Higher yielding
Improved powdery mildew resistance

KEY FEATURES
- Jade-AU® is 12% higher yielding than Crystal® across five years of regional evaluation
- Moderately Susceptible (MS) to powdery mildew (better than Crystal® and Satin II®)
- Moderately Susceptible (MS) to tan spot (field resistance is slightly better than Crystal®)
- Tall, erect plant type that holds its pods high to increase harvestability
- Production agronomy and management equivalent to Crystal®
- Grain quality is equivalent to Crystal® (suitable for No.1, Processing and Manufacturing)

MAIN ADVANTAGES
Jade-AU® is a large seeded bright green mungbean that is broadly adapted to the northern region. It is suitable for both ‘spring planting’ (Sept/early Oct) and ‘conventional summer planting’ (Dec/Jan).

It has a demonstrated consistent yield increase of 12% when compared to Crystal® across all regions of central and southern Queensland and northern New South Wales. It has grain quality equivalent to Crystal® and is highly acceptable in the market place.

Jade-AU® has the best available combined suite of resistance to powdery mildew (greater than Crystal®), tan spot and halo blight (ratings are equivalent to Crystal®).

Jade-AU® is of an equivalent plant type and has similar production agronomy to Crystal® and other current varieties.

SEED PROTECTION & ROYALTIES
Jade-AU® is protected under Plant Breeder’s Rights (PBR) legislation. Growers can only retain seed from their production of Jade-AU® for their own use.

A Seed Royalty, which includes breeder royalties, applies at the point of sale. This royalty helps to fund the National Mungbean Improvement Program and is re-invested in research to develop future mungbean varieties.

AREA OF ADAPTATION
YIELD & ADAPTATION

Jade-AU® is well adapted to both dryland and irrigated production across all regions where mungbean is currently grown. It has been tested by the National Mungbean Improvement Program at 38 sites between 2008 and 2012, this is the most rigorous evaluation program yet for any mungbean variety release.

Jade-AU® is on average 12% higher yielding than Crystal®, This response is relatively consistent across regions and seasons. Table 1, provides a summary of all 38 trials firstly, averaged by region across years and then averaged by year across regions.

Jade-AU® has demonstrated an average yield increase of 12% when compared to Crystal® across sites with low, medium and high yield potential (refer Figure 1), highlighting its reliable performance across all environments.

In a single evaluation in the Burdekin (2012), Jade-AU® yielded 1.6 t/ha and was 8% higher yielding than Crystal® and all other commercial varieties (none replicated strip trial).

Table 1: Long-term average yields expressed as a % of Crystal® by region and by years

<table>
<thead>
<tr>
<th>Variety</th>
<th>Central Qld (14)</th>
<th>Southern Qld (15)</th>
<th>Northern NSW (9)</th>
<th>2008 (3)</th>
<th>2009 (8)</th>
<th>2010 (14)</th>
<th>2011 (9)</th>
<th>2012 (4)</th>
<th>Average (38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large seeded shiny green mungbean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jade-AU® (t/ha)</td>
<td>1.19</td>
<td>1.14</td>
<td>1.18</td>
<td>1.16</td>
<td>1.10</td>
<td>1.30</td>
<td>1.13</td>
<td>0.95</td>
<td>1.17</td>
</tr>
<tr>
<td>Jade-AU®</td>
<td>112</td>
<td>114</td>
<td>108</td>
<td>119</td>
<td>115</td>
<td>111</td>
<td>108</td>
<td>105</td>
<td>112</td>
</tr>
<tr>
<td>Berken</td>
<td>86</td>
<td>83</td>
<td>55</td>
<td>80</td>
<td>95</td>
<td>67</td>
<td>84</td>
<td>59</td>
<td>77</td>
</tr>
<tr>
<td>Crystal®</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Small seeded shiny green mungbean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Diamond®</td>
<td>78</td>
<td>71</td>
<td>46</td>
<td>84</td>
<td>95</td>
<td>50</td>
<td>73</td>
<td>59</td>
<td>72</td>
</tr>
<tr>
<td>Dull seeded green mungbean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satin II®</td>
<td>106</td>
<td>111</td>
<td>93</td>
<td>116</td>
<td>114</td>
<td>98</td>
<td>104</td>
<td>106</td>
<td>107</td>
</tr>
</tbody>
</table>

Source: Trial results from the National Mungbean Improvement Program (2008 - 2012)
Number in parentheses ( ) shows the number of trials

Figure 1: Relative performance of Jade-AU® as a percentage of Crystal® by yield range

Source: Trial results from the National Mungbean Improvement Program (2008 - 2012)
Number in parentheses ( ) shows the number of trials
Jade-AU\textsuperscript{b} has the best available combined suite of resistance to powdery mildew, tan spot and halo blight.

**Powdery mildew**
Jade-AU\textsuperscript{b} is Moderately Susceptible (MS) to powdery mildew. Whilst it has greater resistance than Crystal\textsuperscript{a} and mildew is slower to develop, the disease can still be economically damaging if it occurs prior to or at flowering.

