

11. Oat Variety Trials

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When making oat varietal decisions, it is important to consider various factors. These include the environmental suitability, end use (milling, feed grain, grain and graze or hay production) and likelihood that the required grade/quality will be achieved, potential disease issues (both root and foliar leaf diseases) and yield potential.

NVT Oat Variety Trials

The 2018 SARDI sowing guide covers each of these factors in depth and can be found at <https://grdc.com.au/2018SowingGuideSA>.

The herbicide tolerance of different oat varieties as well as yield and quality information for grain varieties is available on the National Variety Trials (NVT) website www.nvtonline.com.au

There were two Oats National Variety Trial (NVT) sites sown in the South East in 2017. One was located at Bordertown (Table 1) and

the other at Frances (Table 2). To assess their performance as hay varieties, the MFMG funded an oaten hay trial at Keith and Sherwood to compare the early grazing value, hay production or grain yield of oat varieties (Tables 3 to 8).

Table 1: NVT 2017 Bordertown oat variety trial, grain yield and quality.

Variety Name	Yield		Test Weight	1000 grain weight	Protein	Screenings
	(t/ha)	% Site Mean	(kg/hl)	g/1000 seeds	(%)	% (<2.0mm)
Bannister	6.27	119	52.9	31.17	11.8	7.06
Dunnart	5.52	105	51.0	35.80	11.7	5.40
Durack	4.96	94	57.5	34.00	13.5	4.92
Echidna	5.08	97	52.1	31.55	13.1	7.57
Kojonup	5.21	99	52.3	34.63	13.7	5.67
Kowari	5.54	105	54.5	35.55	13.5	5.18
Mitika	4.52	86	55.1	37.58	13.5	4.15
Possum	5.17	98	52.2	34.52	12.8	3.51
Williams	5.66	108	52.9	32.79	12.4	9.44
Wombat	4.88	93	53.4	33.89	13.1	8.04
Yallara	4.31	82	56.8	39.05	12.1	3.05

Site Mean (t/ha)	5.26
CV (%)	4.7
Probability	<0.001
LSD (t/ha)	0.42
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Table 2: NVT 2017 Frances oat variety trial, grain yield and quality.

Variety Name	Yield		Test Weight (kg/hl)	1000 grain weight g/1000 seeds	Protein (%)	Screenings % (<2.0mm)
	(t/ha)	% Site Mean				
Bannister	5.33	104	48.2	34.90	11	7.44
Dunnart	5.25	102	46.9	39.02	10.6	4.40
Durack	4.36	85	52.4	32.55	12.5	7.33
Echidna	4.81	94	46.3	31.13	11.1	12.44
Kojonup	5.29	103	48.7	32.38	11.4	8.41
Kowari	5.32	103	50.6	34.77	11.7	7.59
Mitika	5.13	100	52.7	37.56	12.1	3.36
Possum	4.96	97	48.7	34.02	11.4	5.01
Williams	5.69	111	48.1	34.79	10.9	11.01
Wombat	4.80	93	49.4	32.58	10.9	10.05
Yallara	4.54	88	52.5	38.98	10.8	3.30

Site Mean (t/ha)	5.14
CV (%)	4.29
Probability	<0.001
LSD (t/ha)	0.37

MFMG Oat Trials

To compliment the NVT trials and provide growers with additional information – particularly around hay production, the MFMG implemented an oaten hay trial at Frances in 2016 with trials also planted at Keith and Sherwood. In 2017, two oaten hay trials were undertaken at Keith and Sherwood to compare a variety's ability to produce early grazing, quality hay or good grain yields under specific different local environments.

This trial work has been implemented at the request of grower's who are identifying the benefits of oats in a mixed cropping system. Oats can be used for grazing, taken through for grain (and a milling plant is in close proximity at Bordertown) or if the season shuts down, can be cut for hay. It also can be used as a tool to reduce weed burdens in a continuous cropping system.

The trial design was broken into three separate components. An assessment was made of

1. Early forage cut (with a second forage re-cut assessed at Keith only).
2. Hay cut (milky dough stage).
3. Grain yield.

