



WESTERN

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# GRDC™ GROWNOTES™



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GRAINS RESEARCH  
& DEVELOPMENT  
CORPORATION

# LENTIL

## SECTION 3

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## PRE-PLANTING

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LENTIL TYPES | SELECTION OF VARIETIES | RED LENTIL VARIETIES | GREEN  
LENTIL VARIETIES | SEED | PBR AND ROYALTIES

# Pre-planting

- Lentil varieties differ physiologically by seed size, seed coat colour, kernel (cotyledon), colour and time to maturity.
- Red lentil is split or de-hulled for human consumption.
- Contamination of 'off-type' lentil varieties can lead to marketing concerns.
- Green lentil is predominantly used whole for cooking.
- Seed coat colour can be influenced by environmental conditions before harvest, post-harvest handling, time in storage and storage method.
- A variety's seed size is influenced by rainfall, soil type and seasonal conditions.
- Disease management is still a primary concern when growing lentil.
- Herbicide-tolerant (XT) lentil varieties are available to improve weed control.
- High intensity cropping can change the disease resistance ratings of varieties.
- Seed quality is very important in producing high grain yields.
- Quality seed has good germination and vigour.



### 3.1 Lentil types

Lentil varieties grown in Australia are divided into two main types. The red lentil types have red cotyledons and the green lentil types have yellow cotyledons.

**Table 1:** Australian lentil varieties.

Seed coat colour	Seed size and type				
	Small red	Medium red	Large red	Medium green	Large green
Grey	Nipper <sup>db1</sup> PBA Bounty <sup>db1</sup> PBA Herald XT <sup>db2</sup> PBA Hurricane XT <sup>db1</sup>	Nugget <sup>3</sup> PBA Ace <sup>db3</sup> PBA Blitz <sup>db3</sup> PBA Bolt <sup>db3</sup> Digger <sup>3</sup>	PBA Jumbo <sup>db4</sup> PBA Jumbo2 <sup>db4</sup>		
Tan	Northfield <sup>1</sup>	–	–	–	–
White – green	–	PBA Flash <sup>db3</sup> Cobber <sup>3</sup>	Aldinga <sup>4</sup>	Matilda <sup>5</sup> PBA Greenfield <sup>db5</sup>	Boomer <sup>6</sup> PBA Giant <sup>db6</sup>

1 SRP = small red (premium round) 2 SRS = small red (split) 3 MRD = medium red (dual purpose) 4 LRS = large red (split)  
5 MG = medium green 6 LG = large green

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

#### MORE INFORMATION

For more information on contamination, please see:  
<http://pulseaus.com.au/growing-pulses/bmp/lentil/variety-cross-contamination>

#### Contamination

**It is critical that there is no contamination of other variety types in lentil delivered to markets.**

**Variety contamination is restricted to 1% at delivery, and includes lentil of differing seed coat colour or size (even if the seed colour is the same) or type (red v. green).**





### 3.1.1 Red lentil

Red lentil, sometimes known as small or Persian lentil, is the most commonly grown in Australia and often split or de-hulled for human consumption.<sup>1</sup>

The name red lentil is derived from the red kernel (cotyledon) that is exposed when the seed coat is removed and the seed split.

The cotyledon (kernel) colour required for international trade is red, but seed coat colour can vary from light grey, black to brown, or red and may be speckled. The predominant seed coat colour targeted in Australia is grey and this, to a large extent, is genetically determined and highly heritable.<sup>2</sup>

Seed coat colour can be influenced by environmental conditions before harvest, post-harvest handling, time in storage and storage method.

Seed size can vary according to the variety ([Table 1](#)) and is influenced by rainfall, soil type and seasonal conditions.



**Photo 1:** *Whole red lentils.*

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia



**Photo 2:** *Split red lentils.*

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>1</sup> Grains Research and Development Corporation (2016) Lentil: The Ute Guide. Grains Research and Development Corporation, <https://grdc.com.au/resources-and-publications/all-publications/publications/2008/11/lentils-the-ute-guide>

<sup>2</sup> Pulse Australia (2016) Southern Lentil: Best Management Practices Training Course. Pulse Australia



### 3.1.2 Green lentil

Green lentil, also known as large or Chilean lentil, is predominantly used whole for cooking.

The seed coat is green to brown and the kernel colour is yellow. Seed size can vary from 6 to 10 mm in diameter. French green lentil, another green type, is a very small, dark-coloured lentil with a green kernel.

The cotyledon (kernel) colour required for international trade is yellow with a green-white seed coat that is unblemished. Colour is genetically determined and highly heritable, but blemishing is weather dependent.

Seed coat colour can be influenced by environmental conditions before harvest, post-harvest handling, time in storage and storage method.

Canada sets the market standard for seed size by supplying large (Laird types), medium, (Eston types) and small (Richlea types) green lentil.

Seed size and market category of current Australian varieties vary between the large and medium grades. There is currently no Australian variety in the small green lentil grade. However, there are breeding lines that could meet this market grade in the future.

A variety's seed size is influenced by rainfall, soil type and seasonal conditions.



**Photo 3:** *Green lentil.*

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

FEEDBACK

## MORE INFORMATION

For a paper on one of the latest trial results on lentil please see <http://www.giwa.org.au/2017researchupdates>

A concise overview of this presentation by Mark Seymour, Department of Primary Industries and Regional Development, can be viewed at: <https://youtu.be/OwXEHsyefIA>

## 3.2 Selection of varieties

### IN FOCUS

When choosing a variety, both marketability and agronomic traits must be considered.

Marketability includes colour, size, shape and texture. Price paid can differ between varieties and premiums or discounts can be based on colour, type, size and supply and demand.

Lentil varieties differ in their agronomic traits including disease tolerance, yield and time to maturity. Growing more than one variety might be an option for spreading risk.

Disease management is still a primary concern when growing lentil. Varieties must have the desired trait(s) to manage disease for the location grown.

Herbicide-tolerant (XT) varieties may also drive variety choice in weedy situations (see [Section 8 Weed control](#)).

### 3.2.1 Area of adaptation

Lentil varieties are bred for, and selected in, a range of different environments. Hence, individual varieties have specific areas of adaptation for maximising yield and reliability. Specific adaptation of a variety depends on rainfall, geography, temperature, disease pressure and soil types.

