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GRDC GROWNOTES™

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

FABA BEAN

SECTION 2

PRE-PLANTING

FABA BEAN TYPES | CHOOSING A VARIETY | FABA BEAN VARIETIES | SEED QUALITY | HANDLING BULK SEED | SEED TESTING

Pre-planting

Key messages

- Faba beans have large flat seeds, which are predominantly a beige or buff colour.
- Colour, size, shape and texture are important attributes in the marketability of faba beans.
- Faba beans prefer well-drained loam to clay soils with a pH in the range of 5.4–8.0.
- When choosing varieties, consider their susceptibility to chocolate spot, Ascochyta and rust.
- PBA Samira⍰ is a high-yielding variety with widespread adaption and is the variety of choice in south-eastern WA.

2.1 Faba bean types

The *Vicia faba* varieties grown in Australia can be divided into two types: the smaller, faba bean types, and the larger, broad bean types. This large-seeded bean is well adapted to higher-rainfall areas because of its higher yield potential, better disease and waterlogging tolerance, and virtue of being able to attract higher prices. [1]

2.2 Choosing a variety

When choosing varieties to grow, consider their susceptibility to chocolate spot, Ascochyta blight and rust, along with yield potential, price potential, marketing opportunities, maturity timing, lodging resistance and other agronomic features relevant to the growing region. [2]

Faba bean varieties are bred for a range of environments. Hence, individual varieties have specific areas of adaptation for maximising yield and reliability. Specific adaptation of a variety depends on rainfall, geography, temperatures, disease pressure, and soil types at the site of cropping.

The national pulse production area has been categorised by Pulse Breeding Australia (PBA) into five regions based on rainfall and geographic location (see Figure 1 below):

- Region 1, low rainfall, tropical
- Region 2, medium rainfall, subtropical
- Region 3, low rainfall, subtropical
- Region 4, medium–high rainfall, Mediterranean–temperate
- Region 5, low–medium rainfall, Mediterranean–temperate

The regions cross state borders, and are target zones for national breeding and variety evaluation. Breeding trials and NVT results help to indicate specific adaptation even within a region. Some variety releases have been specific for northern Australia (e.g. Doza⍰ and PBA Warda⍰). Other varieties have been found to be better adapted to specific parts of regions (e.g. PBA Rana⍰ and PBA Kareema⍰ in southern high-rainfall areas).

The area of adaption is specified for each variety so that potential users are aware of the best fit. [3]

1 Pulse Australia (2016) Faba bean production: southern and western region. http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean/southern-guide#australian-industry

2 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 3–Varieties.

3 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 3–Varieties.