This was designed to provide information on either early grazing dry matter production OR hay production OR grain production scenarios.

Keith

The oat variety early forage cut and re-cut dry matter (DM) yields are shown in Table 3. With a 23 May sowing, the average DM production in July was 0.43 t/ha. These plots were re-cut in mid to late October with an average DM yield of 3.17 t/ha to give an overall average combined DM production of 3.6 t/ha. There were no significant differences in DM yield between varieties at either the early or the re-cut assessments. Differences in quality were observed between varieties at the later re-cut assessment (Table 4). The national AFIA grades relate forage quality (hay and silage) to livestock performance and take into account the range in metabolisable energy and crude protein which can occur in hay and silage (Further information can be found on-line at www.afia.org.au).

The hay production trial showed a significant difference between varieties at Keith (Table 5). The highest yielding variety in the hay production component was Bannister (11.29 t/ha) closely followed by Kowari (11.19 t/ha) and Wintaroo (11.17 t/ha). Mitika hay yield was significantly lower than all other varieties (with the exception of Durack and Williams). There were no significant differences between varieties for grain yield with site average yield of 4.06 t/ha (Table 6).

Table 3: MFMG 2017 Keith oat variety trial –dry matter production – *Early Forage Cut and Re-Cut*.

Variety	Date Cut	DM		DM		TOTAL DM removed (t/ha)
		(t/ha)	Date Cut	(t/ha)		
Bannister	25-Jul	0.41	26-Oct	3.76		4.17
Durack	25-Jul	0.43	17-Oct	3.48		3.91
Kowari	25-Jul	0.41	17-Oct	2.88		3.29
Mitika	25-Jul	0.47	12-Oct	2.59		3.06
Williams	25-Jul	0.37	26-Oct	3.06		3.43
Wintaroo	25-Jul	0.48	31-Oct	3.27		3.75
Site Mean (t/ha)		0.43		3.17		3.60
cv (%)		24.7		27.9		
P value (0.05)		0.277		0.164		
I.s.d.		NS		NS		

NS = Not Significant

Table 4: MFMG 2017 Keith oat variety trial - feed test results – *Early Forage Cut and Re-Cut*.

Variety	Date Cut	Dry Matter (%)	Moisture (%)	Crude Protein (% of DM)	Acid Detergent Fibre (% of DM)	Neutral Detergent Fibre (% of DM)	Digestibility (DMD) (% of DM)	Digestibility (DOMD) (% of DM)	Est. Metabolisable Energy (MJ/kg DM)	Water Soluble Carbohydrates (% of DM)	Fat (% of DM)	Ash (% of DM)	AFIA Grade for cereal hay
Durack	25-Jul	92.5	7.5	31.5	16.5	34.4	87.5	81.0	13.4	7.5	4.4	12.5	A1
Kowari	25-Jul	93.5	6.5	33.2	15.7	33.3	87.4	80.9	13.4	5.4	4.6	12.1	A1
Mitika	25-Jul	93.0	7.0	32.2	15.9	32.8	87.7	81.1	13.5	7.1	4.5	12.4	A1
Bannister	25-Jul	92.4	7.6	31.3	17.4	33.5	87.2	80.7	13.4	-	4.4	13.0	A1
Williams	25-Jul	93.6	6.4	30.6	18.1	33.8	85.1	78.9	13.0	3.9	4.3	14.2	A1
Wintaroo	25-Jul	92.3	7.7	31.2	15.9	34.3	87.1	80.6	13.4	7.1	4.4	13.4	A1
Durack	17-Oct	88.8	11.2	9.4	34.4	59.5	54.0	52.6	7.7	4.1	2.7	8.1	C2
Kowari	17-Oct	87.3	12.7	10.8	28.2	54.2	64.5	61.5	9.5	11.8	3.1	6.7	B1
Mitika	12-Oct	86.8	13.2	9.2	28.3	51.9	65.4	62.2	9.6	21.5	3.0	8.3	B2
Bannister	26-Oct	91.4	8.6	8.4	30.3	57.1	62.2	59.5	9.1	11.7	3.0	6.9	B2
Williams	26-Oct	90.7	9.3	8.5	31.2	58.6	58.6	56.5	8.5	11.3	2.8	6.8	C2
Wintaroo	31-Oct	89.7	10.3	8.6	30.4	57.7	60.7	58.3	8.8	7.0	3.1	5.4	B2

Table 5: MFMG 2017 Keith oat variety trial, hay yield and feed test results – Hay Production.