Pulse Breeding Australia has defined five regions in Australia for growing pulses ([Figure 1: Regions for growing pulses](#)). The production area for lentil is confined to two regions based on rainfall and geographic location:

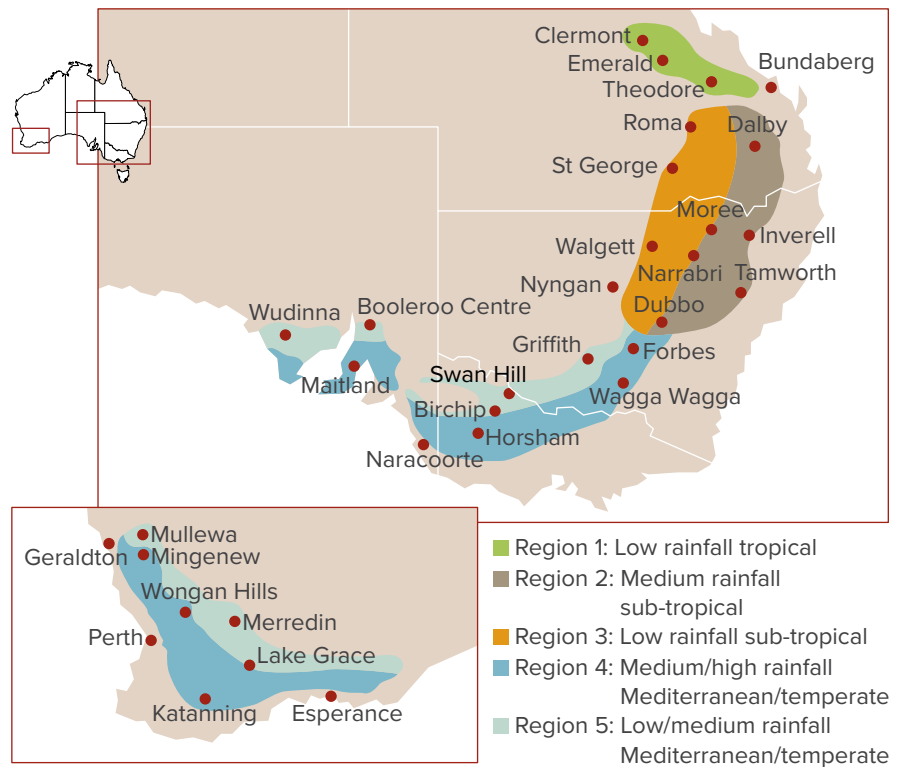
- Region 4 – Medium to high rainfall (Mediterranean/temperate); and
- Region 5 – Low to medium rainfall (Mediterranean/temperate).

These regions cross state borders and are target zones for breeding programs and variety evaluation.

Results from breeding and National Variety Trials (NVT) highlight specific adaptation of varieties within a region (see [Table 2](#) to [Table 9](#)). Some varieties have been found to be better adapted to specific parts of regions.

**Lentil varieties are targeted to Regions 4 and 5.**

FEEDBACK



**Figure 1: Regions for growing pulses.**

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

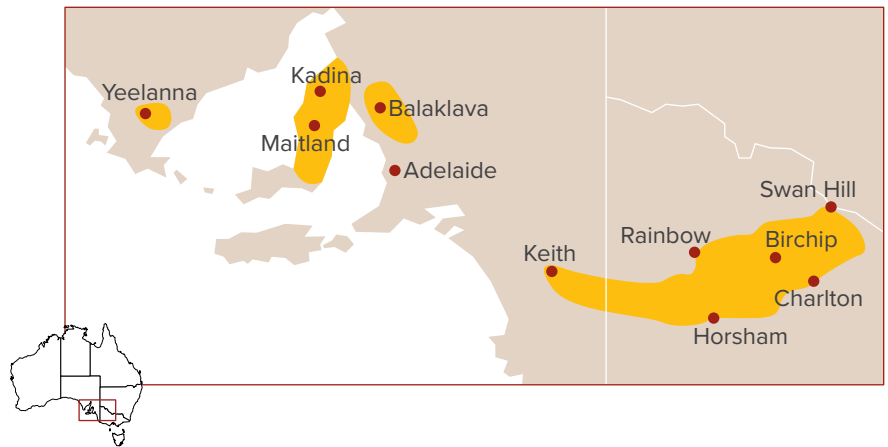
### 3.2.2 Lentil in south-eastern Australia

Lentil in Australia is predominantly grown in the medium/high rainfall/Mediterranean temperate climate regions of South Australia and Victoria with winter-dominant rainfall patterns (Figure 2). Specifically, this is the Victorian Wimmera and Mallee areas, and the Mid North and Yorke Peninsula of South Australia.<sup>3 4</sup>

Small areas of lentil are now being grown in southern New South Wales (and Western Australia). Limited information is available directly from these two states and growers are encouraged to source information from Victoria and South Australia.

3 J Brennan, A Aw-Hassan, K Quade, T Nordblom (2002) Impact of ICARDA Research on Australian Agriculture. Economic Research Report No. 11, NSW Agriculture. <http://archive.dpi.nsw.gov.au/content/science-and-research/economic-reports/economic-research-reports/err11>

4 Pulse Australia (2015) Best Management Guide – Lentil Production: Southern Region. Pulse Australia, <http://www.pulseaus.com.au/growing-pulses/bmp/lentil/southern-guide>



**Figure 2:** The principal lentil growing areas are found in South Australia and Victoria.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

### Victorian lentil variety information

For Victorian information on lentil, go to the Victorian Winter Crop Summary 2017: <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>

### South Australian lentil variety information

For South Australian information on lentil, go to the SA Sowing Guide 2016: [http://www.pir.sa.gov.au/research/services/reports\\_and\\_newsletters/crop\\_performance](http://www.pir.sa.gov.au/research/services/reports_and_newsletters/crop_performance)

### New South Wales variety information

Limited research and trials have been conducted on lentil in New South Wales. Consequently, there are no local management guides or yield data for this region. Information should be sourced from South Australia and Victoria.

For specific information on lentil in NSW go to:

Agronomy and production of lentil in southern NSW 2016  
<https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2016/02/Agronomy-and-production-of-lentil-in-southern-NSW-2016>

Information on Australian pulse varieties is also available at  
[http://pulseaus.com.au/storage/app/media/crops/pulses/2016\\_Pulse-Variety-Charts-web.pdf](http://pulseaus.com.au/storage/app/media/crops/pulses/2016_Pulse-Variety-Charts-web.pdf)

## 3.2.3 Lentil in Western Australia

Lentil is an emerging crop in Western Australia. Approximately 600 ha of lentil was sown in 2016.<sup>5</sup>

In 2004 a land capability assessment was conducted for pulse cropping in Western Australia. Land qualities were assessed for their effects on the growth of field pea, chickpea, faba bean and lentil.<sup>6</sup>

Land suitability maps were developed (Figure 3 and Figure 4) and provide an indication of potential lentil growing areas in Western Australia.

