

OATEN HAY AGRONOMY – SOUTHERN MALLEE

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TAKE HOME MESSAGES

- Highest yielding varieties were Wintaroo (8.2t/ha), then Yallara, Koorabup and Mulgara (all 7.9t/ha).
- Delaying sowing from 5 May to 28 May reduced hay yield by 1.2t/ha.
- Delaying sowing produced a shorter, thinner stem, but there were no benefits for leaf greenness.
- To manage lodging risk, the application of Moddus Evo® reduced hay yield (0.5t/ha) when averaged across varieties in 2020.
- Of the eight varieties evaluated, three (Durack, Koorabup and Mulgara) showed sensitivity to Moddus Evo®, resulting in significant yield loss.

BACKGROUND

Growing hay offers multiple benefits to the farm business including a valuable gross margin, weed management, subsoil moisture conservation, use of compromised crops, market diversification and spreading of cash income.

Achieving good quality hay is dependent on a range of agronomic and growing season conditions. Understanding how varieties perform in your local area helps guide sowing and management decisions to achieve the best outcomes for managing farm production and business risk, and to meet different export and domestic quality specifications demanded by different markets.

There is currently no oaten hay breeding, variety evaluation or agronomy trials in the Victorian southern Mallee. BCG initiated this research in response to help fill this gap. PGR treatments were supported by the National Hay Agronomy project funded by the AgriFutures™ Export Fodder Program.

AIM

To evaluate hay yield and quality of eight oat varieties, when sown at two different dates (3 weeks apart) in the southern Mallee region of Victoria.

To evaluate the effect of a plant growth regulator (PGR) on hay yield and quality of oat varieties to determine the role of PGR's to reduce lodging of oaten hay crops.

Paddock Details

Location:	Curyo
Crop year rainfall (Nov-Oct):	342mm
GSR (Apr-Oct):	205mm
Ave GSR (Apr-Oct):	235mm
Soil type:	Sandy clay
Paddock history:	2019 fallow

Trial Details

Crop type:	Oats
Treatments:	Variety x Sowing Date: Refer to Table 1 Variety (Early May sown crop) x PGR rate (0, 200 mL/ha)
Target plant density:	320 plants/m ²
Seeding equipment:	Knife points + splitter boot (70mm split), press wheels, 30cm row spacing
Sowing dates:	Refer to Table 1
Replicates:	Four
Trial average yield:	7.5t/ha

Table 1. Treatment outline: Oat varieties and time of sowing, Curyo 2020.

Variety characteristics				Sowing date
Variety	End use	Height	Maturity	
Bannister	Milling	Tall dwarf	Quick	5 May
Brusher	Hay/grazing/feed grain	Tall	Quick	28 May
Carrolup	Milling	Mod tall	Quick	
Durack	Milling/hay	Mod tall	Very quick	
Koorabup	Hay	Mod tall	Mid-quick	
Mulgara	Hay/feed	Tall	Quick	
Wintaroo	Hay/grazing	Tall	Mid	
Yallara	Milling	Mod tall	Quick	

Variety characteristics source: 2021 Victorian Winter Crop Sowing Guide

Trial Inputs

Fertiliser:	Granulock® Supreme Z + Flutriafol (200ml/100kg) @ 60kg/ha at sowing and 80kg/ha of urea applied at GS31.
Seed treatment:	EverGol® @ 260mL/100kg and Gaucho® @ 240mL/100kg
Trial managed as per best practice for herbicides, insecticides and fungicides.	

METHOD

A replicated field trial was sown using a split plot trial design. Assessments included NDVI, hay biomass at GS71, plant height, lodging, leaf greenness (SPAD chlorophyll measure) and stem diameter. NIR (including DairyOne calibration) was being processed by the SARDI National Hay Agronomy team at the time of writing.

RESULTS AND INTERPRETATION

Varieties in this trial were chosen with the southern Mallee growing environment in mind. Maturity ranged from early to mid to ensure biomass production and quality was maximised.

