



SOUTHERN JUNE 2018

# LUPIN

### SECTION 1 PADDOCK PLANNING AND PREPARATION

OVERVIEW | VARIETY SELECTION | NARROW LEAFED LUPIN VARIETIES | ALBUS LUPIN VARIETIES | SOIL TYPES AND PADDOCK SELECTION | ROTATION AND CROP SEQUENCE CONSIDERATIONS | WEED AND HERBICIDE CONSIDERATIONS | DISEASE AND PEST CONSIDERATIONS | MACHINERY CONSIDERATIONS | SEED QUALITY AND GERMINATION ISSUES



### (i) MORE INFORMATION

Pulse Australia 'Lupins in South Australia and Victoria': <u>http://www.</u> <u>pulseaus.com.au/storage/app/media/</u> <u>crops/2007\_Lupins-SA-Vic.pdf</u>

National Variety Trials 'Sowing Guides': <u>http://www.nvtonline.com.au/</u> <u>crop-guides/sa/</u>

Agriculture Victoria, 'Growing Lupin': <u>http://agriculture.vic.gov.au/</u> <u>agriculture/grains-and-other-crops/</u> <u>crop-production/growing-lupin</u>

Pulse Breeding Australia: <u>www.grdc.</u> <u>com.au/Research-and-Development/</u> <u>Major-Initiatives/PBA/PBA-Varieties-</u> <u>and-Brochures</u>

GRDC 'Ground Cover Supplement -Flexible Farming': <u>http://gc-</u> <u>supplement.realviewdigital.com/</u> ?iid=66229&startpage=page 0000015#folio=8

## Paddock planning and preparation

### 1.1 Overview

Including lupin in crop rotations with cereals can be more profitable than continuous cereal production in parts of the southern region.

Other benefits of growing this pulse crop are to provide a cereal disease and pest break, increase supplies of organic soil nitrogen (N), create more options for weed control and provide livestock feed in mixed farming systems.

Lupin crops effectively fix atmospheric N in symbiosis with bacteria and can take up phosphorus (P) efficiently from the soil.

The two main types grown in the southern region are the Australian sweet lupin, or narrow leafed lupin (*Lupinus angustifolius*), and albus lupin (*L. albus*), or white lupin.

Each has separate end uses and markets and different growth requirements due to the various soil types, rainfall zones and environments found across southern Australia.

### 1.2 Variety selection

The narrow leafed lupin is the main type grown in South Australia, Victoria and New South Wales.

This species is highly suited to acidic, sandy or low-fertility soils where other pulses may do poorly. Different varieties are suitable for different regional areas, depending on the amount of annual rainfall received.

Albus lupin is produced across all three Australian lupin growing regions, but in a much smaller area.

This species is best suited to fertile, well drained, heavier soils and has slightly better adaptation than narrow leafed varieties to alkaline soils.

Albus lupin tends to grow poorly in low rainfall areas and on infertile, deep sand or waterlogged soils. In the southern region, albus lupin is grown mostly in NSW and VIC.

The varieties of lupin grown in the southern region, agronomic traits and disease ratings of these varieties are outlined in Table 1.<sup>1</sup>



Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>







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Table 1: Lupin variety agronomic and disease guide<sup>2</sup>

Variety	Flowering time	Height	Lodging	Pod Shattering	Drought Tolerance	Aphid Resist	Brown Leaf Spot	Pleiochaeta root rot	CMV seed tranmit	Anthracnose	Phomopsis – Stem	Phomopsis – Pod
Narrow leafed												
PBA Bateman <sup>⊕</sup>	E/VE	Т	MSMR	MRMS		R	MS	MR	MRMS	MR	MR	MR
Jenabillup <sup>⊕</sup>	М	Т	MR	MS	MR	MR	MRMS	R	MRMS	S	MS	R
Jindalee	M-L	М	R	MR	MS		MRMS	R	MS	S	R	R
Mandelup <sup>⊕</sup>	VE	Т	MS	MS	MR	R	MS	R	MS	MR	R	MRMS
PBA Barlock <sup>⊕</sup>	E	М	MR	R		R	MS		RMR	R	MR	R
PBA Gunyidi <sup>⊕</sup>	VE	М	MS	R	MR	R	MS	R	MRMS	MR	R	R
PBA Jurien $^{\diamond}$	VE	Т	MS	MR		R	MS		MRMS	R	R	MR
Quilinock <sup>⊕</sup>	E	S	MS	MR	MR	MS	MRMS	R	MS	SVS	MRMS	MS
Wonga	E-M	Μ	MR	R	MS	R	MS	R	R	R	R	R
Albus lupin												
PBA Murringo <sup>®</sup>	mid	Μ	MSMR			R		MR		VS	Intermediate	
Kiev Mutant	E	М	R		MS	S	MS	VS	Immune	VS	MR	S
Luxor <sup>®</sup>	E-M	M-T	R		MS	S	MR	R	Immune	VS	MR	S
Rosetta	M-L	Т	R		MS	S	MR	MR	Immune	VS	MR	S

