Progress report

National Hay Agronomy Project

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October 2020

Western Australia – agronomy
(Georgie Troup, DPIRD)

In Western Australia, the DPIRD oat agronomy team successfully delivered the core trial at Muresk, where an average hay yield of 6.32 t/ha was achieved. The trial site had sufficient moisture at seeding to germinate and performed well in a warmer and drier than average season. Hay yield was significantly higher when the crop was sown in early May (7.8 t/ha), versus early June (4.8 t/ha). The ranking of varieties differed based on sowing date (e.g. Brusher, Koorabup, and Vasse were better suited to early May sowing than Mulgara and Durack) (Figure 1). Nitrogen rate influenced hay yield, and its impact on hay quality will be measured during November (Figure 2).

Kingbale vs Wintaroo

At Muresk and Wongan Hills, the team also evaluated the new imi-tolerant variety Kingbale, against its parent Wintaroo. The hypothesis tested was that Kingbale would yield the same and respond similarly to Wintaroo to crop management (in this case, increasing applied nitrogen).

At both sites, Kingbale and Wintaroo responded similarly to changes in applied nitrogen (kg N/ha), for hay yield, leaf chlorophyll and stem thickness. At Wongan Hills, Kingbale and Wintaroo yielded similarly, while at Muresk, Wintaroo out-yielded Kingbale by 0.88 t/ha. These limited results suggest that growers can apply the same best practice management practices for growing premium Wintaroo hay to Kingbale if it is commercially available in 2021.

Figure 1  Hay yield (t/ha) at Muresk, WA in 2020 at two times of sowing averaged over three rates of applied N (30, 60 and 90 kg N/ha). LSD (p=0.05) = 1.07 t/ha.

Figure 2  Muresk 27th August 2020.

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agrifutures.com.au/export-fodder
Gibberellic acid (PGR)

In 2020, the team in WA and SA have been evaluating the role of gibberellic acid (GA) – as a plant growth regulator. From recent work undertaken in other cereals, it was hypothesised that GA might assist oaten hay crops which experience dry conditions during head emergence, by increasing head extension. In WA, there was a visual difference between treated and untreated plots, within two weeks of GA application (Figure 3) at both Wongan Hills and Merredin. Assessments such as peduncle length, height to lowest floret, and height to highest floret are underway to affirm if the visual differences noted were present at hay cutting time.

Table 1 April to September rainfall at trial sites in Western Australia

<table>
<thead>
<tr>
<th>Location</th>
<th>Rainfall (1/4/20 - 30/9/20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wongan Hills</td>
<td>192 mm</td>
</tr>
<tr>
<td>Muresk</td>
<td>216 mm</td>
</tr>
<tr>
<td>Merredin</td>
<td>214 mm</td>
</tr>
<tr>
<td>Mount Dale</td>
<td>300 mm</td>
</tr>
<tr>
<td>Manjimup</td>
<td>741 mm</td>
</tr>
</tbody>
</table>
Western Australia – pathology (Geoff Thomas and Kylie Chambers, DPIRD)

Oat disease survey

DPIRD surveyed ten oat crops across Western Australia during August – October of 2020 with additional sites to be studied during early November. The surveys covered different export fodder growing region of WA, with crops selected that had a range of varieties, fungicide and seed dressing applications. From each site, a minimum of 25 tillers has been visually assessed for disease severity (percentage leaf area affected) on the top four leaves. The roots of those plans were also assessed for root disease and pest nematode damage. The results from this survey will be combined with a complimentary survey in a GRDC surveillance project to provide additional value for oat growers.

Septoria research

Septoria trials were established at two sites in WA (Muresk and Dale), locations where septoria infection regularly occurs. Each trial contained the same eight oat varieties, and disease treatments (untreated v full control). Treatments were replicated four times in a randomised complete block design. Infected stubble was applied at Muresk to increase the probability of infection, but was not used at Dale. Visual disease severity was estimated before hay cutting. The hay cuts are currently being processed for yield and quality. Predicta B analysis of the sites was also undertaken. The grain yield and quality from those trials will also be assessed, providing valuable information for seed production.

Rust research

An oat leaf rust trial was established at Manjimup WA (high rainfall zone), where the likelihood of natural infection is high. The trial contained three oat varieties with different leaf rust resistance ratings, and three management strategies (nil control, 1 x spray at flag leaf emergence and full control 3 x sprays). The trial contained four replicates and was sown as a randomised complete block design. Infected plants were sown into the buffers after seeding. Two weeks after the transplants were added, the buffers were inoculated with rust spores to increase the probability of infection. Disease assessments and hay cuts were completed in late October, with hay quality assessment underway. As with the septoria trials, the grain yield and quality from these trials will also be assessed, providing valuable information for the impact of rust on seed production.