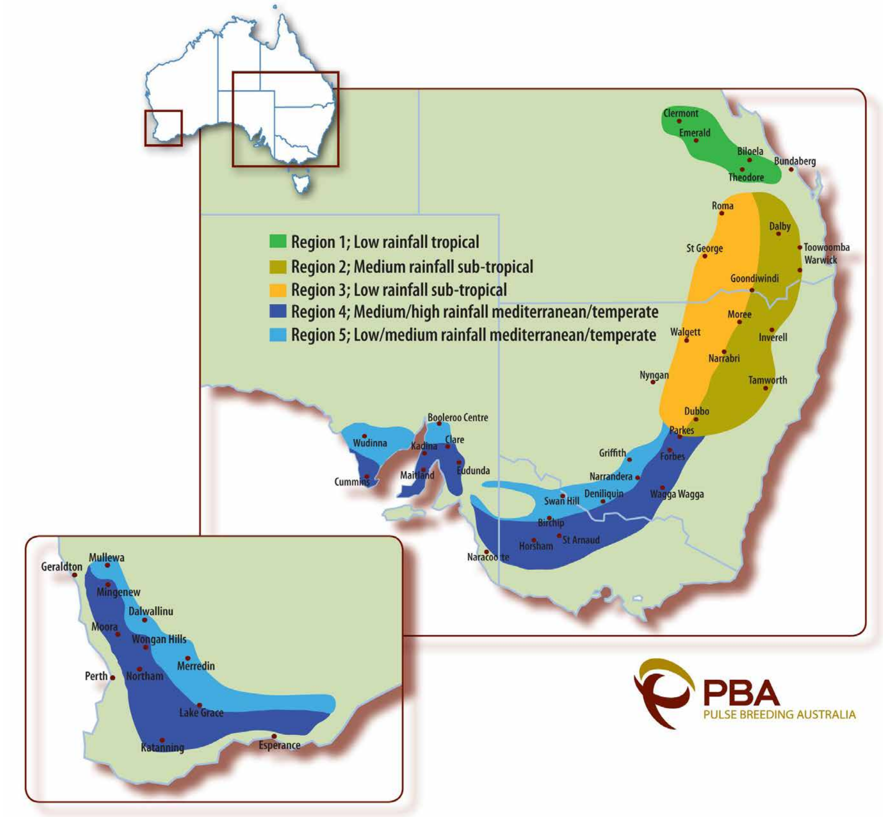

Figure 1: *PBA regions used to describe variety area of adaptation.*

Variety choice will be influenced by market acceptability and susceptibility to factors that downgrade grain quality, especially disease. Small beans such as the old variety Fiord⍉ are less acceptable in major export markets. Medium–small beans (e.g. Farah⍉) are sought because of their size and light colour. Medium-sized beans and broad, large beans (e.g. Aquadulce) remain acceptable because of their size and colour.

2.3 Faba bean varieties

The following varieties are recommended for regions 4 and 5 which cover WA.

Fiesta VF⍉

Fiesta VF⍉ became the standard faba bean variety for southern and western region farming systems and was a replacement for Fiord⍉, especially where chocolate spot was a risk. A medium-sized bean, Fiesta VF⍉ has shown high yields and wide adaptation to conditions in southern Australia. It still remains the preferred variety for some growers over Farah⍉, where Ascochyta is low risk or well managed. It also remains an option over Nura⍉ where chocolate spot and Ascochyta risk is low to medium. It can be used where sowing time is delayed or in low-rainfall areas where faba beans are not expected to grow very tall. It was released in 1998.

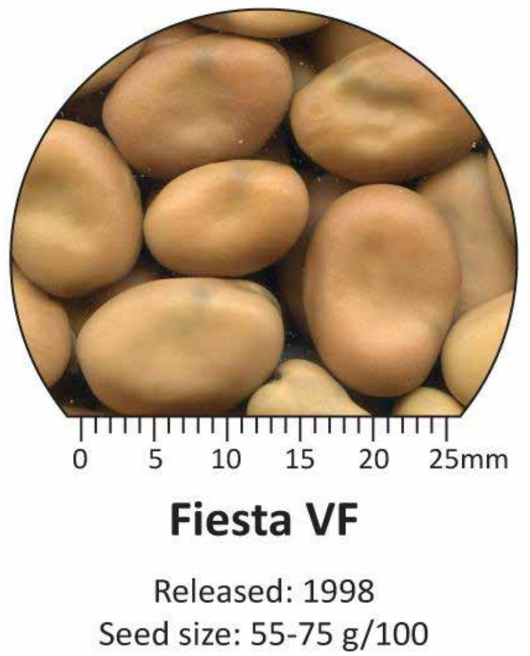

Figure 2: *Fiesta VF(D) was released in 1998.*

Farah(D)

Farah(D) is a selection from Fiesta VF(D) and was a replacement for this popular variety. While it has similar agronomic traits and yield, Farah(D) has a more uniform seed size and improved Ascochyta blight resistance (resistant–moderately resistant) to both leaf and pod infection compared to Fiesta VF(D), and is similar to the variety Ascot. This higher resistance reduces grain staining from Ascochyta at harvest. Farah(D) performs best in medium-rainfall environments. The name 'Farah(D)' is a direct Arabic translation of the word 'fiesta'. It was released in 2003. [4]

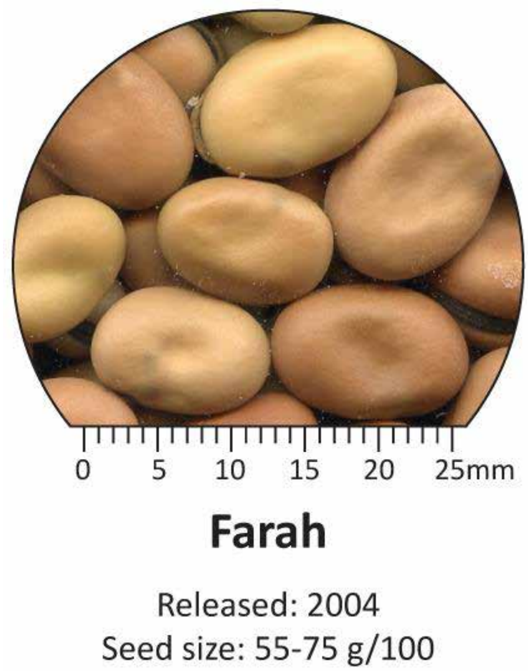

Figure 3: *Farah(D) was released in 2004.*

MORE INFORMATION

Farah(D) Variety Management Package

4 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 3–Varieties.