Flowering time; VE=very early, E=early, M=mid, L=late Height; S=short, M=medium, T=tall Lodging and disease reactions; R = Resistant RMR = Resistant to moderately resistant MR = Moderately resistant MRMS = Moderately resistant to moderately susceptible MS = Moderately susceptible MSS = Moderately susceptible to susceptible S = Susceptible SVS = Susceptible to very susceptible VS = Very susceptible.



Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u> 2





### i MORE INFORMATION

Pulse Australia 'Australian pulse varieties': <u>http://pulseaus.com.</u> <u>au/storage/app/media/crops/</u> <u>pulses/2016\_Pulse-Variety-Charts-</u> <u>web.pdf</u>

PBA Bateman<sup>(b)</sup> variety management guidelines: <u>http://www.seednet.com.</u> <u>au/product-profile-92\_658.html</u>

NVT Victorian Winter Crop Summary: www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary 1.3 Narrow leafed lupin varieties

### 1.3.1 PBA Bateman<sup>()</sup>



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**Figure 1:** PBA Bateman<sup>(h)</sup> This is a new variety released for southern region planting in 2017.

(SOURCE: Pulse Breeding Australia)

PBA Bateman<sup> $\phi$ </sup> is a narrow leafed lupin line released for southern region planting in 2017 under Pulse Breeding Australia (PBA) through Seednet.

It was bred by the PBA Lupin Breeding Program, led by the Department of Primary Industries and Regional Development (DPIRD) in WA.

In NSW National Variety Trials (NVT) it has been found to be high yielding, including in years of high pressure from Bean yellow mosaic virus (BYMV) and Cucumber mosaic virus (CMV).

PBA Bateman<sup> $\phi$ </sup> was one of several breeding lines to out-yield Mandelup<sup> $\phi$ </sup> by between 25 and 38 percent in four National Lupin Initiative trials in NSW in 2015.

PBA advises this variety has significant yield improvements over current narrow leafed varieties in the majority of lupin growing regions in NSW and SA.<sup>3</sup> Variety information for PBA Bateman<sup>(b)</sup> is available at: <u>http://www.seednet.com.au/product-profile-92\_658.html</u>







MORE INFORMATION

PBA Jurien<sup>(b)</sup> variety management guidelines: <u>http://www.pulseaus.com.</u> <u>au/storage/app/media/crops/2015\_</u> <u>VMP-AustLupin-PBAJurien.pdf</u>

FEEDBACK



### 1.3.2 PBA Jurien<sup>()</sup>



**Figure 2:** PBA Jurien<sup>®</sup> is a variety released in Western Australia in 2015 that performs well across southern Australia.

(SOURCE: GRDC)

This variety originated in WA and was released in 2015.

It has performed well across all lupin growing regions of Australia, with consistently higher yields in national trials in recent years compared to many older lupin varieties.

PBA Jurien<sup>()</sup> combines strong disease resistance with high yield potential.

In SA, the lower Eyre Peninsula, south east and upper Eyre Peninsula have had superior yield results in trials of this variety.

In VIC, yield results in trials have been similar to PBA Barlock<sup> $\phi$ </sup>, PBA Gunyidi<sup> $\phi$ </sup>, Jenabillup<sup> $\phi$ </sup> and Mandelup<sup> $\phi$ </sup> (with some regional variation).<sup>4,5</sup>

Variety management guidelines for PBA Jurien<sup>(b)</sup> are available on the Pulse Australia website at: http://www.pulseaus.com.au/storage/app/media/crops/2015\_VMP-AustLupin-PBAJurien.pdf

- 4 South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-to-res.pdf</u>
- 5 Pulse Breeding Australia (2016) PBA Varieties and brochures, <u>www.grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures</u>







### FEEDBACK

### (i) MORE INFORMATION

PBA Barlock<sup>(b)</sup> Variety management guidelines: <u>http://www.pulseaus.com.</u> au/storage/app/media/crops/2013\_ VMP-AustLupin-PBA-Barlock.pdf 1.3.3 PBA Barlock<sup>()</sup>



**Figure 3:** *PBA Barlock<sup>®</sup> is a high yielding variety for most regions of SA and VIC.* (SOURCE: PBA)

PBA Barlock $^{\phi}$  is high yielding and has improved yield potential for most regions of SA and VIC, compared to older narrow leafed varieties.

