination and vigour. Seed kept for a number of years may have decreased in weight. This needs to be taken into account as seed size affects sowing rate and early plant vigour, especially when sowing at depth.

Results from 2020 seed testing has shown:

- the older the seed the lower the germination; and
- seed treated with a thiram-based seed dressing prior to storage had lower germination than bare seed.

Seed-borne: *ascochyta blight survives in seed and can result in seedling death.*

Before you sow

Paddock selection

- Avoid planting chickpeas in the same paddock for at least 3 years.
- Avoid planting chickpea immediately next to last year's chickpea crop.
- Ensure volunteer and 'weed' chickpea plants are controlled.
- Know your paddock's risk rating.

Variety selection

Be sure what variety your seed is. A recent survey of chickpea seed revealed that nearly one third of seed sampled was not the variety the grower thought it was.

If you are sourcing seed from outside your region, e.g. interstate, be sure the variety is suitable for your farming system and the diseases that threaten your region.

In central Queensland, where the ascochyta risk is lower compared to southern regions, grow the highest yielding varieties but have an ascochyta plan in place. In most seasons in central Queensland there will be no cost-benefit of applying a fungicide before the disease is detected. When conditions favour ascochyta, a reactive foliar fungicide program and protective pod sprays are warranted.

See page 4 and 5 for details on chickpea variety characteristics.

Seed test

Test your seed for both germination and vigour with the Pulse Australia minimum standard for germination being 70%.

It is recommended that treated seed be 'test planted' into paddocks intended for chickpeas, and the number that emerge counted – this is your best indicator of seed and seedling vigour and may also identify herbicide residues.

Free seed testing for germination, vigour and pathology is available from NSW DPI.
Send seed samples to:
Dr Kevin J Moore, Tamworth Agricultural Institute
4 Marsden Park Rd, Calala NSW 2340

Seed fungicide treatment

All planting seed should be treated with a registered seed fungicide, **irrespective of seed age and origin**, to control seed-borne ascochyta (internal and external), seed-borne botrytis seedling disease (BSD) and protect seedlings from soil organisms that can reduce establishment and early vigour under less favourable conditions e.g. cold or wet soils, deep planting.

Seed fungicide treatment: Effective application of P Pickel T® (left) compared with poor application (right).

Research has shown that P-Pickel T® (thiram plus thiabendazole), and products containing thiram only (e.g. Thiram® 600) are equally effective against ascochyta.

Follow label directions, use recommended rate and ensure good coverage of seed is achieved.

In crop

Begin monitoring as soon as the crop is out of the ground. If ascochyta is detected, apply a registered fungicide before the next rain event.

Prevention is important during the reproductive stage as the disease on pods causes seed abortion, seed infection and seed defects, and would not be suitable as planting seed for the following season.

In-crop fungicides fall into two use patterns, preventive or curative.

Preventative fungicides include active ingredients such as chlorothalonil and macozeb:

- Preferred products in-crop, being the most reliable and cost effective. They provide excellent protection when applied before rain with good coverage and high water volumes – see label for directions.
- Chlorothalonil and mancozeb are persistent and rain fast (up to 50 mm rain in 10 minutes).
- Expect several weeks control on sprayed plant tissue, but no control on new growth as they have little systemic movement through the plant.
- Veritas ® and Aviator® Xpro ® have excellent preventative activity, but no more than chlorothalonil and are much more expensive.

Chickpea variety ratings for common chickpea diseases in Australia

Variety	Ascochyta blight[1]	Phytophthora root rot[2]	Botrytis grey mould[3]	Virus[4]	Root-lesion nematode (*Pratylenchus thornei*)		Root-lesion nematode (*Pratylenchus neglectus*)	
					Resistance[5]	Tolerance[6]	Resistance[7]	Tolerance[8]
Desi types								
Ambar	MS	VS	S	–	MS	–	MR–MS	–
Jimbour	S	S	S	S	S	T	MR (p)	T
Kyabra	VS	S	S	S	VS	–	MR–MS	–
Neelam	S	VS	S	–	MS	–	MR–MS	–
PBA Boundary	MS	VS	S	S	MS	–	R–MR (p)	–
PBA Drummond	S	S	S	MS	MR–MS (p)	–	MR (p)	–
PBA HatTrick	MS	MR	S	S	MR–MS	–	MR–MS	–
PBA Maiden	MS	VS	S	S	MR–MS	–	MR–MS	–
PBA Seamer	MR	MR	S	S	MR–MS	–	MR–MS	–
PBA Slasher	MS	VS	S	S	MR–MS	–	MR–MS	–
PBA Striker	S	VS	S	S	MR–MS	–	MR–MS	–
Kabuli types								
Almaz	MS	VS	S	S	VS	T	MR–MS	–
Genesis™ 090	R–MR	VS	S	S	MS	T	MR–MS	–
Genesis™ Kalkee	MS	VS	S	S	MS	–	MR–MS	–
PBA Monarch	MS	VS	S	S	MS–S	–	MR–MS	–
PBA Royal	MR	VS	S		MS	–	MR	–

