GRDC GROWNOTES™

NORTHERN REGION

AUGUST 2017

TIPS & TACTICS

MANAGING FABA BEAN DISEASES

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Monitor for rust and chocolate spot, the two main fungal diseases in the region

The best defence is to plant resistant varieties. Monitor often, particularly after rain events, and apply fungicide if required.

New threats to faba beans may emerge so it is important to also be vigilant for changing disease risks. Even with newer varieties that are more disease-resistant, growers need to actively monitor and manage disease risks.

Photo 1: Chocolate spot is a major risk to faba beans in the Northern Region.
Source: Joop van Leur, NSW DPI

KEY POINTS

- Determine which diseases are the highest priority for your area and sow a variety that is resistant to those diseases wherever possible.
- The major risks to faba beans are rust, chocolate spot (Photo 1) and viruses, particularly Bean leafroll virus (BLRV).
- Stemphylium blight (*Stemphylium* spp.) emerged as a severe disease during 2016. Stemphylium is usually considered a minor disease in Australia.
- Faba beans can need up to five fungicide applications during a season that favours disease.
- Be aware of fungicide restrictions: a number of fungicides have restrictions on spray intervals, maximum applications per season and withholding period prior to harvest. Always check the label.

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Disease risks in the Northern Region

Faba bean (*Vicia faba*) is gaining popularity in the Northern Region. Although the area sown to winter pulses in Queensland (Qld) has increased over the last three years, there have been many challenges for growers with erratic seasonal conditions and a range of disease pressures on yield and quality.

The major risks to faba beans in the Northern Region are rust, chocolate spot and viruses (particularly BLRV). Stemphylium blight has emerged as a potentially significant ongoing threat (*see Stemphylium blight: severe threat in 2016, page 4*). Cercospora leaf spot is a minor risk.

While Ascochyta blight is a major concern in the Southern Region, in the Northern Region only the southern (irrigated) faba bean areas of New South Wales (NSW) are considered to be at risk. A new strain was discovered in the Southern Region in 2015 so growers should monitor to see where it spreads.

Determine which diseases are the highest priority for your area and sow a variety that is resistant to those diseases wherever possible.

Major diseases: most important to monitor and manage

Rust (*Uromyces fabae*)

Photo 2: Bean rust shows as orange 'bumps' on leaves.
Source: Joop van Leur, NSW DPI

With early-sown beans, rust infection (Photo 2) can occur at early emergence when temperature and rainfall conditions are suitable for its spread.

Later-sown beans may not get infected until spring, when temperatures, moisture and humidity are high.

Where rust appears early in the season followed by warm and frequent rain events, foliar fungicide application may be required. In disease-favourable seasons, a prophylactic Mancozeb spray prior to canopy closure is recommended (Table 1). This will be effective for both rust and chocolate spot.

Chocolate spot (*Botrytis fabae*)

Photo 3: Chocolate spot on leaves.
Source: Joop van Leur, NSW DPI

Photo 4: Chocolate spot on flowers.
Source: Joop van Leur, NSW DPI

Chocolate spot occurs in faba beans and some other crops (lentils, vetch) and can cause early exposure of the beans leading to staining. This disease is usually not a significant problem in the Northern Region; however, it can be a problem in wet and humid years.

Chocolate spot is more likely to occur in bulky crops after canopy closure. The critical stage for the first inspection will be just before the commencement of flowering, as temperatures begin to increase, and then regularly through the flowering and seed filling period. Lesions occur on leaves and flowers first, but can occur on stems and pods. Flower abortion and drop can occur.

Symptoms first appear as small brown spots on leaves (Photo 3) and flowers (Photo 4), which then rapidly develop into large, irregularly shaped lesions on leaves and decay of flowers if conditions remain favourable.

Chocolate spot requires high leaf moisture or humidity (>70%) within the crop canopy and optimal temperatures of 15–28°C. When humidity levels decrease or maximum daily temperature exceed approximately 28°C, infection levels decline sharply.