Released in 2013, it is an early flowering and maturing variety, with moderate resistance to lodging in high rainfall areas and improved pod shatter resistance than the previously popular varieties Coromup<sup>6</sup> and Tanjil<sup>6</sup>.

This variety features resistance to aphids and has a strong disease resistance profile, including to anthracnose (*Colletotrichum lupini*) and phomopsis (*Diaporthe toxica*), with only mild susceptibility to Brown leaf spot (*Pleiochaeta setosa*).<sup>67</sup>

Variety management guidelines for PBA Barlock<sup>()</sup> are available on the Pulse Australia website at: <u>http://www.pulseaus.com.au/storage/app/media/crops/2013\_VMP-AustLupin-PBA-Barlock.pdf</u>



<sup>6</sup> South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-lo-res.pdf</u>

<sup>7</sup> Pulse Breeding Australia (2016) PBA Varieties and brochures, <u>www.grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures</u>





### FEEDBACK

### (i) MORE INFORMATION

PBA Gunyidi<sup>©</sup> variety management guidelines: <u>http://www.pulseaus.com.</u> <u>au/storage/app/media/crops/2012\_</u> <u>VMP-Austlupin-PBAGunyidi.pdf</u>

### 1.3.4 PBA Gunyidi<sup>()</sup>



**Figure 4:** Released in WA in 2011, PBA Gunyidi<sup>(b)</sup> has high yield potential for the southern region.

(SOURCE: GRDC)

PBA Gunyidi<sup> $\phi$ </sup>, released in WA in 2011, has high yielding potential across VIC and SA and features early flowering and maturing qualities.

It has improved pod shattering resistance compared to Mandelup<sup> $\phi$ </sup> and Jenabillup<sup> $\phi$ </sup>, which can reduce risks of yield loss if harvest is delayed.

It has promising resistance (in varying levels) to aphids, anthracnose and phomopsis, but PBA Gunyidi<sup>(d)</sup> does have mild susceptibility to Brown leaf spot in some areas.<sup>8,9</sup>

Variety management guidelines for PBA Gunyidi<sup>®</sup> are available on the Pulse Australia website at: <u>http://www.pulseaus.com.au/storage/app/media/crops/2012\_VMP-Austlupin-PBAGunyidi.pdf</u>

8 South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-lo-res.pdf</u>



<sup>9</sup> Pulse Breeding Australia (2016) PBA Varieties and brochures, <u>www.grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures</u>



**MORE INFORMATION** 

Jenabillup<sup>()</sup> variety management guidelines: <u>http://www.pulseaus.com.</u> <u>au/storage/app/media/crops/2011\_</u> <u>VMP-NLlupin-Jenabillup.pdf</u>

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### 1.3.5 Jenabillup<sup>()</sup>



### **Figure 5:** Jenabillup<sup>()</sup> is a mid-maturing variety that grows well in medium and high rainfall areas.

(SOURCE: GRDC)

Jenabillup $^{\oplus}$  is a mid-maturing variety, well suited for stock feed and some niche food markets and with adaptation to all rainfall zones.

It grows best in medium and high rainfall areas of SA and was released in that state in 2011.

This variety has moderate resistance to black pod syndrome (caused by BYMV infection) and Brown leaf spot and moderate resistance to seed transfer of CMV.

