AGRONOMY FOR LUPIN SEED PRODUCTION

MARTIN HARRIES DPIRD
Why look at lupin seed production?

Several reports of poor establishment in recent years which may be connected with seed quality

• Jurien release 2015/16
• NVT trials 2018
• Commercial paddocks
  Many reports of high levels of split seed

Will go through these examples and look at aspects of agronomy for seed production
Jurien bulk-up
2015/16

- 40+ mm of rain on mature plants prior to harvest.

Harvested after rain

Harvested before rain

An example of rain damaged seed:
Farmers paddock 2005
‘Rain’ at harvest trials

<table>
<thead>
<tr>
<th>3 trials: 1 laboratory, 2 field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gungurru, Mandelup &amp; Jurien</td>
</tr>
<tr>
<td>Harvest date: 31 Oct (no irrigation), 14 Nov (1 irrigation), 28 Nov (2 irrigations) and 15 Dec (3 irrigations).</td>
</tr>
<tr>
<td>No variety effect 2 of 3 trials</td>
</tr>
</tbody>
</table>
Reduction in germination (%)

Field experiment
Lab experiment

- 1 cycle = 5 to 10%
- 2 cycles = 10 to 20%
- 3 cycles = 35 to 45%

Number of wetting and drying cycles of seed
2018 NVT trials

<table>
<thead>
<tr>
<th>Poor establishment of Mandelup, Barlock, Jurien &amp; Gunyidi</th>
</tr>
</thead>
<tbody>
<tr>
<td>These all came from a separate bulk-up to other varieties</td>
</tr>
<tr>
<td>Seed rate adjusted for germ</td>
</tr>
</tbody>
</table>

Photo Jackie Bucat
Seed used in 2018 NVT trials

- 100 mm rain at harvest
- Seed size: very small (Recommend ≥16g/100 seed)
- Germination: not great (Recommend above 90%)
- Field establishment: low
- Mn concentration: good

<table>
<thead>
<tr>
<th>Variety</th>
<th>100 seed weight (g)</th>
<th>Germination (%) Jan 18</th>
<th>Field estab (%)</th>
<th>Mn (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandelup</td>
<td>13.5</td>
<td>90</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Barlock</td>
<td>11.4</td>
<td>89</td>
<td>61</td>
<td>26</td>
</tr>
<tr>
<td>Jurien</td>
<td>12.9</td>
<td>83</td>
<td>42</td>
<td>36</td>
</tr>
<tr>
<td>Gunyidi</td>
<td>12.2</td>
<td>71</td>
<td>38</td>
<td>32</td>
</tr>
</tbody>
</table>
Re-tested Gunyidi 15/2/19

Rapid seed deterioration

46% germ a year later indicates rain on seed accelerated the aging process.
Harvest timing & physical damage

Best germination = Low speed & high moisture

Same principle for handling

Same principle for air seeders

Blanchard, ED. The Effect of Mechanical Damage on the Seed (1990)

Figure 5: Germination rate versus moisture content for Danja lupins at four impact peripheral speeds.
Manganese deficiency

Split seed

Cotyledon symptoms

Poor germination + won’t emerge
Low Mn conc. = low germination %

Paddock survey

Split seed <7 ppm won’t emerge

~8-20 ppm can look ok, has variable germ % and vigour

A low % of split seed means the rest of the seed lot is probably low Mn too

- Split
- No visual symptoms
- Good

Germination (%)

Seed Mn concentration (ppm)
2018 NVT: relationship btw % split and Mn conc.

Below ~ 10 ppm split seed common

Test results from 2018 NVT

- 3 of 6 sites av Mn conc. 12.6 or lower
- Range across trials 25 ppm to 8 ppm
- Large environmental effect
Do varieties differ?