More regular crop monitoring and protection may also be required in high risk situations such as:

- immediately adjacent to last year's crop
- non-optimal paddock selection (e.g. waterlogging)
- high disease pressure in the previous season
- susceptible variety sown
- short rotation.

If the disease is detected apply Mancozeb at the recommended rate. This will minimise the pressure of chocolate spot as well as rust. Carbendazim and Procymidone (registered in NSW but not in Qld; refer to Table 1 and Sumisclex label) are more active against chocolate spot and preferable with high chocolate spot pressure, but will not control rust.

Minor diseases: not usually a problem

Ascochyta blight (*Ascochyta fabae*)

Photo 5: Typical Ascochyta blight lesion.
Source: SARDI

This strain of Ascochyta is faba bean-specific and is the main cause of seed discolouration in faba beans. Ascochyta blight is not usually a problem in northern NSW and southern Qld.

The initial symptoms will be lesions on the leaves and stems of young plants (Photo 5). A distinguishing feature is fungal fruiting structures (small black dots) visible within the centre of lesions.

Monitoring should commence 2–3 weeks after emergence, or 10–14 days after a rain event. This is to allow time for disease expression after an infection event, such as transmission from infected seed or rain-splashed inoculum. Infected seedlings may deteriorate quickly and affected plant parts above the lesion may break off, making symptoms difficult to detect.

Timing is critical! After the initial inspection, inspect crops every 10–14 days after a rain or heavy dew event. During dry periods, inspections can be less frequent. When monitoring, look for signs of lesions on leaves, or if severe, wilting in upper foliage or small areas of dead or dying plants. If present, examine individual affected plants for symptoms of infection. This method will allow more of the crop to be inspected than a plant-by-plant check.

Mancozeb fungicide may be needed, or a combination with others (Table 1).

Cercospora leaf spot (*Cercospora zonata*)

Photo 6: Cercospora leaf spot symptoms are similar to those of Ascochyta blight and chocolate spot.
Source: SARDI

Cercospora leaf spot (Photo 6) is predominantly a soil-borne disease but it can also infect pods and seeds. Cercospora is thought to survive on bean trash and its spores are probably spread by rainsplash.

Cercospora leaf spot monitoring must start 2–3 weeks after emergence, or within 4–6 weeks of sowing. This is particularly important where faba beans have been grown in the paddock in recent years or there has been quite a few beans grown in that paddock over time.

Protective fungicide needs to be applied before or at first signs of Cercospora lesions, or within the monitoring timeline, irrespective of symptoms when disease risk is high. Subsequent monitoring should occur when checking for chocolate spot prior to and during flowering and podding.

Viruses and other diseases to be aware of

The major viruses in faba beans are:

- Bean leafroll virus (BLRV); the most significant faba bean virus in Australia's northern grain region (Photo 7)
- Beet western yellows virus (BWYV)
- Bean yellow mosaic virus (BYMV) (Photo 8)
- Subterranean clover stunt virus (SCSV)
- Pea seed-borne mosaic virus (PSbMV) (can cause seed staining)
- Broad bean stain virus (BBSV) (can cause seed staining).

Other diseases/pathogens that can affect faba beans include:

- Sclerotinia stem rot, a soil-borne disease can constitute a risk for up to 10 years
- Rhizoctonia
- Stem and *Pratylenchus* nematodes can affect crop performance and yield and once they have occurred can constitute a risk for up to 10 years.