Nura(b

Nura(b is shorter than Fiesta VF(b and Farah(b and less likely to lodge; however the bottom pods are closer to the ground. It flowers about 7 days later than Fiesta VF(b, but matures at a similar time. It is rated as resistant–moderately resistant to Ascochyta blight, moderately susceptible to chocolate spot and moderately susceptible to rust. Seed size is slightly smaller than Farah(b and is light buff (brown) in colour. It was released in 2005.

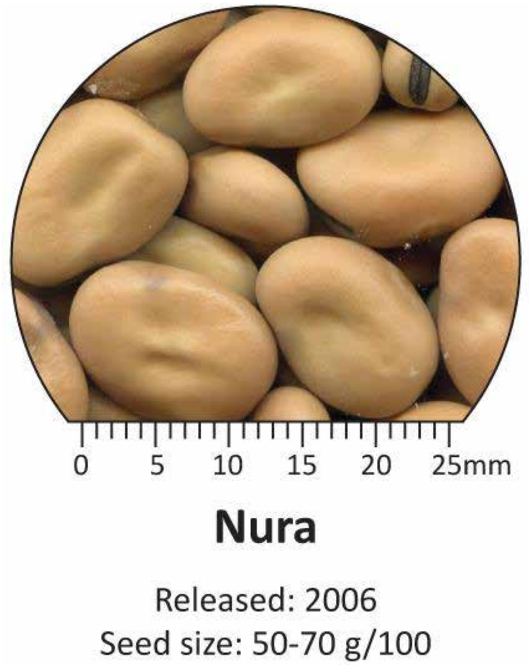

Figure 4: *Nura(b was released in 2006.*

MORE INFORMATION

NuraP Variety Management Package

Seednet: NuraP Fact sheet

PBA Rana(b

PBA Rana(b is a relatively late-flowering and late-maturing variety suited to higher rainfall regions with long seasons. Seed is larger than other current varieties and is considered high quality by the major Egyptian market. PBA Rana(b is resistant to both foliar and seed Ascochyta blight, and has improved resistance to chocolate spot compared to Fiesta VF(b and Farah(b. It was developed by PBA, tested as 974*(611*974)/15-1, and released in 2011. [5]

5 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 3–Varieties.

MORE INFORMATION

PBA Rana⦸ Variety Management Package

PBA Samira⦸ Variety Management Package

Pulse Australia: Faba and broad bean.

NSW DPI (2016) Winter crop variety sowing guide.

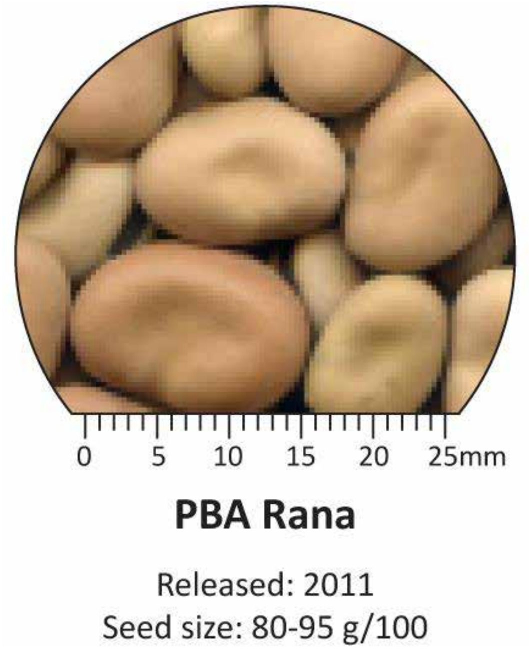

Figure 5: *PBA Rana⦸ was released in 2011.*

PBA Samira⦸

PBA Samira⦸ is a high-yielding variety with widespread adaption and is the variety of choice in south-eastern WA. Excellent disease resistance and later flowering means it can take advantage of late rainfall in longer season environments. Seed size is ideal for the Middle Eastern Markets, similar to Fiesta VF⦸ and Farah⦸. Excellent Ascochyta resistance and improved resistance to chocolate spot and rust compared to Fiesta VF⦸ and Farah⦸. It was developed by PBA, tested as AF05069-2, and released in 2014.

