WEST MIDLANDS GROUP
our knowledge hub

# 2015 GRDC Barley NVT

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GRDC, ACAS

**Purpose:**

The purpose of the canola NVT trials at Dandaragan is to provide growers and their advisors with independent information on the performance of newly released varieties of canola relative to the current commercial varieties grown in the area. The intention is to have two years of data available on the NVT website at the time each new variety is made available for commercial production.

**Location:** Dandaragan

**Soil Type:** Loam over heavy clay

**Soil Test Results:**

| Soil Analysis (CSBP) | | 0-10cm | 10-20cm | 20-30cm | 30-40cm | 40-50cm |
|---|---|---|---|---|---|---|
| Colour | | GRBR | GRBR | GRBR | GRBR | GRBR |
| Ammonium Nitrogen | mg/Kg | 11 | 3 | 1 | 1 | 1 |
| Nitrate Nitrogen | mg/Kg | 19 | 5 | 2 | 1 | 1 |
| Phosphorus Colwell | mg/Kg | 52 | 30 | 12 | 5 | 6 |
| Potassium Colwell | mg/Kg | 282 | 269 | 180 | 233 | 239 |
| Sulphur | mg/Kg | 8.9 | 3 | 1.6 | 5 | 8 |
| Organic Carbon | % | 2.62 | 1.41 | 0.9 | 0.65 | 0.54 |
| Conductivity | dS/m | 0.062 | 0.032 | 0.028 | 0.056 | 0.073 |
| pH Level (CaCl2) | pH | 5.6 | 4.4 | 4.5 | 5.3 | 5.7 |
| pH Level (H2O) | pH | 6.1 | 5.3 | 5.6 | 6.2 | 6.7 |
| Exc. Aluminium | meq/100g | 0.026 | 0.357 | 0.334 | 0.108 | 0.138 |
| Exc. Calcium | meq/100g | 8.51 | 4.82 | 5.99 | 15.1 | 15.72 |
| Exc. Magnesium | meq/100g | 1.15 | 0.89 | 1.53 | 5.29 | 5.54 |
| Exc. Potassium | meq/100g | 0.68 | 0.62 | 0.41 | 0.6 | 0.61 |
| Exc. Sodium | meq/100g | 0.25 | 0.22 | 0.35 | 1.16 | 1.27 |

**Rotation:** 2015: Canola, 2014: Wheat, 2013: Oats

**Growing Season Rainfall (April- October 2015):** Dandaragan West station (9014): 342.2mm

Long term average growing season rainfall for Dandaragan West station (9014): 531.8mm

## BACKGROUND SUMMARY

The National Variety Trial (NVT) program is a national program of comparative crop variety testing with standardized trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the GRDC and is managed by the Australian Crop Accreditation System Limited (ACAS). The NVT

aims to generate independent information for growers about newly released crop varieties. The NVT System has been developed to complement the plant breeding programs. Breeders will make their release decisions prior to nominating lines for testing programs. NVT will only be testing lines close to commercial release.

**TRIAL DESIGN**

**Plot size:** 1.76m x 10m

**Machinery used:** Direct drill with Small Plot Seeder, Knife points and press wheels

**Repetitions:** 3

**Seeding rates and dates:** 12/05/2015, 65 kg/ha

**Fertiliser / Pesticide rates and dates:**

| No. | Date | Maintenance Product Name | Description | Rate | Unit |
|---|---|---|---|---|---|
| **1** | 11/05/2015 | Trifluralin | Herbicide | 2 | L/ha |
| | | SpraySeed | Herbicide | 3 | L/ha |
| | | Chlorpyrifos | Insecticide | 1 | L/ha |
| **2** | 12/05/2015 | Gusto Gold | Fert - Banded @ sowing | 100 | kg/ha |
| | | Urea | Fert - Topdressed IBS | 50 | kg/ha |
| **3** | 24/06/2015 | Alphacypermethrin | Insecticide 6WA-S | 0.3 | L/ha |
| | | Chlorpyrifos | Insecticide 6WA-S | 0.4 | L/ha |
| | | Velocity | Herbicide 6WA-S | 1 | L/ha |
| | | Hasten | Adjuvant | 1% | v/v |
| **4** | 25/06/2015 | MCPA | Herbicide 6WA-S | 1 | L/ha |
| | | Lontrel | Herbicide 6WA-S | 0.3 | L/ha |
| **5** | 28/07/2015 | Urea | Fert - topdressed 11WA-S | 60 | kg/ha |
| **6** | 12/08/2015 | Alphacypermethrin | Insecticide 13WA-S | 0.3 | L/ha |
| | | Prosaro | Fungicide 13WA-S | 0.15 | L/ha |
| | | Hasten | Adjuvant | 1% | v/v |

**TRIAL LAYOUT**

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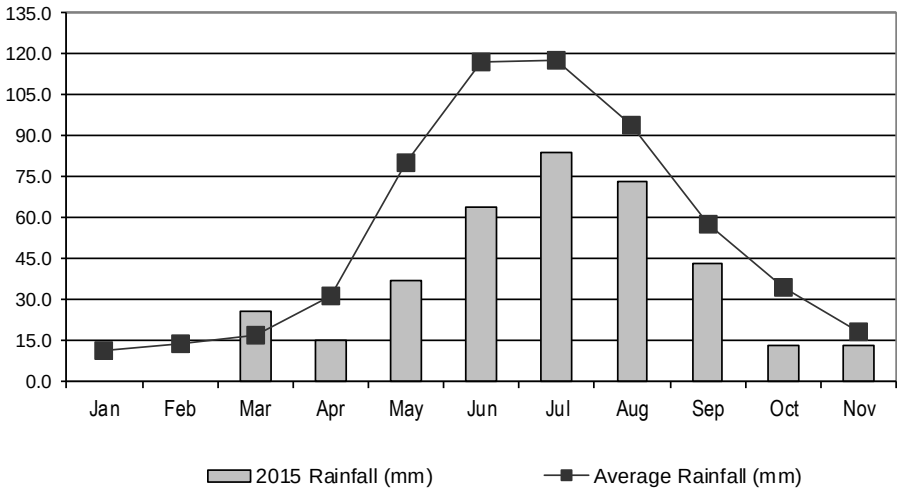
| | Range 1 | Range 2 | Range 3 | Range 4 | Range 5 | Range 6 |
|---|---|---|---|---|---|---|
| | Buffer 1 (Hindmarsh) | Buffer 1 (Hindmarsh) | Buffer 1 (Hindmarsh) | Buffer 1 (Hindmarsh) | Buffer 1 (Hindmarsh) | Buffer 1 (Hindmarsh) |
| **Row 1** | SMBA12-2297 | IGB1305 | Oxford | Alestar | Navigator | WI4897 |
| **Row 2** | Buloke | WI4896 | IGB1463 | SMBA12-1361 | Fleet | Wimmera |
| **Row 3** | IGB1302 | IGB1467 | EB1401 | Gairdner | Maltstar | Fathom |
| **Row 4** | Baudin | SY Rattler | Flinders | Litmus | Mundah | Lockyer |
| **Row 5** | LaTrobe | Scope | Bass | Commander | Hindmarsh | Granger |
| **Row 6** | IGB1334T | Compass | Charger | IGB1414T | Alestar | Scope |
| **Row 7** | Wimmera | Gairdner | Navigator | WI4896 | LaTrobe | IGB1414T |
| **Row 8** | Commander | Flinders | IGB1334T | Granger | IGB1463 | Baudin |
| **Row 9** | Maltstar | SMBA12-1361 | IGB1305 | Buloke | Bass | Compass |
| **Row 10** | Litmus | Oxford | Hindmarsh | Fathom | SMBA12-2297 | IGB1467 |
| **Row 11** | WI4897 | Fleet | Lockyer | SY Rattler | IGB1302 | Charger |
| **Row 12** | EB1401 | Mundah | Scope | WI4897 | Oxford | Buloke |
| **Row 13** | Alestar | Granger | Maltstar | LaTrobe | SY Rattler | EB1401 |
| **Row 14** | Lockyer | Navigator | SMBA12-2297 | Compass | Commander | SMBA12-1361 |
| **Row 15** | Bass | Fathom | Baudin | Mundah | Gairdner | IGB1334T |
| **Row 16** | Hindmarsh | Charger | Wimmera | IGB1302 | WI4896 | Litmus |
| **Row 17** | IGB1414T | IGB1463 | IGB1467 | Fleet | Flinders | IGB1305 |
| | Buffer 2 (Hindmarsh) | Buffer 2 (Hindmarsh) | Buffer 2 (Hindmarsh) | Buffer 2 (Hindmarsh) | Buffer 2 (Hindmarsh) | Buffer 2 (Hindmarsh) |