Photo 7: Bean leafroll virus (BLRV) in NSW DPI Liverpool Plains Field Station near Breeza
Source: Joop van Leur, NSW DPI

Photo 8: Bean yellow mosaic virus (BYMV). Faba beans develop vein yellowing, yellow banding and dark green islands. Symptoms are more prominent on young leaves.
Source: Joop van Leur, NSW DPI

STEMPHYLIUM BLIGHT: SEVERE THREAT IN 2016

There were reports of unusually high incidences of Stemphylium blight (*Stemphylium* spp.) in 2016. The 2016 season was very wet and the disease is unlikely to become a major issue during normal years. Stemphylium blight is generally considered a minor disease in Australia. It is characterised by large grey-black necrotic lesions on the leaves only, often starting from the leaf edge (Photo 9). It looks very different from chocolate spot, which appears as discrete, red-brown lesions after extended periods of wetness. Research is ongoing into which varieties are most susceptible but early reports suggest that PBA Warda$^{\phi}$ is more susceptible to Stemphylium blight than other varieties including the newest variety PBA Nasma$^{\phi}$.

Photo 9: Stemphylium blight causes large grey-black necrotic lesions on the leaves of the plant. Note that it is very different to chocolate spot, which causes red-brown lesions. Source: Joop van Leur, NSW DPI