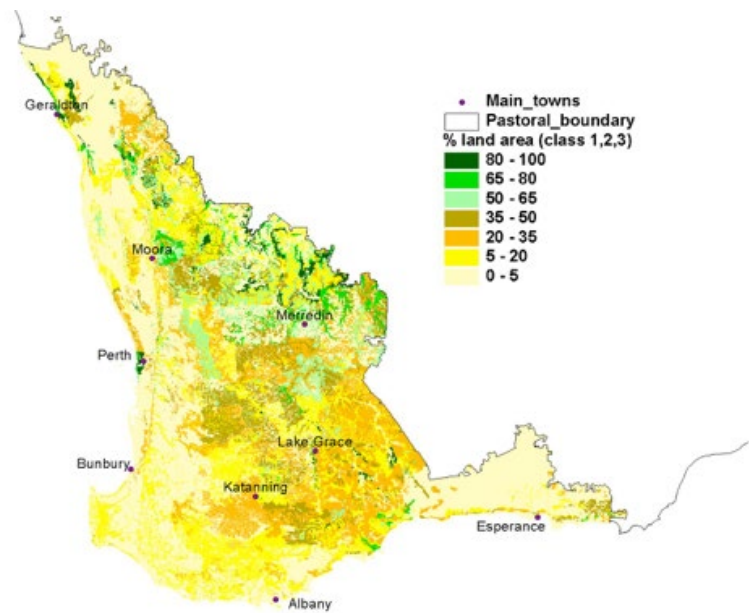
5 M Rodda, G Rosewarne, J Sounness (2016) Lentils may find a home in WA. Grains Research and Development Corporation, <https://grdc.com.au/Media-Centre/Ground-Cover-Supplements/Ground-Cover-Issue-125-Pulse-breeding-advances/Lentils-may-find-a-home-in-WA>

6 P White, D van Gool, N Schoknecht, W Vance (2004) Land evaluation for pulse production in WA. Department of Agriculture, Western Australia, [http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817\\_vancew.htm](http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817_vancew.htm)



SECTION 3 LENTIL

FEEDBACK



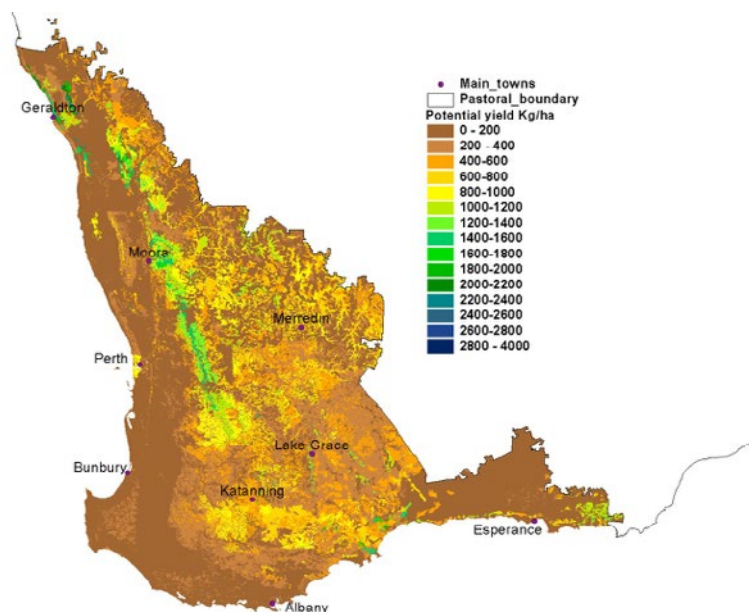
**Figure 3:** Percentage of land moderately suited to lentil production.

Source: Land evaluation for pulse production in WA (2004) DPIRD, [http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817\\_vancew.htm](http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817_vancew.htm)

Soil types in Western Australia differ from those of South Australia and Victoria principally in soil water-holding capacity. Also, WA soils are mainly sandy and acidic, and most have low water-holding capacity. Extensive liming over the past 20 years is improving soil pH suitability.

Figure 3 shows the limited areas of Western Australia that are suited to lentil while Figure 4 shows the low yield potential that lentil has in an average season in most regions.

Lentil in Western Australia is likely to remain a niche crop due to these factors, regardless of market prices.



**Figure 4:** The potential yield of lentil crops in an average season in the Western Australian cropping zone.

Source: Land evaluation for pulse production in WA (2004) DPIRD, [http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817\\_vancew.htm](http://www.regional.org.au/au/asssi/supersoil2004/s5/oral/1817_vancew.htm)



## Western Australian lentil information

The link refers specifically to lentil information from Western Australia.

Lentils may find a home in WA

<https://grdc.com.au/Media-Centre/Ground-Cover-Supplements/Ground-Cover-Issue-125--Pulse-breeding-advances/Lentils-may-find-a-home-in-WA>

### 3.3 Red lentil varieties

#### 3.3.1 Small red varieties

##### PBA Hurricane XT<sup>®</sup>

PBA Hurricane XT<sup>®</sup> is a small, red-seeded lentil with mid flowering and maturity.

PBA Hurricane XT<sup>®</sup> has tolerance to imazethapyr with an interim permit for pre or post-emergent application to 2017. It has improved tolerance to the herbicide flumetsulam plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues.

Product label rates, plant-back periods and all label directions for chemical use must be adhered to when growing PBA Hurricane XT<sup>®</sup>.

PBA Hurricane XT<sup>®</sup> is the highest yielding small red lentil available in Australia and has improved yields over PBA Herald XT<sup>®</sup>, Nipper<sup>®</sup> and Nugget, but lower than PBA Ace<sup>®</sup>.

It is moderately resistant (R) to foliar Ascochyta, R to seed Ascochyta, and moderately resistant moderately susceptible (MR-MS) to Botrytis grey mould.

PBA Hurricane XT<sup>®</sup> was released in 2013 and is commercialised by PB Seeds. It has an End Point Royalty of \$5 per tonne.

PBA Hurricane XT<sup>®</sup> is a suitable variety for Western Australia.

Area of Adaptation: Regions 4 & 5

#### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**PBA Hurricane<sup>®</sup> XT**

Released: 2013  
 Seed size: 3.5-4.0 g/100

**Photo 4:** PBA Hurricane XT<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

FEEDBACK

**PBA Herald XT<sup>®</sup>**

PBA Herald XT<sup>®</sup> is a small, red-seeded lentil best adapted to longer growing seasons with medium to higher rainfall.

PBA Herald XT<sup>®</sup> was the first lentil with improved tolerance to imazethapyr with an interim permit for pre or post-emergent application to 2017. It has improved tolerance to the herbicide flumetsulam plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues.<sup>7</sup>

**Product label rates, plant-back periods and all label directions for chemical use must be adhered to when growing PBA Hurricane XT<sup>®</sup>.**

PBA Herald XT<sup>®</sup> has been outclassed by PBA Hurricane XT<sup>®</sup>.

PBA Herald XT<sup>®</sup> is R to foliar and seed Ascochyta and Botrytis grey mould. Disease resistance assists this variety in achieving high grain quality.<sup>8</sup>

PBA Herald XT<sup>®</sup> is commercialised by PB Seeds. It has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

**i MORE INFORMATION**

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**Photo 5:** PBA Herald XT<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

7 J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>  
 8 J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>

FEEDBACK

### Nipper<sup>®</sup>

Nipper<sup>®</sup> is similar to Northfield in many characteristics, including relatively short height and seed shape, but it has a grey seed coat.

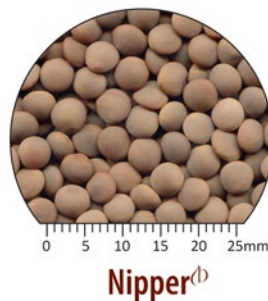
Nipper<sup>®</sup> is resistant to foliar Ascochyta blight, moderately resistant to seed Ascochyta and resistant to Botrytis grey mould. It is also resistant to the exotic disease Fusarium wilt.<sup>9</sup>

Nipper<sup>®</sup> has improved salinity tolerance and generally lodges less than other varieties.