## 2015 Monthly and Average Rainfall Data - Dandaragan West, W.A.

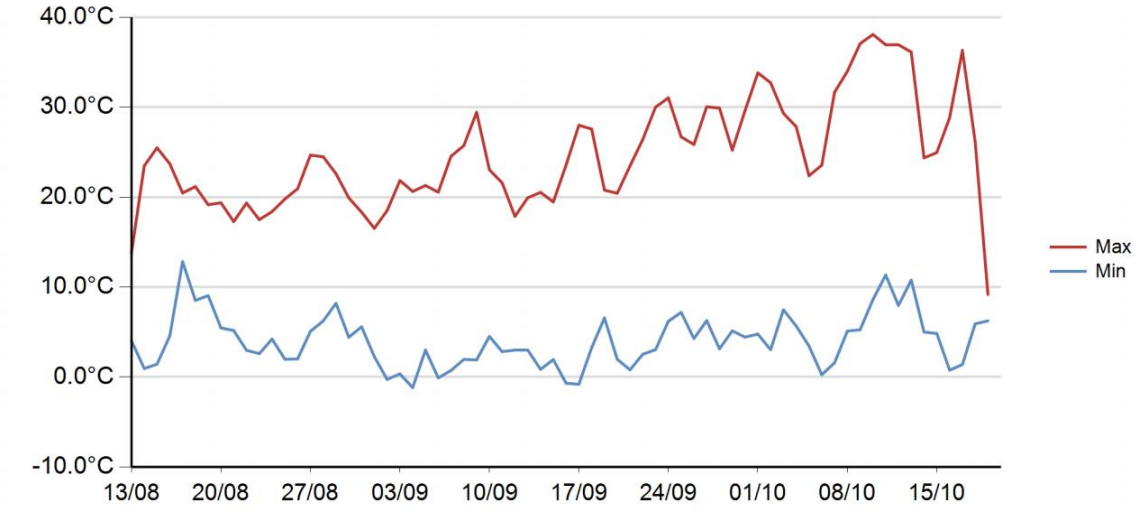
Observations were drawn from Dandaragan West {station 9014}.(11.9km away)




## 2015 Daily Rainfall Data - Dandaragan West, W.A.

| *Date* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *1* | | | 0.0 | 0.0 | 2.2 | 0.0 | 0.0 | 21.4 | 8.8 | 0.0 | 0.0 |
| *2* | | | 0.0 | 0.0 | 0.0 | ↓ | 2.8 | 0.0 | 0.0 | 0.0 | 10.0 |
| *3* | | | 0.0 | 0.0 | 0.0 | 5.6 | 2.0 | 0.0 | 0.0 | 0.0 | |
| *4* | | | 0.0 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | |
| *5* | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | ↓ | 0.0 | |
| *6* | | | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | ↓ | 0.0 | |
| *7* | | | 0.0 | 5.2 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 0.0 | |
| *8* | | | 0.0 | 1.0 | 0.0 | 0.0 | 6.4 | 0.0 | 0.0 | 0.0 | |
| *9* | | | 0.0 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *10* | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | |
| *11* | | | 0.0 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | |
| *12* | | | 0.0 | 2.0 | 0.0 | 0.2 | 0.0 | 0.0 | 25.6 | 0.0 | |
| *13* | | | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | |
| *14* | | | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *15* | | | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | |
| *16* | | | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *17* | | | 0.0 | 0.0 | 13.4 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | |
| *18* | | | 0.0 | 0.0 | 21.4 | 6.0 | 0.0 | 4.6 | 0.0 | 0.0 | |
| *19* | | | 2.0 | 0.0 | 0.0 | 1.4 | 11.0 | 2.8 | 0.0 | 2.8 | |
| *20* | | | 0.0 | 0.0 | 0.0 | 11.0 | 4.8 | 10.8 | 0.0 | 0.0 | |
| *21* | | | 0.0 | 0.0 | 0.0 | 30.4 | 0.0 | 0.8 | 0.0 | 0.0 | |
| *22* | | | 0.0 | 0.0 | 0.0 | 9.2 | 0.0 | 19.0 | 0.0 | 0.0 | |
| *23* | | | 0.0 | 0.0 | 0.0 | 0.0 | 5.4 | 0.2 | 0.0 | 0.0 | |
| *24* | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | |
| *25* | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | |
| *26* | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *27* | | | 8.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *28* | | | 0.0 | 0.0 | 0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 | |
| *29* | | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| *30* | | | 0.0 | 0.0 | 0.0 | 0.0 | | 7.2 | 0.0 | 0.0 | |
| *31* | | | 0.0 | | 0.0 | | 39.8 | 2.0 | | 1.4 | |
| | | | | | sow ing | | | | | | |
| 2015 Rainfall (mm) | | | 25.6 | 15.2 | 37.2 | 63.8 | 83.6 | 73.4 | 43.4 | 13.4 | 13.4 |
| Average Rainfall (mm) | 11.0 | 13.6 | 16.8 | 31.4 | 80.3 | 117.1 | 117.5 | 93.8 | 57.5 | 34.2 | 17.9 |