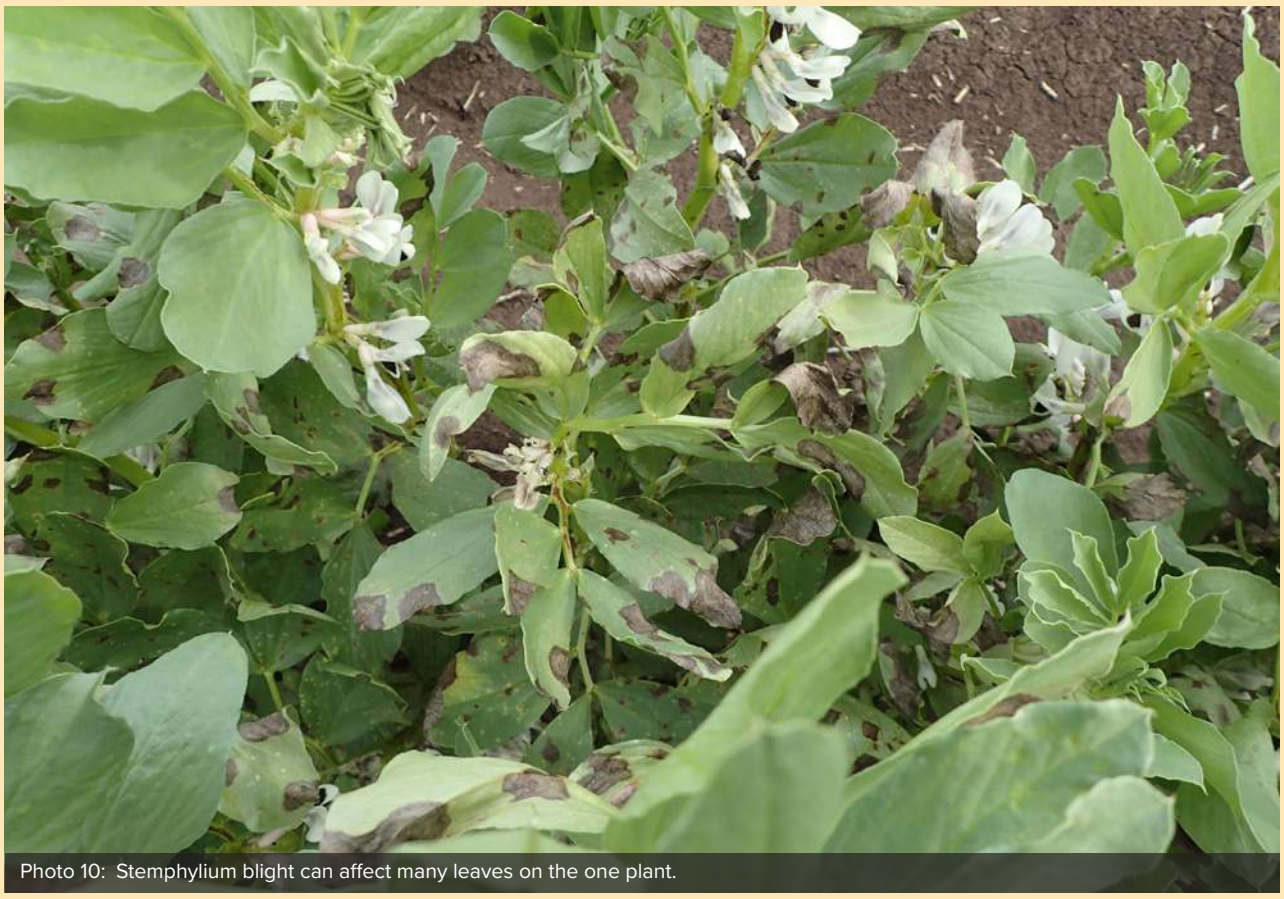

Photo 10: Stemphylium blight can affect many leaves on the one plant.

New advice on fungicide controls for faba diseases in the Northern Region

If 2017 provides good sowing conditions with adequate rainfall during the grain fill period, it is highly recommended that growers spray bean crops to prevent fungal diseases.

Fungicide treatments at the 6-week and 15-week growth stages to minimise rust and chocolate spot will help to maximise yield and harvest of disease-free seed.

There are a few different choices of fungicides to use in faba beans (Table 1). Before deciding which treatment to use review the chemical's registration status, rate of application, withholding period, occupational health and safety issues, residues and off-target effects. This information is available from the Australian Pesticides and Veterinary Medicines Authority (APVMA) and the relevant manufacturer.

Table 1: Fungicide choices for use in faba beans.

Critical period	Primary disease target	Plus secondary target	Fungicide choices*	Comments
First critical period Early vegetative (5–8 weeks after emergence)	Chocolate spot	–	Carbendazim; Chlorothalonil; Copper oxychloride; Mancozeb; Metiram; Procymidone (registered in NSW but not Qld)	Early fungicide application is critical to restrict early development and spread of disease. Cercospora spot is often first disease to appear. Early chocolate spot control can be important in early-sown crops. Rust could be an early target in early sown crops as well. Use the lower rate on crops <20 cm in height. Use the higher rate for dense crops or if disease pressure is severe.
	Rust	–	Chlorothalonil; Copper oxychloride; Mancozeb; Metiram	
	Stemphylium blight	–	None registered	
	Ascochyta blight	–	Mancozeb; Metiram; Azoxystrobin + Tebuconazole (under permit 84310 to 30/11/17); Prothioconazole + Tebuconazole (under permit 84415 to 30/11/17); Cyprodinil (under permit 84461 to 30/11/17)	
	Cercospora leaf spot	–	Tebuconazole (under permit 13752 to 30/6/19); Metiram	
	Cercospora leaf spot	Chocolate spot	Tebuconazole (under permit 13752 to 30/6/19 for Cercospora only) + Mancozeb; or Carbendazim (registered for chocolate spot only); Metiram	
	Rust	Chocolate spot	Mancozeb; Chlorothalonil; Metiram Tebuconazole (under permit 13752 to 30/6/19)	
	Cercospora leaf spot	Ascochyta blight	Tebuconazole (under permit 13752 to 30/6/19 for Cercospora only); Mancozeb; or Metiram	
	Ascochyta blight	Cercospora leaf spot	Tebuconazole (under permit 13752 to 30/6/19 for Cercospora only) + Mancozeb; Metiram	
Second critical period Pre canopy closure, during flowering (13–16 weeks after emergence through flowering)	Chocolate spot	–	Carbendazim; Chlorothalonil; Copper oxychloride; Mancozeb; Metiram; Procymidone (registered in NSW but not Qld)	Early- to mid-flowering protection before the disease establishes is recommended and before canopy closure. Faba plants often produce a lot of biomass, which can affect penetration of the crop in the canopy and reduce the efficacy of fungicides. Protection of flowers to assist pod set is important. If Ascochyta blight is detected, and/or chocolate spot appears in the upper third of the crop canopy, and rain or high humidity are likely, then apply fungicide if crop has sufficient yield potential.
	Rust	–	Chlorothalonil; Copper oxychloride; Mancozeb; Metiram	
	Ascochyta blight	Chocolate spot	Mancozeb; Metiram; Chlorothalonil (registered for chocolate spot only)	
	Chocolate spot	Ascochyta blight	Carbendazim; Chlorothalonil (both are registered for chocolate spot only); Procymidone (registered for chocolate spot only; registered in NSW but not Qld) + Mancozeb; Metiram	
	Chocolate spot	Cercospora leaf spot	Metiram; Carbendazim; Chlorothalonil (both are registered for chocolate spot only); Procymidone (registered for chocolate spot only; registered in NSW but not Qld) + Tebuconazole (under permit 13752 to 30/6/19 for Cercospora only)	
Third critical period Late flowering to end of flowering when pods are filling (15–20 weeks after emergence)	Chocolate spot	–	Carbendazim; Metiram; Chlorothalonil; Procymidone (registered in NSW but not Qld)	Observe all withholding periods. If Ascochyta is detected, rain is likely, or new spots of chocolate spot appear or are likely to appear on unprotected leaves on the upper third of the plant, then apply or re-apply fungicide if the crop has sufficient yield potential.
	Rust	–	Chlorothalonil; Copper oxychloride; Metiram	
	Ascochyta blight &/or rust	Chocolate spot	Mancozeb; Metiram; Chlorothalonil (registered for rust and chocolate spot only)	
	Chocolate spot	Ascochyta blight &/or rust	Carbendazim (registered for chocolate spot only), Chlorothalonil (registered for chocolate spot and rust only); Procymidone (registered for chocolate spot only; registered in NSW but not Qld) + Mancozeb; Metiram	

