Breeding dual purpose wheats at CSIRO

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Canberra
Wheat Germplasm Development and breeding at CSIRO

Plant Industry’s
Germplasm
‘prebreeding’
engine-room

Commercial Breeding Company

Commercial release

Statistics
Quantitative genetics
Agronomy and Crop modelling

Physiology
Pathology

Cytology
Molecular biology
Cereal Chemistry

Agronomy and Crop modelling

Commercial breeding companies
The high rainfall zone (HRZ) of Australia - Australia’s future food bowl

- CSIRO has pioneered breeding in this zone.
- The most reliable and productive cropping region in Australia.
- The region of choice for GM and high value crops.

A vital partnership between CSIRO and Plant and Food Research, New Zealand for HRZ Breeding activities
New varieties released by CSIRO in the HRZ in the last 5 years:

Dual-purpose:
A Mackellar
B Revenue
B Mansfield

Grain only:
A Preston
A Gascoigne

A Commercial partner AWB Seeds
B Commercial partner Grainsearch
Dual purpose wheats have a flexible sowing window and can be planted from February (graze and grain) to June (grain only).
Advantages of dual-purpose wheats

- Grazing value plus grain
- High grain yield (Australian record)
- Soil conservation
- Deeper root system
- Can be managed so that grazing increases yield
- Flexibility in cropping system
- Internationally marketable grain
Conservative estimates in NSW - $700 to $1000 per ha

$250 - $350 per ha animal production (forage)

$450 - $650 per ha grain production

**Monaro**

Fat lambs: $1150 per ha gross margin (forage)

Steers: $1400 per ha gross margin (forage)

Weaner bulls: $600 per ha plus 14 t/ha silage
Dual-purpose breeding programs at CSIRO

1. Feed wheat - GRDC, CSIRO, NZ Plant and Food Research, SFS

2. Milling wheat – HRZ Wheats P/L (CSIRO, PFR, GRDC, Landmark)

Note HRZ Wheats also breeds grain only wheats
## Yield results of dual-purpose wheats in eastern Australia

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (%)</th>
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<tbody>
<tr>
<td>CS95102.1</td>
<td>120</td>
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<tr>
<td>CS123.1</td>
<td>114</td>
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<tr>
<td>Mackellar</td>
<td>109</td>
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<tr>
<td>Dennis</td>
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<td>Chara</td>
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<td>H150.2</td>
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<td>Declic</td>
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<td>Marombi</td>
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<td>Brennan</td>
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<td>Rudd</td>
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<td>Kellalac</td>
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<tr>
<td>Currawong</td>
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<tr>
<td>EGA_Wedgetail</td>
<td>92</td>
</tr>
<tr>
<td>Rosella</td>
<td>92</td>
</tr>
</tbody>
</table>
Plant Type for HRZ winter wheats

Primary requirement:
High yield, rust resistant, grazing tolerant, internationally recognised grain quality (if milling wheat)

- **NZ and CSIRO Source Material**
  - Novel and more robust rust disease package
  - Plant architecture to physically hold up high yields (can exceed 10 t/ha)
  - Breeding for high yield potential
- **Two dual-purpose maturity types**
  - Mid-season (Wedgetail)
  - Late-season (Revenue)
  - Regional (Vernalisation or photoperiod)

- **High Yield potential**
- **AH quality (>11.5% protein)**
- **BYDV resistance**
- **WSMV resistance**
- **Awnless (sprouting tolerance)**
- **Other diseases**
  - Yellow leaf spot
  - Septoria
  - Root diseases
New dwarfing genes for improved establishment - to sow on receding soil moisture
Molecular markers used in breeding

- Yellow rust, leaf rust and stripe rust
- BYDV
- Vernalisation and photoperiod response
- GA responsive dwarthing genes (long coleoptile)
- High molecular weight glutenins