Source: NVT chickpea national disease ratings.

– No data; (p) provisional data based on limited trial assessment

R Resistant; MR Moderately resistant; MS Moderately susceptible; S Susceptible; VS Very susceptible; T Tolerant; MI Moderately intolerant; I Intolerant

[1] *Ascochyta* ratings are for northern Australia (NSW) only, not southern Australia (Vic & SA).

[2] Ratings are a compilation of NSW (Tamworth) and Qld (Warwick) data.

[3] The risk of botrytis grey mould (BGM) damage can be affected by the spray programs for ascochyta blight (AB); fungicides used to control *Ascochyta* can also control *Botrytis*. Note that if BGM risk is high, then a fungicide with greater efficacy for BGM than for AB might also be needed. BGM screening is conducted in a controlled environment and rating is independent of plant architecture.

4 Virus ratings could change with different virus species predominating in different areas.

5 Resistance measures the plant's ability to resist disease. Tolerance measures the plant's ability to yield at a given disease level. Tolerant varieties, while potentially yielding well, are unlikely to reduce nematode numbers for following crops.

Chickpea variety characteristics

Variety	Plant height	Lodging resistance	100 seed weight (g)	Maturity	North Yield as a % of PBA HatTrick 2015–2019		South Yield as a % of PBA Slasher 2015–2019	
					East 1.69 t/ha	West 1.48 t/ha	East 1.40 t/ha	West 1.70 t/ha
Desi types								
Ambar	MS	VG	16	E	n.d.	n.d.	88 (5)	85 (3)
Jimbour	T	VG	20	M	100 (12)	100 (26)	n.d.	n.d.
Kyabra	T	VG	26	M	103 (12)	101 (26)	n.d.	n.d.
Neelam	MT	VG	17	M	n.d.	n.d.	98 (7)	96 (4)
PBA Boundary	T	M	19	M	105 (12)	104 (26)	90 (7)	89 (4)
PBA Drummond	T	VG	22	E–M	120 (3)	119 (6)	n.d.	n.d.
PBA HatTrick	T	M	20	M	100 (12)	100 (26)	93 (7)	92 (4)
PBA Maiden	MS	M	24	M	n.d.	n.d.	94 (7)	96 (4)
PBA Seamer	M	VG	23	M	106 (12)	106 (26)	91 (7)	89 (4)
PBA Slasher	MS	M	18	M	n.d.	n.d.	100 (7)	100 (4)
PBA Striker	MS	M	21	E	n.d.	n.d.	97 (7)	101 (4)

Variety	Plant height	Lodging resistance	100 seed weight (g)	Maturity	Yield as a % of Almaz 2015–2019		Yield as a % of Genesis 090 2015–2019	
					East 2.20 t/ha	West 1.30 t/ha	East 1.62 t/ha	West n.d.
Kabuli								
Almaz	MT	G	41	L	100 (7)	100 (13)	92 (5)	n.d.
Genesis™ 090	M	G	30	M–L	102 (7)	114 (13)	100 (5)	n.d.
Genesis™ Kalkee	T	VG	45	L	96 (7)	93 (13)	90 (5)	n.d.
PBA Monarch	M	F	42	E	100 (7)	109 (13)	95 (5)	n.d.
PBA Royal	M	F	38	E-M	103 (7)	109 (13)	95 (5)	n.d.