*Note that Metham is an alternative to Mancozeb. Where there is both a primary disease target and a secondary disease target, extra fungicides are listed where they are registered for both target diseases. Other fungicides may be able to be used for one target or the other so it is important to check with APVMA.

Source: Adapted from Pulse Australia (2016b) by Protech Consulting

Key strategies to monitor and manage diseases

Use this monitoring process

The two main fungal diseases that Northern Region growers should monitor for are rust and chocolate spot.

This monitoring process allows growers to assess the presence or impact of diseases, weeds or plant disorders.

Growers should monitor a range of locations (ten are recommended) in the paddock, preferably following a 'V' or 'W' pattern (Figure 1).

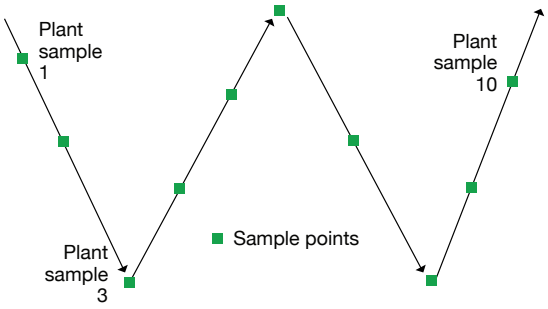

Figure 1: Sampling pattern recommended for surveying and sampling plants to monitor disease.

Management actions to reduce disease risks and impacts

The risk and impact of diseases on yields can be reduced through:

- Selecting appropriate varieties. Aim for resistant varieties wherever possible (Table 2).
- Good paddock placement. Aim for separation of at least 500 m from stubble of same pulse from previous year and consider the history of other diseases; some can remain in soil for up to ten years.
- Effective on-farm hygiene, including: reducing last year's stubble; being careful not to cause mechanical damage e.g. from traffic or herbicide; not moving soil.
- Using seed from crops with low levels of disease. Note that seed dressing for disease control is not recommended for faba bean; however, in high BLRV risk situations a dressing with the insecticide imidacloprid can be used.
- Sowing during the optimum sowing window (avoid early sowing).
- Sowing for optimum plant population.
- Strategic use of in-crop fungicides. Disease-resistant varieties do not require the intense regular foliar fungicide program that susceptible varieties need to control foliar diseases (Refer to Tables 1 and 2).
- Controlling aphids. This may reduce the spread of viruses but it will not eliminate them. Protective insecticide treatments are unlikely to be successful if applied strategically, or economic if applied regularly. Usually the virus spread has occurred by the time the aphids are detected.