2.3.1 Faba bean variety agronomic traits

A summary of agronomic traits for the five varieties Fiesta VF⦸, Farah⦸, Nura⦸, PBA Rana⦸ and PBA Samira⦸ is provided in Table 1.

Table 1: *Faba Bean variety agronomic traits.*

Variety	Plant height	Flower time	Maturity	Lodging resistance	Ascochyta blight		Chocolate spot	Cercospora	Rust	PSbMV seed staining
					Foliage	Seed				
Fiesta VF⦸	Medium	Early–mid	Early–mid	MR	MR	MS	S	S	S	S
Farah⦸	Medium	Early–mid	Early–mid	MR	MR–R	MR–R	S	S	S	S
Nura⦸	Short	Mid	Early–mid	MR	MR–R	MR–R	MS	S	MS	VS
PBA Rana⦸	Med–tall	Mid	Mid	MR	R	R	MS	S	MS	MR
PBA Samira⦸	Medium	Mid	Early–mid	MR	R	R	MS	S	MS	S
PBA Zahra⦸					R	R	MS	S	MS	S
PBA Samira⦸					R	R	MS	S	MS	S

R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible

Source: Pulse Breeding Australia trials program 2007–2013

2.4 Seed quality

High-quality seed is essential to ensure the best start for the crop. Grower-retained seed, if not tested, may be of poor quality with reduced germination and vigour, as well as being infected with seed-borne pathogens.

- All seed should be tested for quality including germination and vigour. The minimum germination requirement for certified pulse seed is 70% compared with 80% in cereals.
- If grower-retained seed is of low quality, then consider purchasing registered or certified seed from a commercial supplier. Regardless of the source, always ask for a copy of the germination report.
- Careful attention should be paid to the harvest, storage and handling of seed intended for sowing.
- Calculate seeding rates in accordance with seed quality (germination, vigour and seed size).

Good establishment with correct plant density and good seedling vigour is important to maximise yields of pulse crops. A slight variation in seed size due to seasonal conditions or an incorrect germination percentage can make a significant difference to the final plant density. [6]

The large size or fragile nature of pulse seed, particularly faba bean, Kabuli chickpea and lupin, makes them more vulnerable to mechanical damage during harvest and handling. This damage is not always obvious, and can be reduced by slowing the header drum speed and opening the concave, or by reducing auger speed and lowering the flight angle and fall of grain. The reduction in the amount of transfer through the augers is important. Rotary harvesters and belt conveyers are ideally suited to pulse grain. They can reduce seed damage that often results in abnormal seedlings, which germinate but do not develop further.

Under ideal conditions, abnormal seedlings may emerge but will lack vigour, making them vulnerable to other rigours of field establishment. Factors such as low temperature, disease, insects, seeding depth, soil crusting and compaction are more likely to affect the establishment of weak seedlings. Abnormal seedlings that do emerge are unlikely to survive for long, and those that survive are likely to have reduced biomass and make little or no contribution to the final yield. [7]

2.5 Handling bulk seed

The large size, awkward shape and fragile nature of many pulses means that every time the seed is handled, it can reduce seed quality. Seed grain, in particular, should be handled carefully to ensure good germination.

Plan so that handling is kept to a minimum to reduce damage between harvest and seeding.

Augers with steel flighting can damage pulses, especially larger-seeded types such as faba beans. This problem can be partly overcome by slowing down the auger. Augers with large flight clearances will cause less damage to large grains.

Tubulators or belt elevators are excellent for handling pulses, as they cause little or no damage. Cup elevators are less expensive than tubulators and cause less damage than augers. They have the advantage of being able to work at a steeper angle than tubulators. However, cup elevators generally have lower capacities.

Combine loaders that throw or sling, rather than carry the grain, can cause severe damage to germination. [8]

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6 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 4–General Agronomy.

7 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 4–General Agronomy.

8 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 4–General Agronomy.

MORE INFORMATION

Factors affecting grain crop seed germination

2.6 Seed testing

2.6.1 Germination testing

Germination tests can be conducted by a simple home test or ideally, by sending a representative sample to a seed-testing laboratory for germination and vigour tests. For faba beans the sample size required is 1 kg for every 25 t of seed.