Nipper<sup>®</sup> is well established in markets, and has attracted a premium price in some years.

Nipper<sup>®</sup> is commercialised by Seednet and has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5



**Photo 6:** *Nipper*<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

## 3.3.2 Medium red varieties

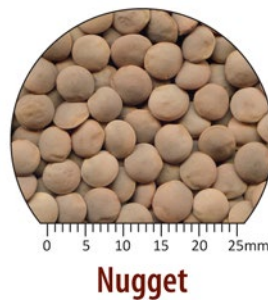
### Nugget

Nugget is a mid-season variety with a medium size seed and a grey seed coat.

Nugget is moderately resistant / moderately susceptible to foliar Ascochyta blight, moderately resistant to seed Ascochyta and resistant to Botrytis grey mould.

Nugget has now been superseded by PBA Jumbo2<sup>®</sup>, PBA Ace<sup>®</sup> and PBA Bolt<sup>®</sup>.

Area of Adaptation: Regions 4 & 5



**Photo 7:** *Nugget*.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>9</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>



FEEDBACK

### PBA Ace<sup>®</sup>

PBA Ace<sup>®</sup> is a medium-sized red lentil with grey seed.

Its maturity is mid-season. PBA Ace<sup>®</sup> has been one of the highest yielding varieties across all areas, especially in Victoria and New South Wales. It can be lower yielding in short, dry seasons.

PBA Ace<sup>®</sup> is best suited to longer season areas, replacing Nugget and PBA Jumbo<sup>®</sup>.

PBA Ace<sup>®</sup> is R to Ascochyta and moderately resistant / moderately susceptible to Botrytis grey mould. It is intolerant to salinity and boron.

PBA Ace<sup>®</sup> has a high milling quality.

PBA Ace<sup>®</sup> was released in 2012 and is commercialised by PB Seeds and has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**Photo 8:** PBA Ace<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia



### PBA Blitz<sup>®</sup>

PBA Blitz<sup>®</sup> is a medium-sized red lentil with a grey seed coat.

It is an early flowering variety suited to the short growing seasons of South Australia. It is not recommended for Victorian growers.

PBA Blitz<sup>®</sup> has improved early vigour and an erect growth habit which is suited to no-till and inter-row sowing.

PBA Blitz<sup>®</sup> is moderately resistant to foliar Ascochyta, moderately resistant/moderately susceptible to seed Ascochyta and moderately resistant to Botrytis grey mould.

This variety is intolerant of soil boron and salinity.

It has demonstrated similar but generally improved milling characteristics compared to Nugget.

PBA Blitz<sup>®</sup> was released in 2010 and is commercialised by PB Seeds. It has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**Photo 9:** PBA Blitz<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

FEEDBACK

### PBA Bolt<sup>®</sup>

PBA Bolt<sup>®</sup> is a medium-sized red lentil with grey seed.

It is adapted to the Mallee and northern Wimmera regions of Victoria and the low to medium rainfall zones of South Australia.

While similar to PBA Flash<sup>®</sup> with early-mid maturity and salinity tolerance, it performs better in the southern Mallee.

It is moderately resistant to foliar Ascochyta blight and resistant to seed Ascochyta blight. Its susceptibility to Botrytis grey mould makes it less suited to medium-high rainfall areas in wetter years and with early sowing.<sup>10</sup>

Like PBA Flash<sup>®</sup>, PBA Bolt<sup>®</sup> is a good variety for timely crop-topping to control weeds.

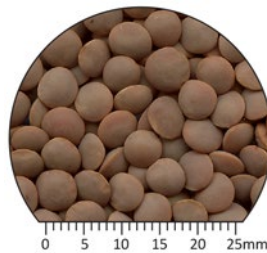
An erect habit and good lodging resistance make it easier to harvest in dry conditions.

PBA Bolt<sup>®</sup> was released in 2012, is commercialised by PB Seeds and has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**PBA Bolt<sup>®</sup>**

Released: 2012  
 Seed size: 4.0-4.7 g/100

**Photo 10:** PBA Bolt<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>10</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>



### PBA Flash<sup>®</sup>

PBA Flash<sup>®</sup> is an early maturing, high-yielding red lentil with a medium seed size.

It is suited to all current lentil growing areas; in particular, shorter season growing areas.

PBA Flash<sup>®</sup> has improved tolerance to boron and salinity compared to Nugget, which along with its height and erectness, has contributed to its popularity in the Mallee.<sup>11</sup>

It is moderately susceptible to foliar and seed Ascochyta blight, and moderately resistant / moderately susceptible to Botrytis grey mould. The disease susceptibility of PBA Flash<sup>®</sup> means that it is no longer a recommended lentil variety and has now been superseded by PBA Bolt<sup>®</sup>

PBA Flash<sup>®</sup> has improved standing ability at maturity relative to other lentil varieties which may make it more prone to pod drop in windy environments, timely harvest is required.

It is well suited to medium red lentil grain markets, particularly for splitting.

PBA Flash<sup>®</sup> was released in 2009 and is commercialised by PB Seeds. It has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**PBA Flash<sup>®</sup>**

Released: 2009  
 Seed size: 4.0-5.0 g/100

**Photo 11:** PBA Flash<sup>®</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>11</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>





### 3.3.3 Large red varieties

#### PBA Jumbo2<sup>Ⓛ</sup>

PBA Jumbo2<sup>Ⓛ</sup> is direct replacement for PBA Jumbo<sup>Ⓛ</sup> and Aldinga.

PBA Jumbo2<sup>Ⓛ</sup> is the highest yielding large-seeded red lentil, approximately 10% higher than PBA Jumbo<sup>Ⓛ</sup>.<sup>12</sup>

PBA Jumbo2<sup>Ⓛ</sup> is suited to medium to high rainfall regions where it produces uniform larger seed size well suited to premium large red split markets.

It is mid flowering and has a maturity similar to PBA Jumbo<sup>Ⓛ</sup>.

PBA Jumbo2<sup>Ⓛ</sup> has a similar seed size to PBA Jumbo<sup>Ⓛ</sup> and Aldinga with a grey seed coat.

It is well suited to no-till inter-row sowing into standing stubble.

PBA Jumbo2<sup>Ⓛ</sup> is R to Ascochyta and Botrytis grey mould. Its tolerance to soil boron is similar to PBA Flash<sup>Ⓛ</sup>.

PBA Jumbo2<sup>Ⓛ</sup> was released in 2014 and is commercialised by PB Seeds with an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

#### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:

<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**PBA Jumbo2<sup>Ⓛ</sup>**

Released: 2014  
Seed size: 4.5-5.5 g/100

**Photo 12:** PBAJumbo2<sup>Ⓛ</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>12</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>



### PBA Jumbo<sup>Ⓛ</sup>

PBA Jumbo<sup>Ⓛ</sup> is suited to medium to high rainfall regions where it produces uniform larger seed size for the premium large red split markets.