Table 2: Faba bean variety ratings for the common bean diseases in Australia.

VS: very susceptible; S: susceptible; MS: moderately susceptible; MR: moderately resistant; R: resistant.

Variety	Ascochyta blight		Chocolate spot	Rust	Cercospora leaf spot	PSbMV Seed staining
	Foliage	Seed				
Ascot VF	R	R	VS	S	S	–
Aquadulce	MS	MS	MS	MS	S	MS
Cairo ◊	VS	VS	VS	MS	–	–
Doza ◊	VS	VS	MS	MR-R	S	–
Farah ◊	MR-R	MR-R	S	S	S	S
Fiesta VF	MS-MR	MS	S	S	S	S
Fiord	MS	MS	VS	S	S	S
Icarus	VS	VS	MR	MR	–	–
Manafest	VS	VS	MS	MS	–	–
Nura ◊	MR-R	MR-R	S	MS	S	VS
PBA Kareema ◊	MR-R	MR-R	MS	MS-MR	S	
PBA Nasma ◊	S	S	MS	MR-R	S	–
PBA Rana ◊	R	R	MS	MS-MR	S	MR-R
PBA Warda ◊	S	S	MS	MR-R	S	–

Adapted from: Pulse Australia, 2016a, 2016b.

WHY DO DISEASE IMPACTS VARY FROM SEASON TO SEASON?

A plant disease may be devastating at certain times and yet, under other conditions, it may have little impact. Diseases can reduce yield and can potentially lead to total crop failure. Diseases also cause seed staining, which can result in downgrading of the bean and reduced profit. In addition, if a plant is suffering disease it is less likely to survive waterlogging. The interaction of host, pathogen and environment are all critical points in disease development, and all can be represented by the classical disease triangle (Figure 2).

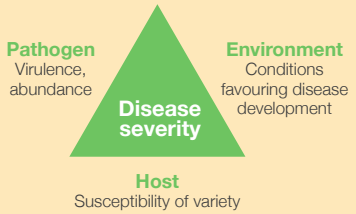

Figure 2: The fungal disease triangle. Source: Agrios 1988

AT A GLANCE: TWO RECOMMENDED NORTHERN VARIETIES

PBA Nasma ⏀ was released in 2015 by Pulse Breeding Australia as an alternative to PBA Warda ⏀ in northern NSW and southern Qld. PBA Nasma ⏀ and PBA Warda ⏀ offer better disease resistance than previous varieties (Table 3). Find out more from Pulse Australia.

Table 3: Resistance and tolerance of PBA Nasma and PBA Warda to the most common Northern Region diseases (rust and chocolate spot) and virus (BLRV).

Disease/virus	PBA Nasma ⏀	PBA Warda ⏀
Rust	Moderately resistant to faba bean rust, slightly less than PBA Warda ⏀. For northern NSW and southern Qld, this level of resistance will provide adequate protection against rust and there will be no or minimal yield loss in most seasons.	Moderately resistant to resistant (equivalent to Doza ⏀).
Chocolate spot	Moderately susceptible.	Moderately susceptible.
BLRV	Moderately tolerant. Good yields have been obtained in the presence of severe BLRV pressure.	Moderately tolerant. Good yield has been obtained in the presence of severe BLRV pressure. It has a higher level of tolerance to BLRV than Doza ⏀.

Source: Adapted from Pulse Australia's variety management packages (Pulse Australia, 2016a).

FAQs

How should I plant faba beans to reduce risk of disease?