**Maximum and minimum temperature during flowering and grain fill (13th Aug-18th Oct)**




| Event | Comments |
|---|---|
| Frost Event | This trial experienced frost conditions on the following dates throughout the flowering period: -0.3 °C on Sep 2, -1.2 °C on Sep 4, -0.1 °C on Sep 6, -0.7 °C on Sep 16, -0.8 °C on Sep 17. Interpret results with caution. |
| Heat Event | This trial experienced extreme heat conditions on the following dates throughout the flowering period: 33.8 °C on Oct 1, 32.7 °C on Oct 2, 34 °C on Oct 8, 37.1 °C on Oct 9, 38.1 °C on Oct 10, 36.9 °C on Oct 11, 36.9 °C on Oct 12, 36.1 °C on Oct 13, 36.3 °C on Oct 17. Interpret results with caution. |

**RESULTS/STATISTICS**

**Table 1: Flowering Date and Variety Yield**

| Variety | Flowering year day | Yield t/ha | % of Site Mean | Long Term Yield t/ha | Ranked on Long Term Yield | Lodging Score |
|---|---|---|---|---|---|---|
| Compass | 239 | 3.80 | 113 | 2.79 | 4 | 5.7 |
| Rosalind | 241 | 3.77 | 112 | 3.03 | 1 | 1.0 |
| Flinders | 246 | 3.66 | 109 | 2.66 | 7 | 0.3 |
| Spartacus CL | 241 | 3.60 | 107 | 2.86 | 2 | 1.0 |
| Granger | 246 | 3.54 | 106 | 2.64 | 9 | 1.0 |
| Alestar | 245 | 3.53 | 105 | 2.43 | 19 | 0.0 |
| Oxford | 254 | 3.52 | 105 | 2.53 | 11 | 0.0 |
| La Trobe | 241 | 3.51 | 105 | 2.79 | 5 | 0.7 |
| Maltstar | 249 | 3.46 | 103 | 2.52 | 12 | 0.7 |
| Lockyer | 254 | 3.42 | 102 | 2.66 | 8 | 3.0 |
| Charger | 239 | 3.41 | 102 | 2.67 | 6 | 3.7 |
| Hindmarsh | 239 | 3.40 | 101 | 2.83 | 3 | 3.0 |
| Wimmera | 242 | 3.40 | 101 | 2.46 | 16 | 0.3 |
| Commander | 249 | 3.27 | 98 | 2.39 | 23 | 4.3 |
| Buloke | 241 | 3.26 | 97 | 2.45 | 18 | 4.3 |
| Fathom | 241 | 3.23 | 96 | 2.57 | 10 | 6.3 |
| SY Rattler | 243 | 3.23 | 96 | 2.46 | 17 | 1.0 |
| Bass | 247 | 3.19 | 95 | 2.31 | 25 | 0.3 |
| Fleet | 241 | 3.06 | 91 | 2.42 | 20 | 6.0 |
| Scope | 243 | 3.04 | 91 | 2.47 | 15 | 4.0 |
| Navigator | 255 | 2.95 | 88 | 2.48 | 14 | 4.7 |
| Gairdner | 255 | 2.83 | 84 | 2.41 | 21 | 4.0 |
| Mundah | 239 | 2.82 | 84 | 2.40 | 22 | 3.0 |
| Baudin | 253 | 2.81 | 84 | 2.32 | 24 | 0.3 |
| Litmus | 242 | 2.64 | 79 | 2.49 | 13 | 6.7 |
| | | | | | | |
| **Site Mean (t/ha)** | | **3.35** | | | | |
| **LSD (t/ha)** | | **0.29** | | | | |
| **CV (%)** | | **5.1** | | | | |
| **Probability** | | **<0.001** | | | | |

**Note:**
For flowering date: Year day 239 ~ 27th August, Year day 255 ~ 12th September

**Table 2: Grain quality: receival standards**

| Variety | Hectolitre Weight kg/hL | Screenings | | Plump Grain >2.5mm % | Grain Brightness Colour | Protein % | 1000 Grain Weight g |
|---|---|---|---|---|---|---|---|
| | | <2.2mm % | <2.5mm % | | | | |
| Compass | 69.20 | 0.8 | 3.8 | 96.2 | 60 | 11.7 | 44.60 |
| Rosalind | 70.00 | 2.1 | 9.1 | 90.9 | 58 | 11.1 | 46.00 |
| Flinders | 71.00 | 1.6 | 9.4 | 90.6 | 60 | 12.5 | 41.40 |
| Spartacus CL | 70.00 | 1.7 | 11.0 | 89.0 | 60 | 12.6 | 43.80 |
| Granger | 65.60 | 10.9 | 40.1 | 59.9 | 61 | 13.8 | 42.30 |
| Alestar | 68.40 | 1.6 | 6.9 | 93.1 | 60 | 11.7 | 39.10 |
| Oxford | 68.80 | 7.9 | 25.0 | 75.0 | 61 | 11.9 | 40.50 |
| La Trobe | 70.40 | 3.9 | 19.1 | 80.9 | 60 | 11.1 | 37.90 |
| Maltstar | 69.80 | 1.5 | 10.5 | 89.5 | 60 | 10.9 | 43.40 |
| Lockyer | 68.20 | 2.5 | 10.7 | 89.3 | 59 | 14.5 | 43.30 |
| Charger | 68.60 | 1.3 | 6.1 | 93.9 | 59 | 11.9 | 41.40 |
| Hindmarsh | 71.00 | 2.8 | 12.5 | 87.5 | 60 | 11.2 | 40.70 |
| Wimmera | 70.40 | 0.6 | 3.9 | 96.1 | 61 | 11.1 | 37.50 |
| Commander | 68.60 | 3.2 | 13.7 | 86.3 | 60 | 11.5 | 38.20 |
| Buloke | 67.80 | 0.7 | 2.9 | 97.1 | 60 | 12.4 | 42.70 |
| Fathom | 67.40 | 1.7 | 8.6 | 91.4 | 60 | 11.4 | 36.60 |
| SY Rattler | 68.60 | 1.4 | 6.3 | 93.7 | 59 | 11.8 | 41.30 |
| Bass | 70.80 | 0.5 | 4.1 | 95.9 | 60 | 12.0 | 41.70 |
| Fleet | 65.40 | 0.3 | 2.2 | 97.8 | 59 | 11.8 | 44.80 |
| Scope | 68.60 | 1.2 | 9.0 | 91.0 | 60 | 12.4 | 46.10 |
| Navigator | 66.80 | 1.6 | 6.9 | 93.1 | 60 | 11.0 | 42.60 |
| Gairdner | 70.60 | 0.4 | 1.8 | 98.2 | 59 | 12.1 | 54.50 |
| Mundah | 65.40 | 4.1 | 21.5 | 78.5 | 58 | 12.8 | 46.90 |
| Baudin | 68.20 | 3.6 | 19.3 | 80.7 | 60 | 12.0 | 44.20 |
| Litmus | 71.00 | 0.2 | 2.0 | 98.0 | 61 | 11.7 | 58.50 |

## OBSERVATION/ DISCUSSION/ MEASUREMENTS

The trial was sown dry on the 12th May and germinated following 36mm of rain that fell about a week later. The trial established well however the season was characterised by substantial rainfall events each at least one month apart. June and July exposed crops to extended dry periods interrupted by small rainfall events that meant the crop was relying on a mix of stored moisture and light rain. A large fall of 61mm over 31st July and 1st August meant adequate moisture during stem elongation however it is likely the PAWC continued to diminish. Regular site inspections showed that the crop was not unduly stressed during tillering and head emergence. There were frost periods in early September although there is little visual evidence to suggest that it reduced yield potential but rather it was most likely multiple days over 30°C in October and the infrequency of rainfall during spring that would have limited grain fill and restricted yield potential. Despite the dry finish to the season the site averaged 3.35 t/ha.