Jennabillup<sup> $\Phi$ </sup> tends to perform better than Mandelup<sup> $\Phi$ </sup> in longer growing season areas, as its extended flowering window can assist with increasing yields. But this makes it less suitable for crop-topping for weed control.<sup>10,11</sup>

Variety management guidelines for Jenabillup<sup>()</sup> are available on the Pulse Australia website at: <a href="http://www.pulseaus.com.au/storage/app/media/crops/2011\_VMP-NLlupin-Jenabillup.pdf">http://www.pulseaus.com.au/storage/app/media/crops/2011\_VMP-NLlupin-Jenabillup.pdf</a>

10 Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>



<sup>11</sup> South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-lo-res.pdf</u>



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### (i) MORE INFORMATION

Mandelup<sup>()</sup> variety management guidelines: <u>http://www.pulseaus.com.</u> <u>au/storage/app/media/crops/2011\_</u> <u>VMP-NLlupin-Mandelup.pdf</u>

### 1.3.6 Mandelup<sup>()</sup>



**Figure 6:** Mandelup<sup> $\phi$ </sup> is a solid performer across most of the southern region. (SOURCE: GRDC)

Mandelup $^{\Phi}$  is a robust and high yielding narrow leafed lupin variety with early maturity, making it suitable for crop-topping.

Released in 2004, it consistently out-yielded earlier-released narrow leafed varieties in low and medium rainfall zones. But it is not recommended for high rainfall areas, as it has a tendency to lodge with high productivity.

Yield potential tends to be marginally higher in VIC's north east, SA's mid north and the lower Eyre Peninsula, but it is considered a solid performer across southern region rainfall zones.

Mandelup  $^{\rm 0}$  has a good disease and insect resistance profile, featuring mild resistance to anthracnose and resistance to aphids.

Reported issues with Mandelup<sup> $\phi$ </sup> include pod shatter with delayed harvest and poorer seed germination rates than in some other varieties.<sup>12,13</sup>

Variety management guidelines for Mandelup<sup>()</sup> are available on the Pulse Australia website at: <u>http://www.pulseaus.com.au/storage/app/media/crops/2011\_VMP-NLlupin-Mandelup.pdf</u>



<sup>12</sup> Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>https://grdc.com.au/resources-and-publications/all-publications/publications/2017/03/nvt-victorian</u> winter-cop-summary

<sup>13</sup> South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-to-res.pdf</u>



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### ) MORE INFORMATION

FEEDBACK

Jindall variety information: <u>http://</u> pulseaus.com.au/blog/post/2017pulse-variety-guide

### **i** MORE INFORMATION

Quilinock<sup>®</sup> variety information: <u>https://</u> www.ipaustralia.gov.au/sites/g/files/ net856/f/journals/pvj\_29\_3.pdf

### 1.3.7 Jindalee

Jindalee is a late maturing variety, flowering later in the season than the newer varieties.

It tends to yield higher than Wonga in many areas and suits medium to high rainfall zones in SA, if anthracnose resistance is not essential. This variety, released in 2000, has intermediate susceptibility to anthracnose.

Jindalee does not typically handle a dry finish well because of its tendency to flower later, but it does have resistance to phomopsis on stem and pods and is moderately resistant to Brown leaf spot.<sup>14</sup>

Variety information for Jindalee is available at: <u>http://pulseaus.com.au/blog/post/2017-pulse-variety-guide</u>

### 1.3.8 Quilinock<sup>()</sup>



**Figure 7:** Quilinock<sup>()</sup> has mostly been superseded in the south.

Released in 1999, Quilinock  $^{\!\!\!\!\!\!\!\!\!\!^{\,\rm O}}$  has been predominantly superseded as an option in most areas of the southern region.

It is early flowering and suits low and medium rainfall areas.

It is susceptible to very susceptible to anthracnose and has poorer phomopsis resistance than most other varieties.

It has poor tolerance to metribuzin herbicide.

There are limited quantities of this variety now grown in the southern region due to anthracnose susceptibility.  $^{\rm 15}$ 

Variety information for Quilinock<sup>®</sup> is available at: <u>https://www.ipaustralia.gov.au/sites/g/</u> files/net856/f/journals/pvj\_29\_3.pdf



<sup>14</sup> Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>

<sup>15</sup> Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>



**MORE INFORMATION** 

Wonga variety information: <u>http://</u>pulseaus.com.au/blog/post/2017-

pulse-variety-guide

FEEDBACK



#### 1.3.9 Wonga



**Figure 8:** Wonga is an older variety but may have a place in high disease risk areas. (SOURCE: GRDC)

Wonga, released in 1997, is an early flowering, moderate yielding lupin with anthracnose resistance and moderate resistance to phomopsis.