Research has shown that in the north, no-till winter pulse crops sown into standing cereal stubble consistently yield higher than those planted into conventionally prepared or reduced tillage seedbeds (GRDC 2016). Standing cereal stubble helps deter aphids (which can transmit viruses) during the early vegetative stage of the crop.

How are viruses transmitted?

Viruses differ from most fungal diseases in that they infect plants systematically and no curative treatment is available. Virus infection levels depend on seasonal conditions, particularly aphid activity, and differ greatly between years and locations. Early infection can lead to stunting, reduced tillering and plant death and losses can be high. Late infections have less impact, but can still affect seed quality.

Pulse viruses are transmitted by insects, either in a persistent way (meaning the insect remains infectious for its whole life) or non-persistent way. Persistently transmitted viruses include: BLRV, BWYV, SCRLV and SCSV (Photo 11).

Imidacloprid (e.g. Gaucho 600 Red Flowable) is registered and when applied as seed treatment will help protect faba bean, field pea and lentil seedlings from early season aphid attack and reduce virus spread.

How can I test for viruses?

Where you suspect virus symptoms, contact NSW DPI at Tamworth to have samples of your crops tested. NSW DPI accepts samples from across the Northern Region and uses Tissue blot immunoassay (TBIA), an efficient way to detect and identify a range of virus species in faba beans. For routine detection of viruses, TBIA has advantages over enzyme-linked immunoassays (ELISA); the cost is much less and the number of plants that can be processed is higher compared to ELISA. ELISA is more suited to test pooled samples (e.g. testing for seed transmitted viruses) and can even be used to detect the presence of virus in the aphid vectors.

My seed has been treated with a fungicide or an insecticide, how will it affect rhizobia inoculation?

It is important to plant the seed within 24 hours of inoculation with a rhizobia inoculant. This is because seed treatments (and other environmental factors) make the rhizobia inoculant less effective. For more information see the Tips and Tactics: Legumes and Nitrogen Fixation fact sheet, https://grdc.com.au/tt-legume-n-fixation.

Photo 11: Subclover stunt virus (SCSV) in faba bean. The symptoms are quite similar to that of BLRV, however it is a completely different virus group, so a proper diagnostic test is required. Source: Joop van Leur, NSW DPI

USEFUL RESOURCES

GRDC (2014) GrowNotes: Faba beans (north), GRDC, July 2014, https://grdc.com.au/Resources/GrowNotes

GRDC (2016) Sowing faba beans in the north (2016), GRDC Radio episode 114, https://grdc.com.au/Media-Centre/GRDC-Podcasts/Northern-Weekly-Update/2016/04/114-north

GRDC (2017) PBA Varieties and Brochures, https://grdc.com.au/research/trials,-programs-and-initiatives/pba/link3.aspx

GRDC (2017) Faba bean disease management update, GRDC Update Paper, https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2017/02/faba-bean-disease-management-update

CropPro (2015) Identification & Management of Field Crop Diseases in Victoria - Updated October 2015, 'Diseases in Pulses: Faba Beans' chapter, http://www.croppro.com.au/crop_disease_manual/ch06.php

Pulse Australia (2015) Managing viruses in pulses, http://www.pulseaus.com.au/growing-pulses/publications/manage-viruses

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GN Agrios (1988) Plant Pathology, 3rd. ed. Academic Press, Inc., New York, 803pp.

GRDC (2016) Establishing winter pulses in the northern region, https://grdc.com.au/archive/key-issues/establishing-winter-pulses-in-the-northern-region/details

Pulse Australia (2016a) Faba bean production: northern region by Pulse Australia, http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean/northern-guide

Pulse Australia (2016b) Faba bean: Integrated disease management, Australian Pulse Bulletin, 15 January 2016, http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean/idm-strategies

GRDC PROJECT CODE

DAN00176; Northern NSW Integrated Disease Management

UA00127 PBA Australian faba bean breeding program (2011–2015)

DAN00202: New tools and germplasm for Australian pulse and oil seeds breeding programs to respond to changing virus threats

MORE INFORMATION

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