<table>
<thead>
<tr>
<th>Variety/Line</th>
<th>Mn</th>
<th>Mn rank (1-14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBA Gunyidi</td>
<td>20.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Mandelup</td>
<td>20.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Jenabillup</td>
<td>19.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Breeder line 1</td>
<td>18.5</td>
<td>5.7</td>
</tr>
<tr>
<td>PBA Jurien</td>
<td>18.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Breeder line 2</td>
<td>17.0</td>
<td>7.0</td>
</tr>
<tr>
<td>PBA Leeman</td>
<td>17.3</td>
<td>7.0</td>
</tr>
<tr>
<td>Breeder line 3</td>
<td>16.9</td>
<td>7.5</td>
</tr>
<tr>
<td>Coromup</td>
<td>16.5</td>
<td>8.7</td>
</tr>
<tr>
<td>Breeder line 4</td>
<td>16.4</td>
<td>9.0</td>
</tr>
<tr>
<td>PBA Bateman</td>
<td>15.8</td>
<td>10.3</td>
</tr>
<tr>
<td>PBA Barlock</td>
<td>15.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Breeder line 5</td>
<td>14.4</td>
<td>12.2</td>
</tr>
<tr>
<td>Breeder line 6</td>
<td>13.9</td>
<td>13.2</td>
</tr>
</tbody>
</table>

Test results from 2018 NVT seed

- Varieties did differ in Mn concentration at 4 sites
- Range between varieties = 6.6 ppm
- Variety less of a factor than environment
- No data here to say Jurien is a problem but should keep testing

4/6 sites sig
Environmental factors & Mn seed conc.

Zones 8, 1 and northern parts of 2 & 3 (sands), pick heavier soils for seed production.

Low rainfall = less Mn uptake

Last few season late starts… a major effect on split seed
Reduced supply?

- Fertiliser product and placement
  - A lot of paddocks sown without Mn
  - Higher P:Mn ratio compound fertilisers
  - Top-dressing ~25% as effective as deep banding
  - Are you getting enough Mn on?
- Increased lime application
- Reduced compound Mn over the rotation with reduced lupin production
- Effects of soil inversion on Mn distribution within the soil profile unknown.
Increased demand?

- Increased yields
- Soil amelioration and changes in plant yield architecture
- 2018 demo
  - Un-ripped 2% yield secondary laterals
  - Ripped 19%
Other things to consider

Crop topping
Timing
Glyphosate not registered & will reduce germination

Storage
Wild radish: lupin seed germ dropped by 20% after 5 days at 5% contamination with green radish pods

Temp and moisture: <25°C & <13% moisture

Poor establishment due to many other factors
i.e. Herbicides on ameliorated soils, fert tox, soil pathogens and other pests...?
Testing

Do the basics

• Seed size
• Inspect for damage
• Germination
• Vigour
• Manganese concentration
Summary

Growing lupin grain for seed requires some attention to detail;

• Site selection
• Nutrition
• Early harvest
• Good handling and storage
• Testing of seed

Environment and management are much bigger effects than variety
Further information

Manganese


Further information

**Physical damage & storage**


Blanchard E (1994) Physical damage of grain legumes during harvesting, handling and seeding and its effect on seed viability. GRDC final report, project DAW 36G


**Harvest timing**


**Contacts**

*AgWest plant laboratories*
Email: DDLS-STAC@agric.wa.gov.au
Phone +61 (0)8 9368 3721

*Chemistry centre of WA*
Mn seed testing; around $50 per sample, but minimum charge around $200.
T: +61 8 9422 9800 W: www.chemcentre.wa.gov.au
Acknowledgments

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## Harvest timing

### 6 varieties: Leeman, Jurien, Barlock, Gunyidi, Mandelup and Gungurru

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>No variety response</td>
<td></td>
</tr>
<tr>
<td>Delaying 2 weeks (mid Nov)</td>
<td>6% loss</td>
</tr>
<tr>
<td>Delaying 6 weeks (mid Dec)</td>
<td>15% loss</td>
</tr>
<tr>
<td>Gungurru 292 kg/ha vs Jurien 367 kg/ha</td>
<td></td>
</tr>
<tr>
<td>Higher yielding variety</td>
<td>more yield loss</td>
</tr>
</tbody>
</table>

Gungurru 292 kg/ha vs Jurien 367 kg/ha in the table shows higher yielding variety results in more yield loss when harvested at different times.