PBA Jumbo<sup>Ⓛ</sup> is a high yielding, large-seeded red lentil with a grey seed coat.

It is mid flowering with a maturity similar to Nugget. This variety is suited to no-till inter-row sowing into standing stubble.<sup>13</sup>

PBA Jumbo<sup>Ⓛ</sup> is moderately resistant / moderately susceptible to foliar Ascochyta blight and susceptible to seed Ascochyta and moderately susceptible to Botrytis grey mould. The disease susceptibility of PBA Jumbo<sup>Ⓛ</sup> means that it is no longer a recommended lentil variety and has now been replaced by PBA Jumbo2<sup>Ⓛ</sup>.

Tolerance to soil boron is similar to PBA Flash<sup>Ⓛ</sup>.

PBA Jumbo<sup>Ⓛ</sup> was released in 2010, is commercialised by PB Seeds and has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Regions 4 & 5

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**Photo 13:** PBA Jumbo<sup>Ⓛ</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

### 3.3.4 Superseded red lentil varieties

Red lentil varieties that have been superseded by new, improved varieties include:

- Northfield;
- PBA Bounty<sup>Ⓛ</sup>;
- Cassab<sup>Ⓛ</sup>;
- Cumra;
- Cobber (the original lentil variety that pioneered the Australian industry);
- Digger; and
- Aldinga.

Digger and Cobber pioneered the lentil industry in Victoria, while in South Australia, Northfield and Aldinga kick-started the lentil industry. More recently, Nugget has been superseded. It was the industry medium sized standard for some years.

<sup>13</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>

FEEDBACK

### 3.3.5 Trial data of red lentil varieties

**Table 2:** Long-term red lentil yields as a percentage of Nugget (2007–2013).

Variety	South Australia					Victoria		New South Wales	
	Yorke Peninsula	Mid North	Lower EP	Mallee	South East	Wimmera	Mallee	South East	South West
<b>Small red lentil</b>									
Nipper <sup>Ⓛ</sup>	97	96	100	94	96	95	87	85	90
Northfield	88	92	90	91	95	93	92	88	89
PBA Bounty <sup>Ⓛ</sup>	102	102	105	105	92	99	103	109	101
PBA Herald XT <sup>Ⓛ</sup>	90	92	92	102	98	96	93	89	91
PBA Hurricane XT <sup>Ⓛ</sup>	105	107	107*	119	114	110	111	111	104
<b>Medium red lentil</b>									
Nugget	100	100	100	100	100	100	100	100	100
PBA Ace <sup>Ⓛ</sup>	107	111	105	112	99	102	96	124	115
PBA Blitz <sup>Ⓛ</sup>	106	106	115	112	99	102	96	101	93
PBA Bolt <sup>Ⓛ</sup>	101	109	108	126	120	114	119	119	101
PBA Flash <sup>Ⓛ</sup>	105	109	114	116	114	109	103	105	94
<b>Large red lentil</b>									
Aldinga	96	98	99	100	95	97	101	102	97
PBA Jumbo <sup>Ⓛ</sup>	110	108	112	107	103	105	102	106	103
PBA Jumbo2 <sup>Ⓛ</sup>	119	117	118*	129*	117*	118	121	126*	117*
Yield of Nugget (t/ha)	2.78	2.28	1.40	1.22	1.59	1.51	1.13	1.15	1.31

\* Variety has had limited evaluation in this region so treat results with caution.

Source: NVT, PBA, SARDI, DEPI Vic, NSW DPI

**Table 3:** Red lentil agronomic traits.

Variety	Seed coat colour	Seed size (as % of Nugget)	Crop vigour	Height	Flowering time	Maturity	Pod drop	Shattering	Boron	Salt
<b>Small red lentil</b>										
Nipper <sup>Ⓛ</sup>	Grey	75-80	Poor/Mod	Short	Mid/Late	Mid	MR	MR	I	MT
Northfield	Tan	80	Poor/Mod	Short	Mid	Mid	MR	MR	I	I
PBA Bounty <sup>Ⓛ</sup>	Grey	90	Moderate	Med/short	Mid/Late	Mid	R	R	I	MI
PBA Herald XT <sup>Ⓛ</sup>	Grey	75	Poor/Mod	Short	Mid/Late	Mid/Late	MR	R	I	I
PBA Hurricane XT <sup>Ⓛ</sup>	Grey	85	Moderate	Medium	Mid	Mid	MR	R	I	I
<b>Medium red lentil</b>										
Nugget	Grey	100	Moderate	Medium	Mid	Mid/Late	MR	R	I	I
PBA Ace <sup>Ⓛ</sup>	Grey	100	Good	Medium	Mid	Mid	R	MR/MS	I	I
PBA Blitz <sup>Ⓛ</sup>	Grey	115-120	Mod/Good	Med/Tall	Early	Early	MR	MR	I	I
PBA Bolt <sup>Ⓛ</sup>	Grey	100	Mod/Good	Medium	Early/Mid	Early/Mid	R	R	MI	MI
PBA Flash <sup>Ⓛ</sup>	Green	100-110	Moderate	Medium	Early/Mid	Early/Mid	MR	MR	MI	MI
<b>Large red lentil</b>										
Aldinga	Green	120	Moderate	Medium	Mid	Mid	MR	MR	I	MI
PBA Jumbo <sup>Ⓛ</sup>	Grey	120	Moderate	Medium	Early/Mid	Mid	MR	MR	MI	I
PBA Jumbo2 <sup>Ⓛ</sup>	Grey	120	Mod/Good	Medium	Mid	Mid	MR	R	MI	I

VS = Very Susceptible; S = Susceptible; MS = Moderately Susceptible; MR = Moderately Resistant; R = Resistant. I = Intolerant; MI = moderately intolerant, MT = Moderately Tolerant.

Source: Pulse Breeding Australia

FEEDBACK

**Table 4:** Red lentil disease traits.

Variety	Botrytis grey mould	Ascochyta blight	
		Foliage	Seed
<b>Small red lentil</b>			
Nipper	R	MR/MS	MR
Northfield	S	MR/MS	MR
PBA Bounty <sup>Ⓛ</sup>	MS	MR/MS	MS
PBA Herald XT <sup>Ⓛ</sup>	R	R	R
PBA Hurricane XT <sup>Ⓛ</sup>	MR/MS	MR	R
<b>Medium red lentil</b>			
Nugget	MR/MS	MR/MS	MR/MS
PBA Ace <sup>Ⓛ</sup>	MR/MS	R	R
PBA Blitz <sup>Ⓛ</sup>	MR	MR	MR/MS
PBA Bolt <sup>Ⓛ</sup>	S	MR	R
PBA Flash <sup>Ⓛ</sup>	MR/MS	MS	MS
<b>Large red lentil</b>			
Aldinga	MS	MR/MS	MS
PBA Jumbo <sup>Ⓛ</sup>	MS	MR/MS	S
PBA Jumbo2 <sup>Ⓛ</sup>	R	R	R

VS = Very Susceptible; S = Susceptible; MS = Moderately Susceptible; MR = Moderately Resistant; R = Resistant

Source: Pulse Breeding Australia

Due to the high intensity of lentil cropping on the Yorke Peninsula and in the Lower Mid North of South Australia changes have occurred in the virulence of Ascochyta blight pathogens. This has resulted in increased levels of infection of Ascochyta blight in PBA Flash<sup>Ⓛ</sup> and Nipper<sup>Ⓛ</sup>, and to a lesser extent PBA Jumbo<sup>Ⓛ</sup>.<sup>14</sup>

Vegetative and podding sprays for Ascochyta blight are now recommended for these varieties in disease prone areas. Note there are changes to the disease rating (Table 4).