Weather damage

A hay staining trial was established in Muresk, WA. The trial was sown with Carrolup and had eight different pre-cutting fungicide treatments (including a nil fungicide). Fungicides were applied as per label recommendation. The trial had six replicates, in randomized complete block design. Hay was cut and windrowed based on the fungicide withholding period (e.g. 22 days after strobilurin application) (Figure 5). Windrows were weathered using aerial irrigation on three occasions at 1, 2 and 3 weeks after cutting.

Hand cuts/grabs from the windrow have been completed, with quality assessment underway (visual weather damage assessment and NIR predicted quality) pre and post weathering – currently underway (Figure 6). Samples for microbial testing are currently being prepared (septoria disease assessments, fungal spore counts, and yeast and mould counts).

The foliar fungicides assessed were:

1. Nil fungicide
2. Propiconazole (125g a.i./ha)
3. Epoxiconazole (31.25g a.i./ha) and azoxystrobin (80g a.i./ha)
4. Azoxyoltrin (160 g a.i./ha) and cyproconazole (84g a.i./ha)
5. Pyraclostrobin (42.5 g a.i./ha) and epoxiconazole (31.25g a.i./ha)
6. Propiconazole (125g a.i./ha)
7. Pyraclostrobin (42.5 g a.i./ha) and epoxiconazole (31.25g a.i./ha)
8. Propiconazole (125g a.i./ha)
Figure 5  Weathering trial at Muresk.

Figure 6  L: Saprophytic growth on the bleached (top) of the windrow, and R: Mould growing on green oat tissue in the centre of the windrow.
South Australia – delivered by SARDI (Courtney Peirce)

Hay quality across South Australia is expected to be fairly poor due to the La Nina forecast and late rain, resulting in lots of hay being left on the ground becoming rain affected. 2020 has definitely turned into a year for grain production rather than hay, with the late rains expected to boost grain quality across most of SA. Exporters have been engaging the research team throughout the season – with the key question during September and October being “would the grower be better off ($/ha) is they leave hay crops standing and harvest for grain, as the likelihood of downgrades due to weather damage are high?” To address this, grain yield, quality, and performance ($/ha) will be reported from trials located at Hart, Lameroo and Tarlee through a collaboration with another project (supported by SAGIT). At Lameroo, Tarlee, and Booleroo steady rainfall during the growing season has resulted in strong hay yields, while at Hart, reduced winter rainfall produced low yields:

1. Lameroo
   a) Gibberellic acid trial (evaluating the role of PGR in export fodder) hay yield: 6.7 t/ha trial average (from 4th June sowing date)
   b) Kingbale vs Wintaroo (determining if Kingbale performs and responds similarly to Wintaroo) hay yield: 7.8 t/ha trial average (from 18th May sowing date)

2. Tarlee
   a) Gibberellic acid trial hay yield: 7.1 t/ha trial average (from 28th May sowing date)
   b) Kingbale vs Wintaroo hay yield: 10.9 t/ha trial average (from 19th May sowing date)
   c) Moddus Evo (evaluating the role of PGR in export fodder) hay yield: 9.6 t/ha trial average (from 24th April effective sowing date) (Figure 7).

3. Booleroo
   a) Gibberellic acid trial hay yield: 6.7 t/ha trial average (from 11th May sowing date)

4. Hart
   a) Early May sown hay yield: 3.4 t/ha, Early June sown hay yield: 2.7 t/ha

The drought stressed plants at Hart resulted in a very small cutting spread between varieties and sowing dates as the plants rushed through their growth stages in September where weather was alternating between days with substantial rainfall and days that were hot and windy. Samples are currently being processed for quality analysis.
The 2020 season has seen a complete reversal from 2019, with above average rainfall received through the season, producing high biomass at all sites. Research in NSW has included 1) selecting the best variety, sowing window and nutrition rate, 2) selecting the optimum sowing density for export fodder quality, 3) the role of defoliation (grazing) in export fodder systems. At Dirnaseer, the all trials have been cut. Hay yield is being analysed, and hay quality processing has commenced (Figure 8). At Gerogery, plant development has been slow, due to being in colder environment compared to the Yenda and Dirnaseer trial locations. Some plot lodging has occurred due to the lush growth at all sites. Some varieties and treatments are yet to be cut due to the prolonged growing season. At Yenda, a similar situation to Gerogery where the growing season has delayed the development of the plants, with some plots yet to reach flowering, therefore hay cuts are yet to be completed. Milled samples from all NSW trials will be sent to SA for NIR quality analysis.