The 2020 growing season was characterised by high summer rainfall (174mm January – April), creating strong soil moisture reserves and increasing soil nitrogen (282kg N/ha). These favourable conditions were followed by limited winter rainfall, particularly in June and July. Favourable, mild conditions in spring produced an average hay yield of 7.9t/ha.

Selecting the right variety and seizing an early sowing opportunity optimised hay yield in 2020 at Curyo.

On average, oaten hay sown in early May (8.1t/ha) benefited from very good starting soil moisture and produced 1.2t/ha higher hay yield ($P=0.005$) than when sowing was delayed three weeks (6.9t/ha).

Wintaroo was the highest yielding variety (8.2t/ha), followed by Yallara, Koorabup and Mulgara (7.9t/ha) when averaged across sowing dates (Figure 1).

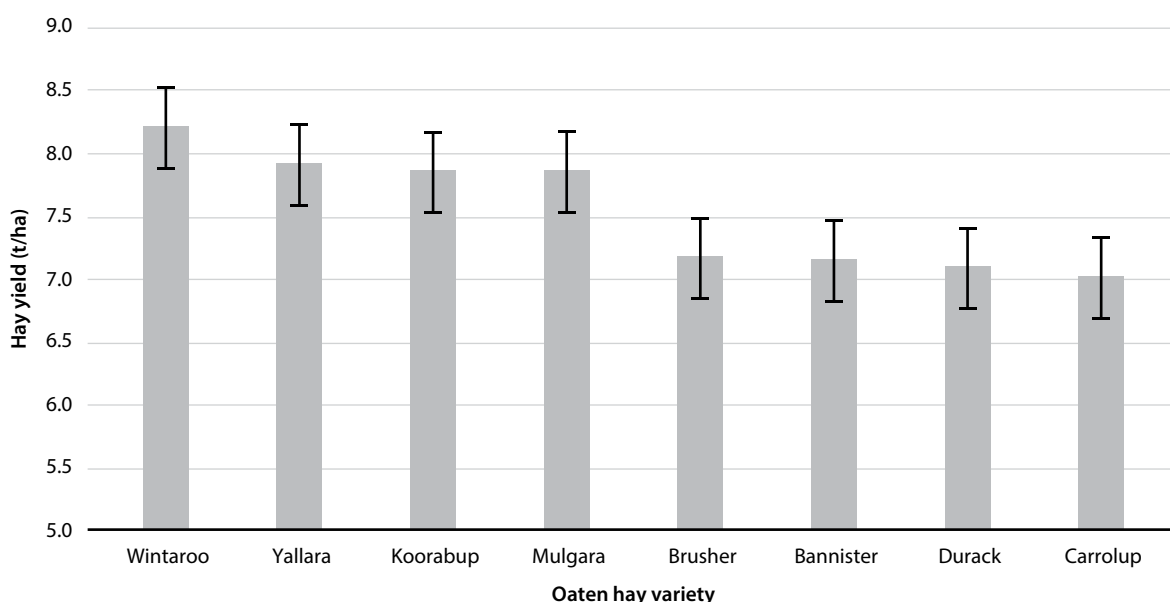


Figure 1. Mean oaten hay yield (t/ha) of eight varieties, averaged across two sowing dates (early and late May) at Curyo 2020. Stats: $P<0.001$ LSD=0.64t/ha, CV=8.5%.

There was no statistical interaction between variety and sowing date, meaning varieties responded similarly to the change in sowing date.

Hay quality

Plant height: Earlier sown crop produced taller plants ($P=0.001$), and varieties differed in their plant height ($P<0.001$). The early May sown crop benefitted from the longer growing season, with plants averaging 89cm in height, compared with late May sown plants at 78cm. Mulgara was the tallest variety averaging 96cm across both times of sowing, while shortest varieties were Yallara and Bannister at 79cm and 72cm respectively.

Lodging: Despite producing a tall, high biomass crop in 2020, lodging did not affect the trial.

Leaf greenness: Leaf greenness varied between varieties ($P=0.034$). Koorabup and Bannister were the greenest, whereas Carrolup and Wintaroo had the lowest green measure. Sowing date had no effect on leaf greenness in 2020.