**i MORE INFORMATION**

For detailed disease information go to [Section 10 Diseases](#)



## SECTION 3 LENTIL

### FEEDBACK

**Table 5:** Availability of red lentil varieties.

Variety	PBR	Licensee or Agency	Commercial Partner	Seed Supplying Agents	Telephone	EPR (\$/t incl GST) & Market Restriction
<b>Small red lentil</b>						
Nipper <sup>Ⓛ</sup>	PBR	DPI Vic	Seednet	Seednet	1800 007 333	\$5.50
Northfield	Terminated	SARDI	AFCA	None	-	None
PBA Bounty <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Herald XT <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Hurricane XT <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	tba
<b>Medium red lentil</b>						
Nugget	None	DPI Vic	Seedmark	Heritage	1800 007 333	\$5.50
PBA Ace <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Blitz <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Bolt <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Flash <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
<b>Large red lentil</b>						
Aldinga	None					None
PBA Jumbo <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
PBA Jumbo2 <sup>Ⓛ</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50

Source: Pulse Breeding Australia

### MORE INFORMATION

For further variety information go to Variety Central [www.varietycentral.com.au](http://www.varietycentral.com.au)



### 3.4 Green lentil varieties

#### 3.4.1 Medium green varieties

##### PBA Greenfield<sup>Ⓛ</sup>

PBA Greenfield<sup>Ⓛ</sup> is a medium-sized green lentil. It has broad adaptation being best suited to the medium-rainfall lentil-growing regions.

PBA Greenfield<sup>Ⓛ</sup> is the highest yielding green lentil variety with yields similar to PBA Ace<sup>Ⓛ</sup>.<sup>15</sup>

PBA Greenfield<sup>Ⓛ</sup> has improved tolerance to salinity.

It is resistant to shattering, although timely harvest is still required.

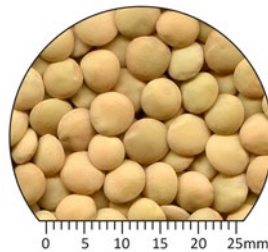
PBA Greenfield<sup>Ⓛ</sup> is moderately resistant / moderately susceptible to foliar and seed Ascochyta and moderately resistant to Botrytis grey mould.

PBA Greenfield<sup>Ⓛ</sup> was released 2014 and is licensed to PB Seeds. It has an End Point Royalty of \$5 per tonne.

Area of Adaptation: Region 4

#### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**PBA Greenfield<sup>Ⓛ</sup>**  
 Released: 2014  
 Seed size: 5.0-5.5 g/100

**Photo 14:** PBA Greenfield<sup>Ⓛ</sup>.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

<sup>15</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>

FEEDBACK

### 3.4.2 Large green varieties

#### Boomer

Boomer is a large seeded green lentil. It is tall, bulky and vigorous but can lodge when growing conditions are favourable.

Sowing early can increase lodging and result in smaller seed.

Boomer is moderately resistant to foliar Ascochyta blight and moderately resistant moderately susceptible to seed Ascochyta blight and Botrytis grey mould.

Early harvest is important to prevent shattering and produce good coloured seed.

Boomer was released 2008 and is licensed to Seednet with a \$5 per tonne End Point Royalty.

Boomer<sup>®</sup> is expected to be superseded by PBA Giant<sup>®</sup>.

Area of Adaptation: Region 4

#### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:

<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>



**Boomer<sup>®</sup>**

Released: 2008

Seed size: 5.5-7.0 g/100

**Photo 15:** *Boomer*.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia



### PBA Giant<sup>16</sup>

PBA Giant<sup>16</sup> is the largest seeded green lentil in Australia with an average seed diameter of 5.8 mm (approximately 7 g/100 seeds).<sup>16</sup>

PBA Giant<sup>16</sup> is broadly adapted but best suited to the medium-rainfall lentil-growing regions.

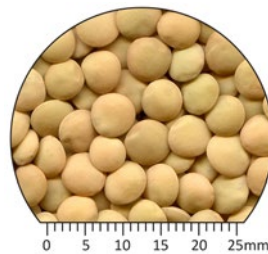
It has similar yield and improved shattering resistance to Boomer, although timely harvest is still required to minimise shattering.

PBA Giant<sup>16</sup> is more resistant to lodging at maturity than Boomer.

It is moderately resistant to foliar Ascochyta, and moderately susceptible to seed Ascochyta and Botrytis grey mould.

PBA Giant<sup>16</sup> was released 2014 and is licensed to PB Seeds with a \$5 per tonne End Point Royalty.

Area of Adaptation: Region 4



**PBA Giant<sup>16</sup>**

Released: 2014  
Seed size: 6.0-7.5 g/100

**Photo 16:** *Giant<sup>16</sup>*.

Source: Southern Lentil: Best Management Practices Training Course (2016), Pulse Australia

### MORE INFORMATION

Go to the GRDC website for the brochure on this variety:  
<https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>

### MORE INFORMATION

Please see the following for more information on contamination:  
<http://pulseaus.com.au/growing-pulses/bmp/lenil/variety-cross-contamination>

### Contamination

**Variety contamination can be an issue for marketing lentil, although it is less so now that red lentil varieties are grey-seeded types.**

**That said, it is an agronomic issue when it comes to paddock management, variety selection/changeover and marketing.**

**A 1% maximum visual contamination applies at delivery. So admixture of reds and greens, reds of differing seed coat colour or different seed size within the same seed coat colour must be considered and avoided.**

### 3.4.3 Superseded green lentil varieties

The only green lentil variety that has been superseded by new, improved varieties is Matilda.

<sup>16</sup> J Couchman, K Hollaway (2018) Victorian Winter Crop Summary 2018, Department of Economic Development, Jobs, Transport and Resources, <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crop-summary>



FEEDBACK

### 3.4.4 Trial data of green lentil varieties

**Table 6:** Long-term green lentil yields as a percentage of Nugget (2007–2013).

Variety	South Australia					Victoria		New South Wales	
	Yorke Peninsula	Mid North	Lower EP	Mallee	South East	Wimmera	Mallee	South East	South West
<b>Medium green lentil</b>									
PBA Greenfield <sup>db</sup>	111	111		114*	113*	112	114	116*	110*
<b>Large green lentil</b>									
Boomer	102	102	101	97	103	102	102	102	102
PBA Giant <sup>db</sup>	98*	103*				106*	112*	112*	103*
Yield of Nugget (t/ha)	2.78	2.28	1.40	1.22	1.59	1.51	1.13	1.15	1.31

\* Variety has had limited evaluation in this region so treat results with caution.