There were no significant differences in yield between the top 8 yielding varieties of Compass, Rosalind, Flinders, Spartacus CL, GrangeR, Alestar, Oxford and La-Trobe. The varieties were of various maturity lengths indicating that maturity was not an overriding factor in this trial and suggesting that variety performance was more likely determined the capacity to cope with stresses and then recover.

Compass is a new variety derived from Commander but with improvements in grain yield, grain plumpness and agronomic characteristics over Commander. Barley National Variety Trial (NVT) data (2009- 2014) suggests that the grain yield of Compass is competitive with Hindmarsh and La Trobe in this environment. Compass generally has a plumper grain and its advantage was seen in this season with lower screenings than that of Hindmarsh and LaTrobe.
Compass has good head retention although its straw strength is an issue. It is susceptible to lodging in high yielding situations and this was shown even at Dandaragan in 2015 where Compass was rated similar to Litmus and higher than Buloke and Scope for weak straw. Compass has been released as a feed barley, but is being evaluated by Barley Australia with an accreditation decision possible as early as autumn 2017.

Rosalind is a new early maturing feed variety with excellent yield potential and has been ranked number one for yield across the 2009-2014 seasons for the WMG area. Rosalind has the capacity to out-yield Hindmarsh and being relatively new it is one to keep an eye on for the future.

Spartacus CCL is the new early maturing imidazolinone tolerant (IT) barley from Intergrain. It has a similar agronomic, disease resistance and grain quality profile to that of LaTrobe and higher yield with better head retention than Scope. Whilst it is being released as a feed variety it is under evaluation as a possible malt. IT varieties are a useful agronomic tool dependent on weed spectrum of a paddock and plant back periods.

Flinders and GrangeR are new malt varieties currently being evaluated for suitability in the international brewing markets. Limited segregation opportunities are to be expected until full market acceptance is achieved. These varieties have good powdery mildew and leaf rust tolerance but other varieties have demonstrated better adaption to Dandaragan with higher and more reliable yields. GrangeR was shown to have a low hectolitre weight at this site in 2015 and also high screenings, which may be attributable to grain shape. It is also recommended to be grown away from the coast to reduce the risk of kernel discolouration at harvest.

Alestar has been in the NVT program for 5 years now and has a lower ranking of 19 in terms of long term yield data for WA. It was commercially released in 2014 and application for malt accreditation by Barley Australia was made in 2015. It does have the potential to out yield Hindmarsh in high-yielding conditions. Matures 6 days earlier than Oxford and is resistant to powdery mildew and leaf rust, MR-MS to Spot Form Net Blotch and MR to scald.

Oxford is a feed barley best suited to environments with a higher yield potential were it has the potential to out yield Hindmarsh and where late April sowing is possible. It is both resistant to leaf rust and powdery mildew. Screenings were high for Oxford in this year's NVT. Recommended to be grown in areas with a low probability of delivering malt grade grain due to kernel discolouration.

La Trobe, a malting variety by Intergrain with good market demand, is derived from the same cross as Hindmarsh and thus has equivalent yield across most rainfall zones but with improved quality. It has very good yield potential in high rainfall areas however it is at risk to spot type net blotch (STNB) (S). La Trobe, as with Hindmarsh, should be treated with a quality smuticide before sowing.

Overall, the site produced grain with high protein levels in the range 10.9-14.5% and this probably reflect the 60 kg/ha of Urea top-dressed just prior to the 61mm received at the end of July. Test weights were high and reached 71 kg/hL whilst screening were low for most varieties with only Granger, Oxford, Mundah and Baudin rated at less than 80% plump grain.

Grower decisions on variety replacement or retention should not be based solely on the 2015 NVT data, but should include consideration of relative variety performance across location, long term yield predictions and local farmer experience.

**PEER REVIEW/REVIEW**

Peter Charlton

# Oat variety trial

Georgie Troup
Department of Agriculture and Food, Western Australia, Northam.

## Aims

To provide growers and advisors with independent information on the performance of newly released varieties relative to the current commercial varieties grown in the area. In 2015, the GRDC Oat Agronomy project team processed the grain from the oat NVT to determine the grain quality (hectolitre weight, and screenings) of the varieties tested. These results support growers to better evaluate the choice of varieties available and allow them to take advantage of the current pricing opportunities in milling oat production.

## Method

This study was undertaken in 2015 at Dandaragan on a loam over heavy clay site (West Midlands Group main trial site) to compare eight milling oat varieties, Bannister, Carrolup, WA02Q302-9 (under milling evaluation), Williams, Yallara, Mitika, Wandering (Oat2 only), and Kojonup. Trials were established into canola stubble and were direct-drilled with a small plot air-seeder with on-row packing press wheels. Oat seed was placed at 2 to 3 cm depth. Agras fertiliser was banded below the seed at 80 kg/ha, supplying a total of 11 kg N/ha, 11 kg P/ha and 7 kg S/ha. The trial was sown dry on 12th May, and established well following germinating rains 5-6 days after sowing. Grain yield data for breeding line WA02Q302-9 was not available at the time of publishing, WA02Q302-9 is a potential milling variety expected to be released in Spring 2016.

## Results

Carrolup was the lowest grain yielding variety in this trial (Table 1).

GIWA Oat specifications for hectolitre weight require oat grain to have a minimum hectolitre weight of 51 kg/hL for receival as Oat1 and 49 kg/hL for receival as Oat2. All varieties achieved the minimum hectolitre weight for receival as Oat1 in this trial. WA02Q302-9 had the highest hectolitre weight in this trial, and this observation is supported by Troup *et al.* (2015).

To achieve the GIWA Oat1 specification the grain has a limit of 10% screenings, whilst for Oat2 there is no limit on screenings. Williams exceeded the Oat1 screenings limit by 0.1%, and had higher screenings than all other varieties.

Bannister and Carrolup produced the highest hay yields of 9.9 t/ha and 9.7 t/ha respectively. Early maturing dwarf milling variety Mitika produced the lowest hay yield of 6.6 t/ha.