Sampling should be random and include numerous subsamples to give best results. It is easier and more accurate to take numerous samples while seed is being moved out of the seed cleaner, storage or truck, or by sampling from numerous bags if the grain is stored this way.

If there is an issue with kept grain, get a sample tested early. Testing prior to grading and seed treatment could provide savings if the quality is found to be unsatisfactory, allowing more time to source replacement seed. If the germination and vigour are below optimal, or marginal, or the crop was weather-damaged at harvest, it is advisable to have it re-tested soon after storing, handling and grading have occurred.

2.6.2 Vigour testing

In years of drought or a wet harvest, seed germination can be affected but, more importantly, seedling vigour can also be reduced. Poor seedling vigour can heavily reduce establishment and early seedling growth. This can occur under difficult establishment conditions such as deep sowing, crusting, compaction, and wet soils, or when seed treatments have been applied.

Some laboratories offer a seed vigour test when doing their germination testing. Otherwise growers can conduct their own tests by sowing seeds into a soil tray that is kept cold (<20°C). Observe the germination, speed and uniformity of emergence, and any abnormal shoot and root development.

Vigour represents the rapid, uniform emergence and development of normal seedlings under a wide range of conditions. Tests such as the Accelerated ageing vigour test and Conductivity vigour tests, are used by seed laboratories to establish seed and seedling vigour.

2.6.3 Accelerated ageing vigour test

Accelerated ageing estimates the longevity of seed in storage. It is now also used as an indicator of seed vigour and has been successfully related to field emergence and stand establishment. This tests seed under conditions of high moisture and humidity. Seeds with high vigour withstand these stresses and deteriorate at a slower rate than those with poorer vigour. Results are reported as a percentage, and the closer the accelerated ageing number is to the germination result, the better the vigour. [9]

2.6.4 Conductivity vigour test

The conductivity test measures electrolyte leakage from plant tissues and is one of two vigour tests recommended by the International Seed Testing Association (ISTA). Conductivity test results are used to rank vigour lots by vigour level.

Information is interpreted for as follows:

- <25 µS/cm/g—nothing to indicate seed is unsuitable for early sowing or adverse conditions.
- 25–29 µS/cm/g—seed may be suitable for early sowing, but there is some risk of poor performance under adverse conditions.
- 30–43 µS/cm/g—seed is not suitable for early sowing especially under adverse conditions.
- >43 µS/cm/g—seed is not suitable for sowing.

9 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 4–General Agronomy.

It is important to have a germination test done as well, because a conductivity test cannot pick up all seed-borne chemical and pathogen scenarios.

2.6.5 Weed contamination testing

Sowing seed free of weeds cuts the risk of introducing new weeds. It also reduces the pressure on herbicides, especially with increasing herbicide resistance. Tests for purity of a seed sample, including the amount and type of weed seed contamination, can be conducted if requested.

2.6.6 Disease testing and major pathogens identified in seed tests

Seed-borne diseases such as Ascochyta blight in chickpea, faba bean and lentil pose a serious threat to yields. Seed-borne diseases can strike early in the growth of the crop when seedlings are most vulnerable and can result in severe plant losses and hence lower yields.

Testing seed before sowing will identify the presence of disease and allow steps to be taken to reduce the risk of disease. If disease is detected, the seed may be treated with a fungicide before sowing or a clean seed source may be used (Table 2).

For a disease test, 1 kg of seed is required, except for Anthracnose (on lupin) which requires 2 kg. [10]

Table 2: *Major pathogens identified in seed tests on faba bean.*

Pathogen	Disease
Botrytis fabae	Chocolate spot
Ascochyta fabae	Ascochyta blight
Ditylenchus dipsaci	Stem nematode
BBSV	Broad bean stain virus

Laboratories that will test for some or all of the above diseases include:

DPIRD Diagnostic Laboratory Services (DDLS)

Seed Testing and Certification

Department of Primary Industries and Regional Development
Telephone (08) 9368 3721
Email: ddls-stac@agric.wa.gov.au

SARDI Field Crops Pathology
GPO Box 379, Adelaide, SA 5001
Telephone (08) 8303 9384
Facsimile (08) 8303 9393
Web: www.sardi.sa.gov.au/diagnostic_services/Crop_diagnostics

10 Pulse Breeding Australia (2013) Southern/Western Faba & Broad Bean—Best Management Practices Training Course. Module 4–General Agronomy.