Source: NVT, PBA, SARDI, DPI Vic, NSW DPI

**Table 7:** Green lentil agronomic traits.

Variety	Seed coat colour	Seed size (as % of Nugget)	Crop vigour	Height	Flowering time	Maturity	Pod drop	Shattering	Boron	Salt
<b>Medium green lentil</b>										
PBA Greenfield <sup>db</sup>	Green	130	Good	Tall	Mid	Mid/Late	R	MR	I	MI
<b>Large green lentil</b>										
Boomer	Green	140-160	Good	Tall	Mid	Mid/Late	MR	S	MI	I
PBA Giant <sup>db</sup>	Green	170	Good	Tall	Mid	Mid/Late	R	MR/MS	MI	I

VS = Very Susceptible; S = Susceptible; MS = Moderately Susceptible; MR = Moderately Resistant; R = Resistant. I = Intolerant; MI = Moderately Intolerant, MT = Moderately Tolerant.

Source: Pulse Breeding Australia

**Table 8:** Green lentil disease traits.

Variety	Botrytis grey mould	Ascochyta blight	
		Foliage	Seed
<b>Medium green lentil</b>			
PBA Greenfield <sup>db</sup>	MR	MR/MS	MR/MS
<b>Large green lentil</b>			
Boomer	MR/MS	MR	MR/MS
PBA Giant <sup>db</sup>	MS	MR	MS

VS = Very Susceptible; S = Susceptible; MS = Moderately Susceptible; MR = Moderately Resistant; R = Resistant

Source: Pulse Breeding Australia

**Table 9:** Availability of green lentil varieties

Variety	PBR	Licensee or Agency	Commercial Partner	Seed Supplying Agents	Telephone	EPR (\$/t incl GST) & Market Restriction
<b>Medium green lentil</b>						
PBA Greenfield <sup>db</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50
<b>Large green lentil</b>						
Boomer	PBR	DPI Vic	Seednet	Seednet	03 5389 0150	\$5.50
PBA Giant <sup>db</sup>	PBR	PBA	PB seeds	PB seeds	03 5383 2213	\$5.50

Source: Pulse Breeding Australia

For further variety information go to Variety Central: [www.varietycentral.com.au](http://www.varietycentral.com.au)

**MORE INFORMATION**

For detailed disease information go to [Section 10 Diseases](#)

## 3.5 Seed

### 3.5.1 Seed quality

**Seed quality is very important in producing high grain yields.**

High yields are produced by achieving optimum plant populations. Optimum plant populations are achieved with quality seed. Quality seed has good germination and vigour. Good germination and vigour allows for sowing rates to be calculated accurately resulting in optimum plant populations.

Factors affecting seed quality include:

- variations in seed size (due to seasonal conditions);
- poor germination percentage (can result in inaccurate calculation of sowing rates);
- harvest and post-harvest seed damage (produces abnormal seedlings without vigour); and
- seed-borne diseases (cause reduced germination).<sup>17</sup>

Grower-retained seed, if not tested, might have reduced germination and vigour, as well as being infected with seed-borne pathogens. Infected seed has the potential to introduce and/or spread disease onto the property.

**The only way to accurately measure seed germination rate, vigour and disease is to have it tested.**

Key parameters for ensuring high seed quality include:

- All seed should be tested for quality including germination and vigour.
- If grower-retained seed is of low quality, consider purchasing registered or certified seed from a commercial supplier.
- Always check the germination report of purchased seed.
- Seed should be treated with a thiram-based fungicide for the prevention of seed-borne diseases.
- Careful attention should be paid to the harvest, storage and handling of seed intended for sowing.
- Calculate sowing rates in accordance with seed quality (germination, vigour and seed size).
- **All seed over 12 months old should be retested for germination and vigour.**<sup>18</sup>

**It is important to know the germination and expected establishment percentages when calculating sowing rates.**

<sup>17</sup> Pulse Australia (2016) Southern Lentil: Best Management Practices Training Course. Pulse Australia

<sup>18</sup> Pulse Australia (2016) Southern Lentil: Best Management Practices Training Course. Pulse Australia



**i MORE INFORMATION**

The Australian Seeds Authority provides a listing of the laboratories in Australia that test and certify seed for both international and domestic purposes. They can be found on the ASA website:  
<http://aseeds.com.au/testing/>

### 3.5.2 Seed testing

Germination tests are conducted by seed testing laboratories. The sample required for seed testing lentil is one kilogram for each 10 tonnes of seed.

**Failure to obtain a true sample will result in inaccurate test results that could then lead to poor establishment in the paddock.**

The sample should be random and consist of numerous sub-samples.

Sub-samples can be taken when seed is being moved:

- out of the harvester;
- into or out of the truck;
- into or out of the silo; and
- into or out of the seed cleaner.

Seed testing is best done as soon as possible after harvest:

- if there is a suspected quality issue;
- prior to grading and seed treatment; and
- to provide more time to source replacement seed if needed.

#### Seed testing in Australia

The Australian Seeds Authority (ASA) is responsible for controlling seed certification in Australia, and oversees two certification schemes:

- the Organisation for Economic Co-operation and Development (OECD) Schemes for the Varietal Certification or the Control of Seed Moving in International Trade; and
- the Australian Seed Certification Scheme.

#### Other seed tests

There are numerous other seed tests available for:

- vigour;
- accelerated ageing vigour;
- conductivity vigour;
- cool germination and cold;
- tetrazolium (TZ) vigour;
- weed contamination; and
- seed-borne disease.

### 3.5.3 Grower-retained seed

#### Poor quality grower-retained seed

Seed quality issues can occur when a crop is harvested in less than ideal moisture conditions or poor seasonal conditions. A sharp seasonal finish where maturity is achieved suddenly, a wet harvest, or a delayed harvest can all have a significant impact on seed quality.

Low germination rates and poor seedling vigour can cause slower and uneven emergence resulting in sparse establishment and a weak crop. Plants may be more vulnerable to virus infection, fungal disease and insect attack, and are less competitive with weeds. Any of these factors can result in lower yields.

The fragile nature of pulse seed, particularly faba and broad bean, lupin, kabuli chickpea and lentil, makes them more vulnerable to mechanical damage during harvest and handling. This damage is not always visually apparent. Damage can be minimised by reducing the harvester thresher speed and opening the concave, or by reducing auger speed and lowering the flight angle and fall of grain. Rotary harvesters and belt conveyers are ideally suited to pulse grains. Both reduce seed

FEEDBACK

**i** MORE INFORMATION

For details on retained seed or viability, please see the following GRDC videos

Retained pulse seed

[https://youtu.be/5lq9T6\\_f6Tg](https://youtu.be/5lq9T6_f6Tg)

Insure seed viability with aerated storage

<https://youtu.be/8HFilsCnka0>

**i** MORE INFORMATION

Refer to [Section 11 Pre-harvest treatments](#) and [Section 13 Storage and handling](#).

damage that often results in abnormal seedlings which germinate but do not develop further due to poor vigour.