**Tan spot and halo blight**
Jade-AU\textsuperscript{b} is Moderately Susceptible (MS) to these diseases, tan spot field resistance is slightly better than Crystal\textsuperscript{a}. Both of these diseases are caused by bacterium and as such foliar fungicide sprays are of no benefit. There are no effective in crop management options.

Growers should follow the guidelines as presented in the ‘Mungbean Management Guide’.

### Table 2: Disease resistance of Australian mungbean varieties

<table>
<thead>
<tr>
<th>Variety</th>
<th>Powdery mildew</th>
<th>Tan spot</th>
<th>Halo blight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Score</td>
<td>Rating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Range</td>
</tr>
<tr>
<td>Large seeded shiny green mungbean</td>
<td></td>
<td>MS</td>
<td>4.1</td>
</tr>
<tr>
<td>Jade-AU\textsuperscript{b}</td>
<td>VS</td>
<td>6.2</td>
<td>5.0 - 7.5</td>
</tr>
<tr>
<td>Berken</td>
<td>S</td>
<td>5.3</td>
<td>3.3 - 7.0</td>
</tr>
<tr>
<td>Crystal\textsuperscript{a}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small seeded shiny green mungbean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Diamond\textsuperscript{a}</td>
<td>MS</td>
<td>4.5</td>
<td>3.0 - 7.5</td>
</tr>
<tr>
<td>Dull seeded green mungbean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satin II\textsuperscript{a}</td>
<td>S</td>
<td>5.1</td>
<td>3.7 - 7.0</td>
</tr>
</tbody>
</table>

**Source:** The National Mungbean Improvement Program

S = Susceptible, MS = Moderately Susceptible, MR = Moderately Resistance, R = Resistant

Score: 1 = no disease, 9 = dead

**AGRONOMIC MANAGEMENT**

Production agronomy is equivalent to current varieties. The growth habit of Jade-AU\textsuperscript{b} is similar to Crystal\textsuperscript{a}, maturing in the same number of days and with equivalent plant height and lodging resistance.

Target an established plant population of:
- **Dryland** 25 plants/m\textsuperscript{2}
- **Irrigated** 30 plants/m\textsuperscript{2}

### Table 3: Agronomic traits of Australian mungbean varieties

<table>
<thead>
<tr>
<th>Variety</th>
<th>Seed weight (g/100 seeds)</th>
<th>Days to flowering</th>
<th>Days to maturity</th>
<th>Plant height (cm)</th>
<th>Lodging score</th>
<th>Shattering score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large seeded shiny green mungbean</td>
<td>6.6</td>
<td>44</td>
<td>85</td>
<td>63</td>
<td>2.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Jade-AU\textsuperscript{b}</td>
<td>5.8</td>
<td>45</td>
<td>84</td>
<td>61</td>
<td>5.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Berken</td>
<td>6.1</td>
<td>45</td>
<td>84</td>
<td>66</td>
<td>2.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Crystal\textsuperscript{a}</td>
<td>3.3</td>
<td>45</td>
<td>82</td>
<td>62</td>
<td>3.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Small seeded shiny green mungbean</td>
<td>3.3</td>
<td>45</td>
<td>82</td>
<td>62</td>
<td>3.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Green Diamond\textsuperscript{a}</td>
<td>5.9</td>
<td>44</td>
<td>83</td>
<td>65</td>
<td>2.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Dull seeded green mungbean</td>
<td>5.9</td>
<td>44</td>
<td>83</td>
<td>65</td>
<td>2.5</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**Source:** The National Mungbean Improvement Program

Score: 1 = no visible/adverse affect, 9 = severely affected

**Employ the services of an Accredited Mungbean Agronomist**

A list of which can be found on the AMA website under ‘Growing Mungbeans’
SEED QUALITY

The quality of grower retained seed will deteriorate over a period of time. These samples often look uneven and may have a large proportion of dull blue-green seeds mixed with shiny seeds.

Current industry best practice is for growers to replace their planting seed every 3 seasons to ensure that the seed is genetically pure, of the highest vigour and of minimal risk for the seed borne diseases tan spot and halo blight. These bacterial disease are seed borne and can significantly reduce yields.

AMA APPROVED SEED

Only purchase seed that is clearly labelled as AMA Approved Seed. This seed has been harvested from dedicated seed crops that have been inspected to ensure minimal risk of the seed borne diseases tan spot and halo blight. It is available from your local AMA member or seed re-seller.

VARIETAL PURITY

Varietal purity is essential, as mixtures are unacceptable in the market place. Mixed seed lines will often attract heavy discounts purely on their visual appearance. This particularly applies to contamination with varieties like Satin II, with its dull seed coat giving the appearance of weather damage in the sample.

MARKETING

Jade-AU has high grain quality characteristics, equivalent to Crystal and is suitable for the No. 1, Processing and Manufacturing markets.

ENQUIRIES

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BREEDING

The National Mungbean Improvement Program is led by Queensland Department of Agriculture, Fisheries and Forestry (DAFF) in partnership with the Grains Research and Development Corporation (GRDC) and the Australian Mungbean Association (AMA).

Jade-AU (evaluated as M07213) was developed from a cross of VC2768A released by AVRDC, the World Vegetable Centre and the Australian breeding line 3511-9.

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