**Table 1** NSW trial summary

<table>
<thead>
<tr>
<th>Trial</th>
<th>Location</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing date X Variety X Nutrition</td>
<td>Yenda</td>
<td>Vasse still to be cut, other varieties cut and being processed. Site relocated from Yanco to Yenda due to initial irrigation bay having high soil nitrogen levels.</td>
</tr>
<tr>
<td>Variety X Plant density (Three varieties Mulgara, Yallara and Wintaroo; Target plant populations 160, 200, 240, 280, 320 &amp; 360)</td>
<td>Dirnaseer</td>
<td>All cuts completed</td>
</tr>
<tr>
<td></td>
<td>Yenda</td>
<td>All cuts completed</td>
</tr>
<tr>
<td></td>
<td>Gerogery</td>
<td>1/3 of cuts completed</td>
</tr>
<tr>
<td>Variety X Defoliation X Nutrition (Three varieties Yallara, Mulgara, Yarran; 4 nitrogen treatments Nil, upfront, Z30, split upfront and Z30; mechanical defoliation mid tillering and just prior to Z30)</td>
<td>Dirnaseer</td>
<td>All cuts completed</td>
</tr>
<tr>
<td></td>
<td>Yenda</td>
<td>All cuts completed</td>
</tr>
<tr>
<td></td>
<td>Gerogery</td>
<td>1/3 of cuts completed</td>
</tr>
</tbody>
</table>
Hay quality across Victoria is expected to be fairly poor due to the La Nina conditions experienced during cutting, curing and baling, with some hay left for 8 weeks on the ground.

The trials were both sown into moisture, however the dry conditions in June and July reduced yield potential. Spring rain resulted in good head emergence, and minor lodging in some plots.

### Victoria – agronomy trials delivered by the Birchip Cropping Group (Alison Frischke and Genevieve Clarke)

<table>
<thead>
<tr>
<th>Trial</th>
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<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing date X Variety X Nutrition</td>
<td>Rupanyup</td>
<td>Cuts were completed. Hay quality measurements (leaf chlorophyll and stem thickness) will commence 2/11/20. The trial site received 223mm of growing season rainfall.</td>
</tr>
<tr>
<td>Effect of growth stage on yield and quality</td>
<td>Rupanyup</td>
<td>Additional research to evaluate the effect of growth stage (Z59, Z71, Z71 + 14 days) on hay yield and quality. Hay cuts completed 26/10/20, quality assessment is currently underway.</td>
</tr>
<tr>
<td>Role of PGR in export fodder (Moddus Evo)</td>
<td>Curyo</td>
<td>Cuts completed (including height and lodging evaluation). Leaf chlorophyll and stem thickness assessment is currently underway. The trial site received 189mm of growing season rainfall, and 148mm Nov-March rainfall.</td>
</tr>
</tbody>
</table>

*Milled samples from all VIC trials will be sent to SA for NIR quality analysis.*

*Figure 9* Koorabup oats sown on the 5th May (L) and the 28th May (R) at Rupanyup.
Victoria – pathology research delivered by AgVic (Mark McLean and Hari Dadu)

The pathology team in Victoria have undertaken paddock surveys at twenty nine locations, covering the major oat growing regions in Victoria, this is approximately double the number of the paddocks surveyed in 2019. The research team had plans to survey interstate in 2020, however due to Covid-19 restrictions this was no possible – instead the team increased the number and range of surveys in Victoria.

Unlike 2019, the wet Spring in 2020 has resulted in higher infection levels of RLL in the trial at Longernong and Inverleigh, and therefore enhanced the efficacy of fungicides (Figure 10). The trial is showing significant differences between untreated and treated plots, and is expected to provide valuable information for growers going into the 2021 season.

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**Trial** | **Location** | **Progress**
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Red Leather Leaf | Longernong | Vasse still to be cut, other varieties cut and being processed. Site relocated from Yanco to Yenda due to initial irrigation bay having high soil nitrogen levels.
Inverleigh | Cuts completed, quality and disease assessment currently underway.
Weather damage | Longernong | Cuts/windrows completed, and quality assessment underway in November-December.

Figure 10 Gradual progression of red leather leaf symptoms in Oats