Establishment of weak seedlings can be caused by low temperature, disease, insects, sowing depth, soil crusting and compaction. Seedlings that do emerge are unlikely to survive for long, or produce less biomass, and make little or no contribution to final yield.

### Achieving high quality grower-retained seed

Achieving high quality grower-retained seed requires the best area of a paddock being selected prior to harvest. Best areas have a low weed burden, an absence of diseases, and a crop that is vigorous and healthy and likely to mature evenly with good grain size.

Seed should be harvested first (prior to commercial grain) and ideally in conditions with 11–12% moisture. Harvesting seed at low moisture deems it susceptible to cracking.

When desiccating a paddock for seed, careful attention must be paid to the herbicide used. **DO NOT use glyphosate to desiccate or crop-top lentil if the seed is to be retained for sowing.**

Glyphosate can have a significant impact on germination, normal seed count and vigour.

Growers should also ensure that seed varieties are properly labelled in storage and that different varieties are not accidentally mixed and sown together. Sowing varieties with different disease susceptibility will compromise disease management.

### 3.5.4 On-farm seed testing

A simple preliminary on-farm test can be conducted to assess germination and vigour. Ideally this should be followed up with a laboratory test from which sowing rates can be calculated.

Process:

1. Use a flat, shallow tray about 5 cm deep.
2. Place a sheet of newspaper on the base to cover drainage holes.
3. Fill with clean sand, potting mix, or a freely draining soil.
4. Temperature must be less than 20°C, so the test may need to be conducted indoors.
5. Randomly count out 100 seeds, including any damaged seeds.
6. Sow 10 rows of 10 seeds in a grid at the correct sowing depth.
7. Place the seed on the levelled soil surface and gently push each in with a pencil marked to the required depth. Cover seed holes with a little more soil and water gently.
8. Keep the soil moist, but not wet (overwatering will result in fungal growth and possible rotting).
9. After 7–14 days most viable seeds will have emerged.
10. Only count normal, healthy vigorous seedlings at 7 and 14 days. This number is the germination percentage.



**Photo 17:** *On-farm seed testing.*

(Photo: E. Leonard, AgriKnowHow)

### 3.5.5 Handling bulk seed

The large size, awkward shape and fragile nature of many pulses means they need careful handling to prevent seed damage. Seed grain should be handled carefully to ensure good germination.

To prevent seed damage, forward planning is required to minimise grain handling between harvest and sowing.

Auguring from the harvester should be treated with as much care as later during handling and storage because it has the same potential for seed damage.

Augers with steel flighting can damage pulses, even small-seeded types like lentil. This problem can be partly overcome by reducing auger speed.

Tubulators or belt elevators are excellent for handling pulses as little or no damage occurs.

Cup elevators are less expensive than tubulators and cause less damage than augers. They have the advantage of working at a steeper angle than tubulators. However, cup elevators generally have lower capacities.

Combine loaders that throw or sling the seed, rather than carry, can cause severe damage to germination and should be avoided.

### 3.5.6 Safe storage of seed

Most grower-retained seed will need to be stored for a period of 180 days or more.

Seed needs to be stored correctly to ensure its quality is maintained. Ideal storage conditions for pulses are at around 20°C and at a maximum moisture content of 12.5%.

Lentil seed quality can deteriorate in storage (like other grain). Deterioration occurs most rapidly under conditions of high temperature and moisture. These conditions may result in poor seed germination and emergence.

Reducing moisture and temperature increases longevity of the seed. Conversely, moisture at very low levels (<10%) may render lentil more vulnerable to mechanical damage during subsequent handling (Table 10).



FEEDBACK

**Table 10:** Effect of moisture content and temperature on storage life of chickpea seed.

Storage moisture (%)	Storage temperature (°C)	Longevity of seed (days)
	20	> 200
12	30	500-650
	40	110-130
	20	700-850
15	30	180-210
	40	30-50

**Under Australian conditions, storage of seed above 13% moisture is not recommended.**

Reducing temperature in storage is the easiest method of increasing seed longevity. It will also reduce the potential for insect damage.

Options for reducing seed temperature in silos include aeration and painting the outside of the silo with white paint. Aeration results in dry, ambient air which, as well as reducing storage temperature, also reduces moisture of seed harvested at high moisture. Painting can reduce temperature by as much as 4–5°C and can double storage life.

Heat drying of lentil seed should be limited to temperatures below 40°C.

**i MORE INFORMATION**

For detailed information, refer to [Section 13 Storage and handling](#).

## MORE INFORMATION

Sourced from Australian Grain Technologies (2016) PBR and EPR Information, <http://www.agtbreeding.com.au/sourcing-seed/pbr-and-epr>

### 3.6 PBR and royalties

Plant Breeders' Rights and End Point Royalties provide an incentive to companies and individuals to invest in plant breeding. This value adding to the grains industry, by producing superior varieties, has numerous benefits:

- increased productivity with higher yields;
- improved price received for grain due to improved quality;
- protection from productivity losses caused by diseases and environmental stresses; and
- improving the profitability of grain growing.

#### 3.6.1 Plant Breeders' Rights (PBR) <sup>(1)</sup>

Plant Breeders' Rights (PBR) relate to legislation covered in the *Plant Breeders' Rights Act (1994)*.

PBR is a copyright which protects the plant breeder's intellectual property rights for new and uniquely different plant varieties.

PBR provides the legal mechanism by which a breeder can license a variety to a grower and impose an End Point Royalty (EPR). The EPR aids in recovering the costs of breeding and allows re-investment into future variety development.

PBR allows the breeder/owner of the variety to place restrictions on what the grower, and others in the supply chain, can do with the protected variety.

The grower enters into a contract with the breeder/owner at the point of seed purchase of a PBR variety.

The contract between the grower and breeder/owner may place restrictions on what the grower can do with the grain produced from the seed when planted as a crop.

**PBR restrictions can differ between varieties and breeders/owners.**

**The PBR legislation allows the variety breeder/owner to prevent growers from selling seed to other growers and any other third parties including traders and end-users.**

#### 3.6.2 End Point Royalties

An End Point Royalty (EPR) is a fee paid by growers for every tonne of grain produced and sold as grain for each variety.

The EPR amount is set by the variety owner (breeder) when the variety is released. This may vary between varieties.

The EPR represents a performance based equitable return to the breeder/owner for successful crop breeding. Breeding a new cultivar is expensive, taking from eight to twelve years with an estimated cost of at least \$2 million per variety.<sup>19</sup>

An EPR shares the risk between the breeder and the grower, whereas a seed royalty places all the risk on the grower.

For example, with EPR if the grower has a failed crop, the breeder receives no royalty. With a seed royalty, the grower pays a fee regardless of whether the crop is a success or failure.

<sup>19</sup> Australian Grain Technologies (2016) PBR and EPR Information. Australian Grain Technologies, <http://www.agtbreeding.com.au/sourcing-seed/pbr-and-epr>