**Table 1. Varietal differences in hay yield, grain yield, hectolitre weight and screenings.**

| | Hay yield (t/ha) | Grain yield (t/ha) | Hectolitre weight (kg/hL) | Screenings (% < 2.0 mm) |
|---|---|---|---|---|
| Bannister | 9.9 | 6.4 | 55.5 | 7.4 |
| Carrolup | 9.7 | 5.8 | 59 | 6.4 |
| Kojonup | 9.3 | 6.6 | 55.9 | 3.8 |
| Mitika | 6.6 | 6.4 | 58 | 2.3 |
| Wandering * | 9.3 | 7.0 | 54.8 | 3.9 |
| Williams | 9.0 | 7.2 | 55.3 | 10.1 |
| Yallara | 9.1 | 6.0 | 55.8 | 4.6 |
| WA02Q302-9 | 8.0 | _ | 61 | 3.9 |
| **LSD (p=0.05)** | **0.3** | **0.8** | **0.7** | **2** |

## References

Troup GM, Paynter BH and Malik R (2015). Bannister and Williams, how do the new oat varieties stack up? 2015 Agribusiness Crop Updates, Perth, WA, 24-25 February 2015.

**Acknowledgements**

Thank you to Mt Gerizim Farms and K.L.M for funding the Oat NVT trial at Kayanaba and DAFWA for providing the contract services.

# Wheat or barley - the best options for early sowing at Dandaragan

Brenda Shackley, Blakely Paynter and Christine Zaicou-Kunesch
DAWFA Katanning, Northam and Geraldton

| | | | | | |
|---|---|---|---|---|---|
| **Purpose:** | Evaluate yield and quality response of long season wheat and barley to sowing time. | | | | |
| **Location:** | Dandaragan | | | | |
| **Soil Type:** | Black deep loamy duplex | | | | |
| **Soil Test Results:** | Depth (cm) | 0-10 | 10-20 | 20-30 | 30-40 |
| | Gravel (%) | 5 | 5 | 0 | 0 |
| | pH ($CaCl_2$) | 6.1 | 6.3 | 7.0 | 7.6 |
| | $NH_4$ (ug/g) | 1 | <1 | 2 | 1 |
| | $NO_3$ (ug/g) | 16 | 4 | 2 | 1 |
| **Rotation:** | Canola (2014), wheat (2013), oats (2012) | | | | |
| **Rainfall (2015):** | Dandaragan (patch point data) | | | | |

| Jan | Feb | March | April | May | June | July | August | Sept | Oct | Summer (Jan-Mar) | GSR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.7 | 28.6 | 28.0 | 20.3 | 38.5 | 68.0 | 94.6 | 83.9 | 32.2 | 12.4 | 61.3 | 349.9 |
| | | | | | | | | | | | |

## BACKGROUND SUMMARY

What are your cereal seeding options with an April sowing? The information and options for seeding in May are much easier to make, however, there is a need for information on the performance of later maturing varieties where there is the opportunity to sow early or in areas where frost management is required. Research is being conducted into the yield and quality response of long season wheat and barley varieties to a range of sowing times between mid-April and mid-May.

## TRIAL DESIGN

Trials have been initiated at Dandaragan, Katanning and Gibson in 2015. Twenty-four varieties (12 wheat and 12 barley) were sown at three sowing times targeting mid-April with the first seeding date and then three weekly intervals thereafter in early May and late May.

**Plot size:** 7 rows (22cm row spacing) x 10m

**Machinery use:** small pot research equipment

**Repetitions:** 3

**Crop type and varieties used:**

Wheat (12 varieties): Whistler, Yitpi, Mace, Magenta, Harper, Trojan, Calingiri, Zen, Bremer, Cutlass (RAC2069), ADV08.0065 and LPB11-1728

Barley (12 varieties): Bass, Baudin, Compass, Flinders, Granger, La Trobe, Lockyer, Maltstar, Oxford, Rosalind, Scope CL and Urambie

**Seeding dates (TOS):** 16 April (TOS1, mid-April), 07 May (TOS2, early May) and 27 May (TOS3, late May) 2015

**Seeding rates:** Target establishment for both wheat and barley was 150 plants/m$^2$.

**Fertilizer rates and dates:**

- At seeding K-Till Extra drilled (100 kg/ha) and NPK Blue top-dressed (250 kg/ha)
- 9 June TOS1 and TOS2 and 23 Jun TOS3 - UAN (60L/ha)