Stem thickness: Thinner stems ($<6\text{mm}$) with lower fibre and higher water-soluble carbohydrates make better quality hay. All treatments met this target, ranging from 4.4 to 5.5mm, likely driven by the high target plant density of 320 plants/ m^2 (sowing rates ranged from 101 to 163kg/ha).

Stem thickness was influenced by sowing date, with the later sown crop producing slightly thinner stems (-0.2mm). Varieties differed in their stem thickness, with Mulgara producing the thickest stems, and there was an interaction between sowing date and variety ($P=0.003$). For the varieties Bannister, Durack and Wintaroo late May sowing produced finer stems (Figure 2). There were no differences in stem diameter between sowing times for other varieties.

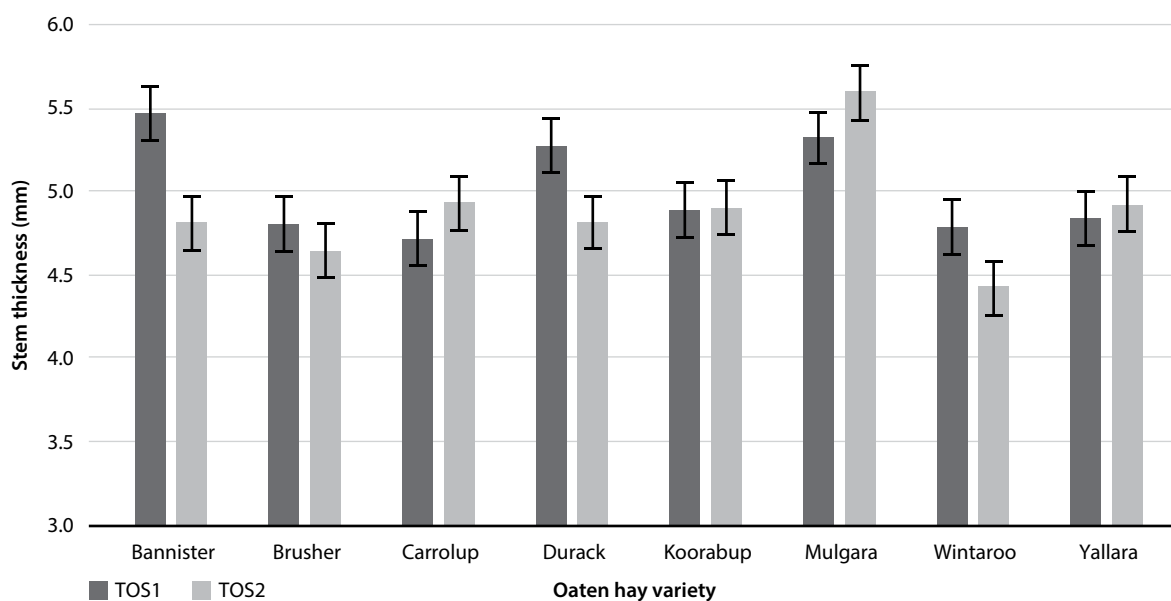


Figure 2. Stem thickness (mm) of hay varieties at two times of sowing, Curryo 2020.

Stats: Variety x TOS: $P=0.003$, $\text{LSD}=0.33\text{mm}$, $\text{CV}=4.9\%$.

When averaged across sowing dates, Wintaroo had the finest stems, followed by Brusher and Carrolup, while Mulgara was the broadest (Table 2).

Table 2. Oat variety response to PGR Moddus Evo®, Curyo 2020

Variety	Hay yield (t/ha)
Bannister	5.1 ^b
Brusher	4.7 ^{de}
Carrolup	4.8 ^{cde}
Durack	5.0 ^{bc}
Koorabup	4.9 ^{bcd}
Mulgara	5.5 ^a
Wintaroo	4.6 ^e
Yallara	4.9 ^{cd}
Sig. diff.	<0.001
LSD (P=0.05)	0.25
CV%	4.9

Plant Growth Regulator

Moddus Evo® application is intended to reduce the internode length, shortening plant height and increasing straw strength, to reduce the likelihood of lodging which is detrimental to hay production.