Yield results are a combined-across-sites analysis using NVT and PBA data from 2015–2019
Number of trials in brackets ( )
n.d. = no data

Plant height: T tall; MT medium–tall; M medium; MS medium–short

Lodging resistance: VG very good; G good; M moderate; F fair

Maturity: E early; M medium; L late

Scenario

Low risk chickpea paddock. Ascochyta is detected 7 to 14 days after a rainfall event. Apply a preventative fungicide prior to next rainfall event. There is no need for a curative spray. The disease level is likely to be low but this crop is now **high risk**.

Fungicides with preventative and curative activity include products such as Aviator® Xpro® (prothioconazole + bixafen) and Veritas® (tebuconazole + azoxystrobin):

- Post-infection or salvage applications should not be considered part of a grower's standard ascochyta management program – they should only be used if a spray is missed.
- These fungicides are much more expensive than chlorothalonil and no more effective when applied as preventatives.
- Both products have good rainfast qualities.
- Both Veritas® and Aviator® Xpro® labels state a maximum of two applications of each in any one season
- Veritas® and Aviator® Xpro® need to be applied within 48 hours of rain starting for maximum curative benefit and no later than72 hours of rain starting for any benefit. Restrictions for both apply to seasonal use patterns (refer to labels).
- Aviator® Xpro® cannot be applied after late flowering.
- Veritas® can be applied at any growth stage.
- Expect several weeks control on sprayed plant tissue, but new growth will not be protected as they have little systemic activity.

What to do if disease found in the paddock

If crops are infected with ascochyta, all varieties will recover well if dry conditions persist.

If disease is detected and you spray with a curative product, move back to a preventative fungicide regime before the next rainfall event.

Changes in the pathogen

The ascochyta fungus is evolving with more aggressive isolates contributing to an increased susceptibility of all cultivars. This change in virulence aggressiveness has occurred in Victoria, South Australia, New South Wales and Queensland. Selection pressures are being applied through both environmental and farming practices. Slowing the rate of pathogen evolution can be achieved by adhering to recommendations of crop rotation and fungicide use. The higher frequencies of aggressive isolates have resulted in increased disease severity on broadly grown cultivars, including on PBA Boundary$^{\Phi}$ and PBA HatTrick$^{\Phi}$.

No chickpea variety is immune to ascochyta infection. The varieties with a higher-ratings simply have improved levels of resistance, meaning the disease takes longer to go through a cycle and/or the variety sustains less damage. Changes in the pathogen will continue to occur and isolates will appear in farmers crops that cause more damage on varieties with improved resistance. The good news is there is no evidence that these more aggressive isolates are any harder to manage than the older ones and the current recommendations will be just as effective on these "new" isolates as on the "older" ones.

Other diseases

Phytophthora root rot (soil borne) and *sclerotinia* (seed, soil and air borne) are considered **moderate to high risk** in 2020. Although inoculum loads are unlikely to have increased, their survival will have been prolonged by dry conditions. The pathogens survive in tough thick-walled resting structures (oospores and sclerotia, respectively) in roots and soil, on volunteers and other leguminous hosts.

Botrytis seedling disease (BSD, seed borne) is only likely in crops planted with seed produced in the 2016 (and possibly 2017) crop year. 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), *Pratylenchus thornei*, are soil borne and 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 were high (40/g) in the 2016 season. Even starting numbers of 10/g soil still need a break of 30 months.

Viruses are an unknown threat after a drought. Most need a green bridge of chickpeas or other plants for survival or as hosts for virus vectors. Some viruses can be seed borne. Vectors can fly or be blown in from regions that have not experienced drought; as such viruses are still a risk to 2020 crops.

Further reading

"Why adhering to integrated *Ascochyta rabiei* management strategy is now more important than ever to sustain a profitable chickpea industry" Rebecca Ford (Griffith Uni), Kevin Moore (NSW DPI), Prabhakaran Sambasivan (Griffith Uni), Yasir Mehmood (Griffith Uni), Kristy Hobson (NSW DPI), Christine Walela (SARDI Clare), Jason Brand (DEDJT Horsham) and Jenny Davidson (SARDI Urrbrae)

"Managing chickpea diseases after the drought". Kevin Moore, Steve Harden, Kristy Hobson and Sean Bithell (NSW DPI).

"How long does it take to reduce Pratylenchus thornei (root lesion nematode) populations in the soil?" Jeremy Wish (CSIRO) and John Thompson (University of Queensland).

Further information

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