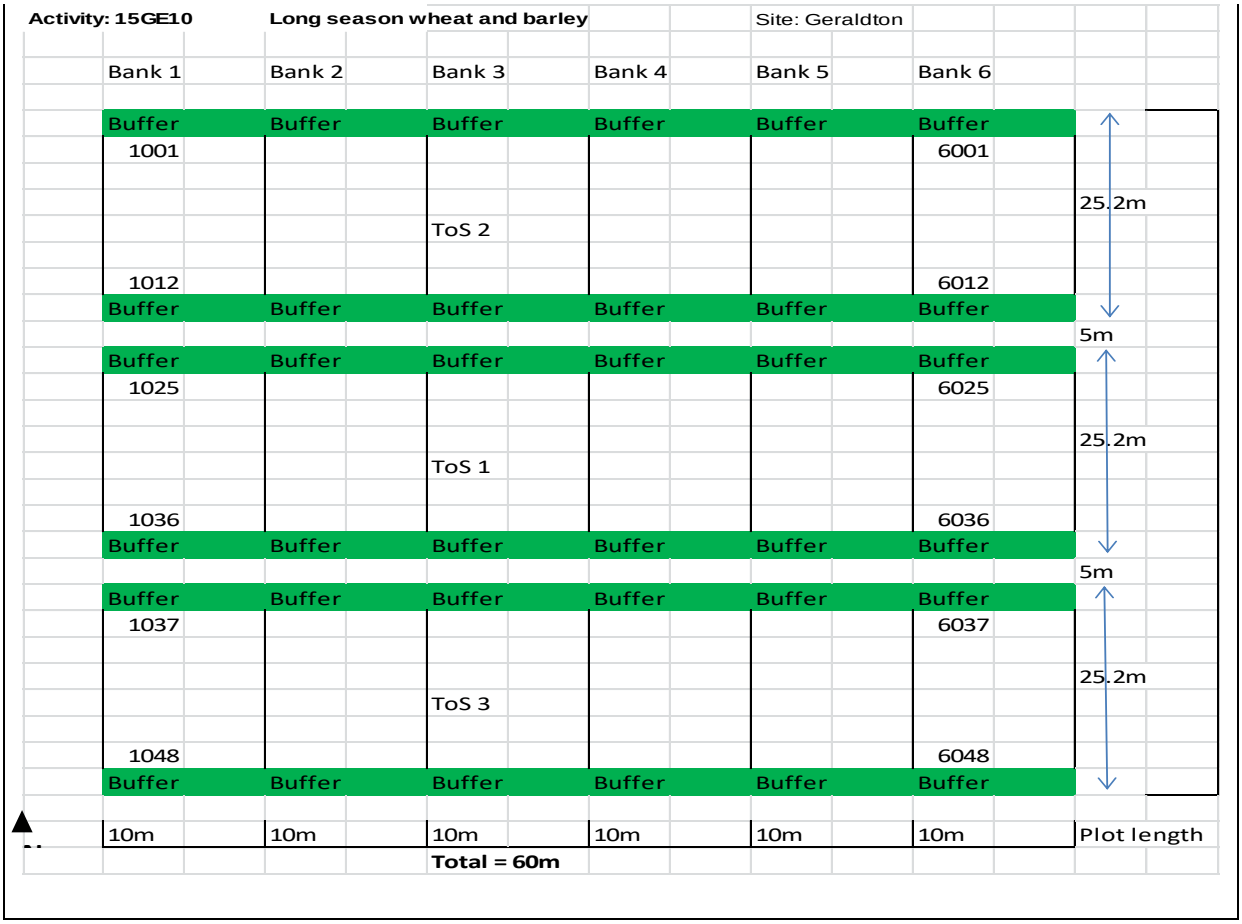
**Herbicide rates and dates:**

- At seeding - Lorsban (200mL/ha) + Boxer Gold (2.5L/ha) + Sprayseed (2.5L/ha) + Dominex (200mL/ha)
- 28 May TOS 1 and 9 Jun TOS 2 - Velocity (800mL/ha) + 1% Hasten
- 23 Jun TOS 1 and TOS3 - Velocity (700mL/ha) + 1% Hasten + MCPA LVE (400mL/ha)
- 15 Jul TOS 1 andTOS3 - Jaguar (1L/ha) + 1% Hasten + MCPA LVE (400mL/ha)

**Other applications/treatment rates and dates:**

- Uniform in furrow (400ml/ha) at seeding.
- 15 Jul TOS1 and TOS2 Prosper (600mL/ha) and TOS3 Prosaro (300mL/ha)
- 29 Jul TOS1 Prosaro (300mL/ha)

**TRIAL LAYOUT**


Activity: 15GE10
Long season wheat and barley
Site: Geraldton
Bank 1
Bank 2
Bank 3
Bank 4
Bank 5
Bank 6
Buffer
1001
1012
ToS 2
6001
6012
25.2m
5m
1025
1036
ToS 1
6025
6036
1037
1048
ToS 3
6037
6048
10m
Total = 60m
Plot length

## RESULTS

Many areas in the wheatbelt of WA received good levels of summer rain in 2015, including the site at Dandaragan. Rainfall at Dandaragan continued into April providing the opportunity to sow in mid-April into drying top soils. The drying topsoil (with all sowing dates) resulted in an average establishment of 115 plants/m² for wheat and 120 plants/m² for barley against a target density of 150 plants/m².

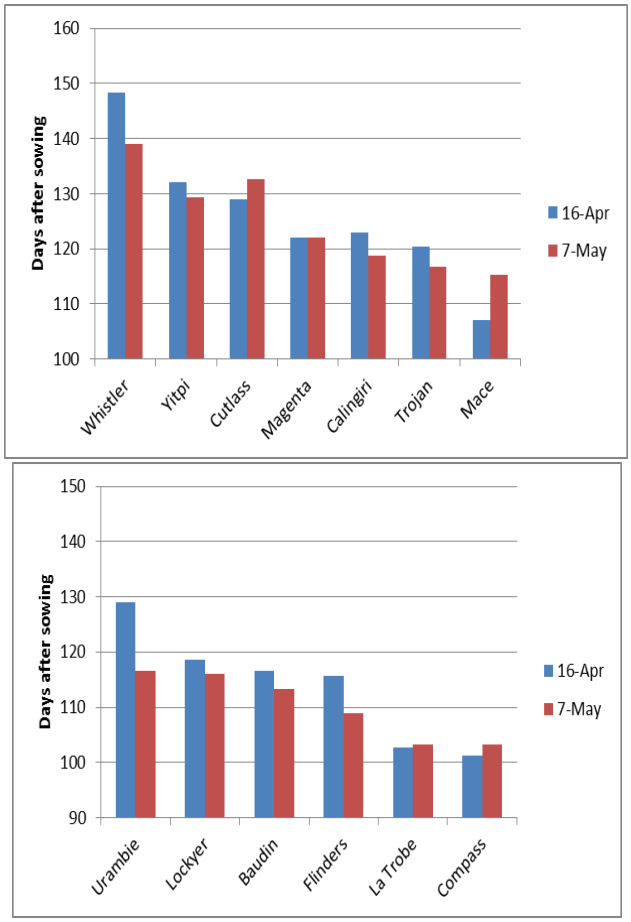
At the Dandaragan NVT wheat site, an e-Temperature logger also recorded some frost events and periods of temperature above 30°C during grain fill. This NVT site was in close proximity to this wheat and barley agronomy trial but no frost damage was clearly observed in our trial.

### Flowering and awn peep observations

The spread of flowering between the wheat varieties range from just over 40 days between the spring wheat Mace and the winter wheat Whistler when sown in mid-April at Dandaragan (Figure 1). The duration to flowering for Mace was 107 days after sowing with mid-April planting and 115 days with early May sowing. Zen, the new longer season ANW had very similar flowering dates to Calingiri (data not shown). The new APW variety Cutlass appears to have a similar maturity compared to Yitpi.

The spread of awn peep between the barley varieties was slightly lower than for wheat at ~30 days between the spring barley Compass and the winter barley Urambie (Figure 1). The average duration to awn peep in the earliest barley varieties (Compass and La Trobe) was around 102 days after sowing for both the mid-April and early May planting.

**Figure 1: Flowering (50%) of wheat or awn peep of barley taken as days after sowing of varieties sown mid-April and early May at Dandaragan in 2015**




**Grain yield – wheat**

Across the three sites the average grain yield ranged from over 5.5t/ha for wheat and 7.5t/ha for barley at the early May sowings to 4.2t/ha for wheat and 3.3t/ha for barley when sown mid-April at Dandaragan (Figure 2). The average yield of barley was higher than wheat (ranging from >2t/ha to 0.25t/ha) at sowing times and sites in 2015. Most varieties obtained their highest yields at the early May sowing.

Although Mace was one of the lowest yielding wheat varieties when sown mid-April at Dandaragan, Yitpi was the only variety that achieved a significantly higher yield at that sowing date. Overall yields increased by 1.5t/ha by delaying the sowing time until early May (Figure 3). This yield response to sowing time was also observed at the RSCN trial at Yuna (https://agric.wa.gov.au/n/4552), with the exception of Forrest, a late maturing spring wheat which was included in the Yuna trial. The reason for this response was not adequately measured in the trials.
Visual observations at Dandaragan did not suggest that biomass for the mid-April sowings was lacking in comparison to early May sowings. Ear numbers were recorded to be lower for the mid-April compared to the early May sowings at an average of 341/m² to 400/m² respectively.