Wonga is one of the older varieties but its resistance properties are relevant to growers at risk – despite a tendency to be out-yielded by other varieties.<sup>16</sup>

Variety information for Wonga is available at: <u>http://pulseaus.com.au/blog/post/2017-pulse-variety-guide</u>

### 1.4 Albus lupin varieties

### 1.4.1 Murringo<sup>()</sup>

Murringo $^{\phi}$  is the newest and highest yielding albus lupin variety for southern and northern grain growing regions of Australia.

Bred by DPIRD as a cross between a germplasm accession from the Azores Islands and the Russian variety, Vladimir, it was released in 2017 through Seednet.

Murringo<sup> $\phi$ </sup> is best suited to medium and high rainfall lupin growing regions of NSW, but can also be grown in parts of VIC and SA.

This variety is suited to a late-April to mid-May sowing and is mid-flowering, with a slightly longer maturity time than  ${\rm Luxor}^{\rm 0}$ 

It has moderate resistance to pleiochaeta root rot and phomopsis, but is susceptible to anthracnose.

Grain quality and its pure white colour makes Murringo<sup> $\phi$ </sup> well suited to albus human consumption markets. Seed size is similar to Luxor<sup> $\phi$ </sup> and Amira<sup> $\phi$ </sup>.

Variety management guidelines for Murringo<sup>(+)</sup> are available at: <u>www.seednet.com.au/</u> <u>product-profile-92\_649.html</u>



Murringo<sup>(+)</sup> variety management guidelines: <u>http://www.seednet.com.</u> <u>au/product-profile-92\_649.html</u>



<sup>16</sup> South Australian Research and Development Institute (2016) Sowing Guide, SARDI, <u>http://www.nvtonline.com.au/wp-content/uploads/2016/03/SA-sowing-guide-2016-lo-res.pdf</u>



**MORE INFORMATION** 

**MORE INFORMATION** 

Rosetta variety management

VMP-Albuslupin-Rosetta.pdf

guidelines: http://www.pulseaus.com.

au/storage/app/media/crops/2009\_

A

Luxor<sup>(b)</sup> variety management

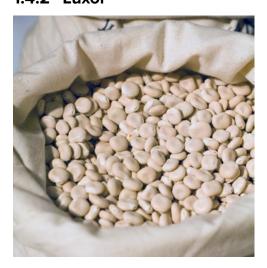
VMP-AlbusLupin-Luxor.pdf

guidelines: <u>http://www.pulseaus.com.</u> au/storage/app/media/crops/2009\_

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**1.4.2 Luxor**<sup>()</sup>



**Figure 9:** Luxor<sup>®</sup> was the albus variety developed to replace Kiev Mutant and has improved resistance to pleiochaeta root rot.

(SOURCE: GRDC)

Released in 2008, Luxor<sup>®</sup> was the albus variety developed to replace Kiev Mutant and has improved resistance to pleiochaeta root rot (caused by the fungus *Pleiochaeta setosa*).

It is slightly taller than Kiev Mutant and is suitable for lower to medium rainfall regions and high rainfall regions where pleiochaeta root rot can be a problem.

 $Luxor^{\oplus}$  is 100 percent sweet and should not be grown within two kilometres of other albus varieties to avoid contamination with bitter lines.  $^{17}$ 

Variety management guidelines for Luxor<sup>()</sup> are available on the Pulse Australia website at: <u>http://www.pulseaus.com.au/storage/app/media/crops/2009\_VMP-AlbusLupin-Luxor.pdf</u>

### 1.4.3 Rosetta

Rosetta, released in 2007, is recommended for medium to high rainfall areas of the southern region and is a longer season variety.

It is best suited to cool environment parts of VIC and SA and has good Brown leaf spot resistance.

This variety was released for its improved yield over Kiev Mutant and its 100 percent sweet status for export markets means it should not be grown near other albus varieties.<sup>18</sup>

Variety management guidelines for Rosetta are available on the Pulse Australia website at: <u>http://www.pulseaus.com.au/storage/app/media/crops/2009\_VMP-Albuslupin-Rosetta.pdf</u>

17 Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>

18 Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>





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### i MORE INFORMATION

Kiev Mutant variety information: <u>http://</u> <u>pulseaus.com.au/blog/post/2017-</u> <u>pulse-variety-guide</u>

#### 1.4.4 Kiev Mutant



**Figure 10:** *Kiev Mutant has largely been replaced.* 

Kiev Mutant was once the most widely grown albus lupin variety in southern Australia, but has now been virtually replaced by newer lines.