Similar to the results observed in a 2019 trial, Moddus Evo® influenced both hay yield and plant height. In 2020, Moddus Evo® reduced hay yield by 0.5t/ha when averaged across varieties, with some varieties demonstrating a greater yield penalty than others. This included Durack, Koorabup and Mulgara whose yields were reduced by 1.3t/ha, 0.9t/ha, and 0.8t/ha respectively. The hay yield of Bannister Brusher, Carrolup, Wintaroo and Yallara was unaffected by the PGR application.

The application of Moddus Evo® reduced plant height, with varieties exhibiting differences in their sensitivity to the product (Table 3).

Stem diameter, however, was unexpectedly reduced by PGR application, although this effect was minor (0.2mm) and with no varietal interaction.

Only minor lodging was recorded at this location in 2020 due to the dry winter, however there was a minor influence from the application of the PGR on lodging score (P=0.004).

Table 3. Oat variety response to PGR Moddus Evo®, Curyo 2020

Variety	Hay yield (t/ha)		Plant height (cm)		Stem thickness (mm)	
PGR Rate (mL/ha)	0	200	0	200	0	200
Bannister	8.0	7.9	77.8	68.1	5.5	5.0
Brusher	7.5	7.5	87.4	70.7	4.8	4.6
Carrolup	7.6	7.2	90.3	69.1	4.7	4.6
Durack	8.1	6.8	91.1	58.4	5.3	4.6
Koorabup	8.3	7.5	84.0	71.7	4.9	5.0
Mulgara	8.7	7.9	101.8	72.5	5.3	5.1
Wintaroo	8.3	8.4	90.6	75.1	4.8	4.8
Yallara	8.5	8.1	84.1	70.7	4.8	4.7
Sig. diff.						
Variety	0.004		0.001		<0.001	
Moddus	<0.001		<0.001		0.004	
Variety x Moddus	0.014		0.003		NS	
LSD (P=0.05)						
Variety	0.58		5.75		0.27	
Moddus	0.19		2.89		0.14	
Variety x Moddus	0.67		7.92		-	
CV%	4.6		7.1		5.5	

These BCG member trial results are indicative of the 2020 growing season. The trial will be repeated in 2021 to evaluate the varieties and sowing date effects in a different set of seasonal conditions.

COMMERCIAL PRACTICE AND ON-FARM PROFITABILITY

Yield and quality of oaten hay varieties depend on a combination of using adapted varieties and managing agronomy to compliment the start to the season and expected growing season conditions.

In a season with a favourable start and spring, sowing at the start of May produced higher biomass than sowing late May by extending the growing season.

Slightly longer season mid-maturing varieties Wintaroo and Koorabup, but also faster varieties Yallara and Mulgara, yielded highest.

For hay quality, leaf greenness was not affected by sowing date. To achieve a nice fresh green colour in hay, the crop growth stage of cutting and height of cutting will have most effect. Optimum cutting time is from flowering (GS61) when anthers are protruding from the top floret, to the watery ripe stage (GS71) when the top floret grain releases a clear greenish liquid when squashed. Higher yields come from later growth stages towards GS71, but from flowering the flag leaf will gradually die, resulting in leaf discolouration. Lower leaves will have already begun to die several days earlier, but the presence of clean flag leaves is usually enough to overcome visual discolouration in the bale, so it's more important to protect the colour of the flag leaf. As well, keep cutting height above 15cm (drink can height) to avoid lower parts of the stem which are older and have been shaded, and can be thicker and higher in fibre and bleached of colour.

Stem thickness was finer by sowing later, but varieties sown at both times of sowing achieved the desired stem thickness of less than 6mm. Therefore, with higher yields, sowing earlier had the greatest financial benefit for income generated per hectare.

Seasonal conditions were not conducive to lodging, and again (like 2019) the response to application of PGR Moddus Evo® was minor. The role for PGR's to manage lodging is more likely to be of benefit in exceptional seasons only, requiring an early season forecast of above average spring rainfall (with high confidence) to invest in the application at GS31, with high rainfall areas more susceptible to regular lodging of crops.

REFERENCES

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