**Figure 2: Average barley and wheat grain yields (t/ha) at the three sowing dates at Dandaragan (Dn), Katanning (Ka) and Gibson (Es) in 2015**

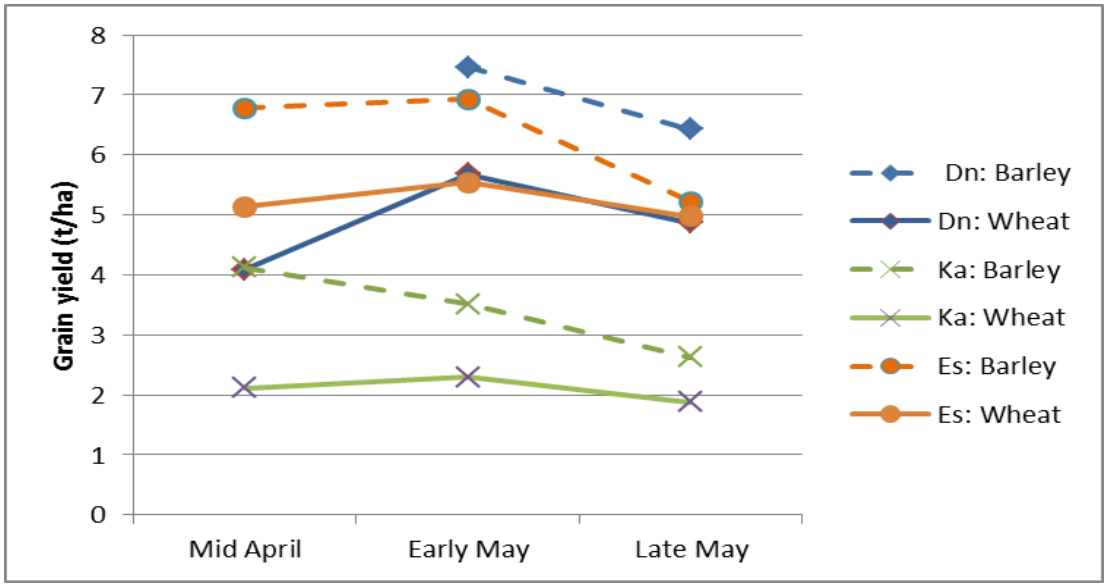
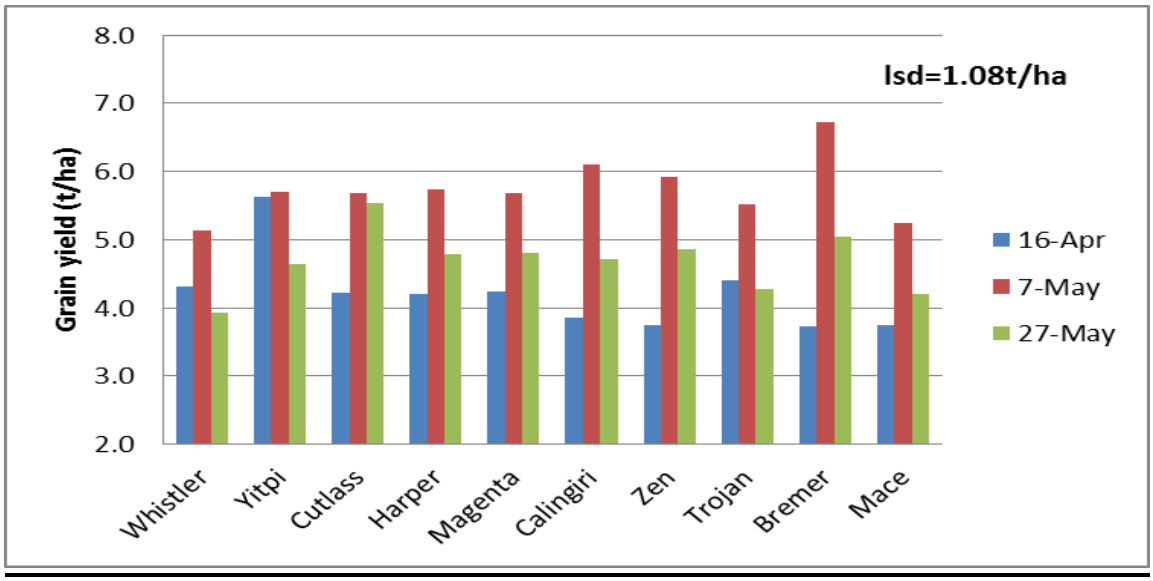



**Figure 3: Grain yield (t/ha) response of wheat varieties to sowing time at Dandaragan in 2015. Varieties arranged in order of maturity**



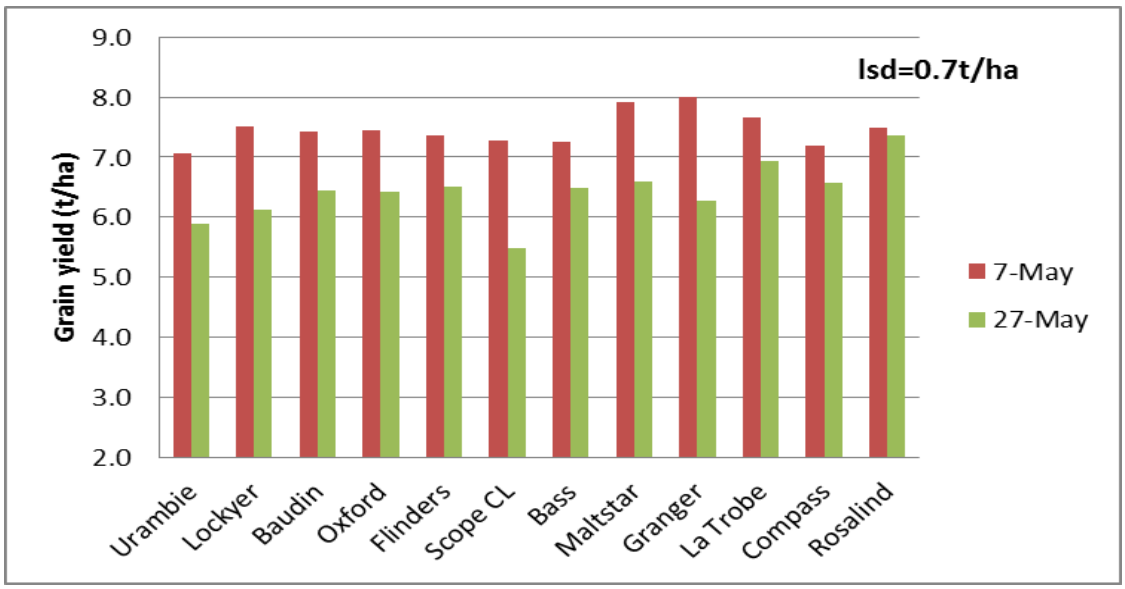

Although Bremer achieved the highest yield in the trial at Dandaragan when sown early May, it was only significantly higher than Mace, Trojan and Whistler. Mace was consistently the lowest yielding variety at Dandaragan, although it is important to note that it was not significantly different from most of the varieties examined in the trial series.