It is a vigorous grower, flowers early and matures later than narrow leafed varieties.

Kiev Mutant requires annual rainfall higher than 450 mm to yield well, but does not handle waterlogged conditions. Alkaloid testing of seed is required.<sup>19</sup>

Variety information for Kiev Mutant is available on the Pulse Australia website at: <u>http://pulseaus.com.au/blog/post/2017-pulse-variety-guide</u>

### 1.5 Soil types and paddock selection

Narrow leafed lupin varieties suit soils with low free lime levels (up to 4 percent) and tend to experience poor growth on hard setting or shallow soils (less than 25 cm) that prevent crop root penetration.

These types are most suited to acid soils with a pH as low as 4 (in Calcium Chloride or  $CaCl_2$ ) formed with sand, or sand over clay, and well-structured loam soils. Alkaline soils up to pH 8.5 are also suitable.<sup>20</sup>

Paddock soil testing for acidity (pH) should be conducted in several locations and at several depths.

This can be carried out by using professional soil testing services.

When growing lupin, it is advised that the top 40 cm of the soil profile should have no, or very low, free lime (no acid fizz reaction).

Albus lupin is typically only suited to heavy, fertile and free-draining soils in the southern region.

These varieties are sensitive to waterlogging and tend to grow poorly on sandy soils.

Albus lupin can achieve higher yields than narrow leafed varieties in some areas, but frost sensitivity and anthracnose risk can be a concern in susceptible zones.

### (i) MORE INFORMATION

DPIRD 'Lupin Essentials': https://www.agric.wa.gov.au/lupins/ lupin-essentials-%E2%80%93growing-successful-lupin-crop



<sup>19</sup> Couchman, J, Hollaway, K (2016) Victorian Winter Crop Summary, Department of Economic Development, Jobs, Transport and Resources, Agriculture Victoria, <u>www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary</u>

<sup>20</sup> White, P, French, B, McLarty, A (2008) Producing Lupins. Department of Agriculture and Food WA Bulletin 1-2008, <u>http://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1009&context=bulletins</u>







### **1.6** Rotation and crop sequence considerations

Lupin survives on soils with low N levels, effectively 'fixes' atmospheric N in symbiosis with rhizobia bacteria and can take up P efficiently from the soil.

Lupin will typically yield better after cereals than pasture. In turn, cereal yields tend to be greater after lupin crops than after pasture.

Growing successive lupin crops is not recommended due to risk of disease, particularly pleiochaeta root rot.

If this is the intention, it is advised to remove as much lupin stubble as possible to reduce disease risk carry over, treat the seed with registered fungicides and direct drill.<sup>21</sup>

### 1.7 Weed and herbicide considerations

Paddock preparation for lupin starts in the summer, as crop germination and early growth can be adversely affected where melons (such as *Cucumis myriocarpus*) and other summer weeds are present. Camel melon (*Citrullus lanatus*) residue can also cause allelopathic affects to the crop.

Lupin crops can be affected by herbicide residues where rainfall has been insufficient in both summer and the previous growing season.

It is advised that this is considered when planning lupin in a rotation, along with the paddock weed burden if a knockdown is not possible.

Consideration of the herbicide label for plant-back periods should be given, as well as soil pH, free lime and rainfall levels.

Lupin has particular sensitivity to group B (sulfonamide) residues and, in high pH soils, some sulfosulfuron active residues can create damage.

All pulses, including lupin, are vulnerable to Group I phenoxy (2,4-D amine and MCPA) residues, particularly in sandy soils with low rates of microbial breakdown.

Clopyralid is another Group I active that has shown significant residual effects in lupin crops the following season after summer application in some areas.

Group I amicide formulations tend to result in more residual issues than ester formulations. Residue issues arising from the use of some newer pre-emergent herbicide options, such as the Group C terbuthylazine and Group K dimethenamid, are discussed in more detail in Chapter 5.

An integrated weed management (IWM) plan that incorporates herbicide, cultural and physical measures will be most effective for suppressing weeds, lowering weed seedbanks and prolonging herbicide sustainability in lupin crops.



### (i) MORE INFORMATION

WeedSmart 10-point Plan: www.weedsmart.org.au

GRDC 'Integrated Weed Management': www.grdc.com.au/IWM

Pulse Australia 'Minimum re-cropping intervals and guidelines': <u>www.</u> <u>pulseaus.com.au/growing-pulses/</u> <u>publications/residual-herbicides</u>

<sup>21</sup> White, P, French, B, McLarty, A (2008) Producing Lupins. Department of Agriculture and Food WA Bulletin 1-2008, <u>http://researchlibrary.agric.wa.gov.au/cqi/viewcontent.cgi?article=1009&context=bulletins</u>



### FEEDBACK

### (i) MORE INFORMATION

DPIRD 'Machinery and Harvest Tips': <u>https://www.agric.wa.gov.</u> <u>au/lupins/amira-anthracnose-</u> resistant-albus-lupin-western-<u>australia?page=0%2C2#smart</u> <u>paging\_toc\_p2\_s1\_h3</u>

DPIRD 'Lupin Essentials': <u>https://</u> www.agric.wa.gov.au/lupins/ lupin-essentials-%E2%80%93growing-successful-lupincrop?page=0%2C4#smartpaging\_ toc\_p4\_s2\_h2



GRDC 'Stored Grain': http://storedgrain.com.au/

### 1.8 Disease and pest considerations

Most of the newer narrow leafed and albus lupin varieties have reasonable levels of disease resistance.

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But it is recommended to have narrow leafed variety seed tested for CMV and anthracnose and albus seed tested for anthracnose.

Narrow leafed lupin tend to be susceptible to Brown leaf spot. To avoid other viruses, sowing lupin adjacent to legumes or pastures is not recommended. Most of the current narrow leafed varieties have phomopsis resistance, but significant rain on the plants while maturing or after harvest can prompt disease development.

It is advised that care be taken if this occurs and there is intent to graze lupin stubbles, or feed lupin seed to livestock, to reduce risks of lupinosis (caused by the fungus *Diaporthe toxica*).

If a paddock has a history of lupin disease, it may be best to fallow it or sow an alternative crop to allow the disease to die back.<sup>22</sup>

### 1.9 Machinery considerations

Successful lupin growing requires use of quality seed and careful seed handling, with particular attention to any auger or seeder mechanisms that can damage grains. Tubulators, or belt elevators, can help to reduce this problem.

Seeding equipment should be capable of sowing the seed without blocking and modifications to seed tubes and dividing heads may be required, as well as changes to the metering mechanisms.

Trials suggest seed yields of narrow leafed lupin are not affected by tillage systems. This means lupin has widespread suitability for a range of farming practices.<sup>23</sup>

During harvesting, care should be taken to avoid pod shattering as lupin enters the header from the cutter bar. It is advised to pay attention to points where there is contact plant on plant, reel on crop or if there is poor removal of cut material. Harvesting in higher humidity situations, such as early mornings, and avoiding extreme heat can help reduce losses from harvest pod shatter in lupin. To prevent the spread of viruses and certain diseases, such as anthracnose, the hygiene and regular cleaning of harvest equipment is important.<sup>24</sup>

### **1.10** Seed quality and germination issues

If lupin seed is coming into VIC or NSW from WA or SA, extra vigilance might be required or seed tested for anthracnose (which only occurs in these two states) to avoid spread.

It is advised that seed being retained on-farm for subsequent sowing should come from paddocks that are harvested first to ensure best quality and germination rates, especially if grain moisture levels are above 11.5 percent at harvest.

Seed with moisture levels above 13 percent should not be stored in a steel silo. Instead, it might be beneficial to dry the grain to ensure viability.<sup>25</sup>



<sup>22</sup> DPIRD (2016) Lupin Essentials – Growing a Successful Lupin Crop, DAFWA, <u>https://www.agric.wa.gov.au/lupins/lupin-essentials-</u> %E2%80%93-growing-successful-lupin-crop

<sup>23</sup> White, P, French, B, McLarty, A (2008) Producing Lupins. Department of Agriculture and Food WA Bulletin 1-2008, <u>http://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1009&context=bulletins</u>

<sup>24</sup> DPIRD (2016) Lupin Essentials – Growing a Successful Lupin Crop, DAFWA, <u>https://www.agric.wa.gov.au/lupins/lupin-essentials-%E2%80%93-growing-successful-lupin-crop</u>

<sup>25</sup> DPIRD (2016) Lupin Essentials – Growing a Successful Lupin Crop, DAFWA, <u>https://www.agric.wa.gov.au/lupins/lupin-essentials-%E2%80%93-growing-successful-lupin-crop</u>