**Grain yield – barley**

The results of the mid-April planting have been excluded from this analysis due to problems with the sample weighing and collection at harvest affecting not only the harvest yields but the purity of the sample obtained from each plot. It is predicted that the mid-April planted would have yielded 7t/ha, mid-way between the grain yield of the early May (7.47t/ha) and late May (6.48t/ha) plantings. This prediction is based on the mid-April sown plots having a similar tiller number as the May plantings (842 vs 891 vs 839 tillers/$m^2$ for TOS1, TOS2 and TOS3 respectively) and the mid-April planting having a similar kernel weight as the early May planting (41.9 vs 42.4 vs 38.4 mg for TOS1, TOS2 and TOS3 respectively). There was no indication of frosted grain in the barley samples.

There was no varietal difference in grain yield for early May sowing (Figure 4), but there was a varietal difference with late May. This was largely due to the poorer performance of Granger, Lockyer, Scope CL and Urambie with late May planting. The other eight barley varieties performed similarly with late May sowing.

**Figure 4: Grain yield (t/ha) response of barley varieties to sowing time at Dandaragan in 2015. Varieties arranged in order of maturity.**




**Grain quality - wheat**

Limited grain quality analysis of wheat samples from Dandaragan has indicated that the mid-April planting had issues with staining of the grain. At Dandaragan, Cutlass, Mace, Magenta, Yitpi and Zen had stained grain above the maximum limit of 25 but below 75 which would result in a downgrade to UH or GP depending on protein levels.

Small grain screenings were an issue in 2015 across WA. Data so far indicates a typical response of increased screenings with delayed sowing for wheat at this site.

Mid-April sowings can also expose grain to conditions which may result in lower falling numbers. Unfortunately the data was not available at the time of publication.

**Grain quality - barley**

Only grain quality data for the two May planting dates is presented due to possible purity issues with the barley samples from the mid-April planting affecting the reliability of the results.

Grain of all barley varieties with a malt classification (Bass, Baudin, Flinders, Granger, La Trobe and Scope CL) or under consideration for a malt classification (Compass and Maltstar) were received as either Malt 1 or Malt 2, except Maltstar with late May sowing (due to high screenings). Bass and Granger were the only two varieties that were acceptable as Malt 1 at both sowing dates. Varietal downgrading from Malt 1 to Malt 2 with early May planting was due to low protein in Compass and high screenings in Scope CL. Downgrading with late May planting was due to high screenings in Baudin, La Trobe and Scope CL.

**Table 1. Receival grain quality of barley varieties with each time of sowing. Mid-April planting data has been excluded due to possible purity issues with samples.**

| Time of sowing<br>Variety | TOS1<br>16-Apr | TOS2<br>7-May | TOS3<br>21-May |
|---|---|---|---|
| Bass | - | Malt 1 | Malt 1 |
| Baudin | - | Malt 1 | Malt 2 |
| Compass[1] | - | Malt 2 | Malt 1 |
| Flinders | - | Malt 1 | Malt 2 |
| Granger | - | Malt 1 | Malt 1 |
| La Trobe | - | Malt 1 | Malt 2 |
| Lockyer[2] | - | Feed | Feed |
| Maltstar[3] | - | Malt 1 | Feed |
| Oxford[2] | - | Feed | Feed |
| Rosalind[2]* | - | Feed | Feed |
| Scope CL | - | Malt 2 | Malt 2 |
| Urambie[2] | - | Feed | Feed |

[1]Compass will enter Stage 1 of malt accreditation in 2016.
[2]Feed-only varieties.
[3]Maltstar is likely to enter Stage 1 of malt accreditation in 2017.

Hectolitre weight averaged across varieties decreased as seeding was delayed (73.8 vs 72.4 kg/hL respectively for the 'malt' varieties at each TOS). Varietal differences were observed. Of the 'malt' varieties, Bass, Flinders and La Trobe had a slightly higher hectolitre weight (74.2 kg/hl averaged across early May and late May) whilst Baudin and Maltstar were slightly lower (71.9 kg/hl) than the other 'malt' varieties.

Screenings doubled with delays in seeding from early May to late May (11 vs 26 % respectively for the 'malt' varieties at each TOS, respectively). Varietal differences were observed. Of the 'malt' varieties, Bass, Compass, Flinders and Granger (12% screenings averaged over early and late May) had lower screenings than Baudin, La Trobe, Maltstar and Scope CL (25%).

Average grain protein concentration was similar across times of sowing. Varietal differences were observed. Of the 'malt' varieties, Bass and Scope CL (11.3% averaged across TOS2 and TOS3) had the highest grain protein and Compass (9.8% averaged across TOS2 and TOS3) the lowest.

Grain brightness increased as seeding was delayed (58 vs 60 'L*' respectively for the 'malt' varieties at each TOS, respectively). Varietal differences were observed. Of the 'malt' varieties, Baudin and Compass had the brightest grain and Granger the darkest grain, although varietal rankings did change slightly with time of sowing.

## DISCUSSION

Traditionally sowing wheat in Western Australia was not recommended until after Anzac Day. A date based on the yield performance and maturities of commercially available wheat varieties in the 1990s. Since then growers have seen the release of Mace, a high yielding and very adaptable variety which at 67% dominates the area sown to wheat in WA in 2015 (Data courtesy of CBH group). Growers are now set up and keen to take advantage of any summer rainfall, but there is limited information on which wheat varieties to grow with a very early sowing opportunity.

Research carried out by James Hunt *et al*. (2014) suggested that the faster maturing winter wheat Whistler appeared well adapted to WA. When sown in mid-April Whistler was able to yield equivalent or better than Mace planted in late May (Crop Updates 2015). Results from Dandaragan and Katanning trials do support this suggestion but this research also suggests there are commercial varieties currently available in WA which can yield similar or higher and have a superior grain quality classification compared to Whistler. However these varieties can still be at the risk of frost and grain quality problems associated with very early sowings.

At all three sites in this trial series, barley out yielded wheat with both the mid-April and the early May planting (note we have included the predicted yield for barley with mid-April planting at Dandaragan of 7t/ha in this assessment). Barley was over 1.5t/ha better than wheat with both mid-April and early May planting. Whilst this research continues to highlight the need for a wheat variety which is more suitable for early sowing opportunities in Western Australia, growers looking for a cereal to sow in April could consider barley as being their new wheat variety until such wheats are released. Whilst this is only one year of observations there are many reasons to consider barley particularly with mid-April planting ahead of planting a wheat variety, including reduced (but still possible) frost risk.

The feed barley varieties Lockyer, Oxford, Rosalind and Urambie did not provide any yield advantage over those with a 'malt' classification at Dandaragan in 2015. The 'malt' varieties would therefore have been more profitable than the feed varieties as they were received with a premium over the feed barley varieties (either Malt 1 or Malt 2) at a similar grain yield.

With any early planting opportunity growers need to factor in increased fungicide costs. At Dandaragan powdery mildew and barley leaf rust in the barley plots and yellow spot in the wheat plots had to be controlled, particularly in the mid-April planting.

## ACKNOWLEDGEMENTS

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