Variety	Date Cut	Hay Yield DM (t/ha)	Dry Matter (%)	Moisture (%)	Crude Protein (% of DM)	Acid Detergent Fibre (% of DM)	Neutral Detergent Fibre (% of DM)	Digestibility (DMD) (% of DM)	Digestibility (DOMD) (% of DM)	Est. Metabolisable Energy (MJ/kg DM)	Water Soluble Carbohydrates (% of DM)	Fat (% of DM)	Ash (% of DM)	AFIA Grade for cereal hay
Bannister	17-Oct	11.29	85.7	14.3	6.8	26.7	51.4	67.2	63.7	9.9	23.6	2.8	6.8	A3
Durack	10-Oct	9.53	87.4	12.6	8.7	30.3	58.3	58.9	56.7	8.5	13.5	2.7	7.1	C2
Kowari	10-Oct	11.19	85.1	14.9	7.7	26.3	50.9	67.8	64.2	10.0	23.8	2.8	7.4	A3
Mitika	10-Oct	9.12	85.5	14.5	8.3	26.4	51.1	66.6	63.2	9.8	23.6	2.9	6.8	A2
Williams	17-Oct	10.23	86.2	13.8	8.8	31.4	57.1	59.1	56.9	8.5	12.4	2.8	7.1	C2
Wintaroo*	17-Oct	11.17	-	-	-	-	-	-	-	-	-	-	-	

Site Mean (t/ha)	10.42
P Value (0.05)	0.038
I.s.d.	1.513
CV%	3.3

* Feed Test Results n/a

Table 6: MFMG 2017 Keith oat variety trial, grain yield and quality results – Grain Production.

Variety	Yield t/ha	% Site Mean	Test Weight (kg/hl)	1000 grain weight (g/1000 seeds)	Screenings % (< 2.00mm)	Protein (%)	Oil (fat) (%)	Groat (%)
Bannister	4.33	107	48.4	32.0	11.8	12.5	7.9	73.6
Durack	4.13	102	52.8	33.4	11.8	14.0	7.1	73.6
Kowari	4.31	106	48.7	34.6	8.6	13.8	7.0	73.7
Mitika	4.05	99	50.3	35.4	8.6	14.8	7.0	77.7
Williams	4.18	103	46.5	27.8	28.2	12.9	6.9	69.1
Wintaroo	3.36	83	48.9	35.0	12.6	14.5	7.7	74.3

Site Mean (t/ha)	4.06
CV (%)	7.8
P Value (0.05)	0.119
I.s.d.	NS

NS= Not Significant

Sherwood

The oat variety early forage cut dry matter (DM) yields and quality are shown in Table 7. With a 19 May sowing, the average DM production in August was 1.79 t/ha. There were no significant differences in DM yield between varieties at this early forage production assessment (no forage re-cut was made at Sherwood).

The trial at Sherwood showed a significant difference in hay yield with Wintaroo, Mammoth and Saia oats providing yields all in excess of 8.0 t/ha (Table 8). AFIA grades achieved at Sherwood for oaten hay in 2017 ranged from B2 to C2 (Table 7). There was a significant difference between varieties for grain yield; Williams (4.16 t/ha) significantly out-yielded all varieties except Bannister (3.38 t/ha).

Table 7: MFMG 2017 Sherwood oat variety trial, dry matter production and feed test results – *Early Forage Cut*.

Variety	Date Cut	Hay Yield DM (t/ha)	Dry Matter (%)	Moisture (%)	Crude Protein (% of DM)	Acid Detergent Fibre (% of DM)	Neutral Detergent Fibre (% of DM)	Digestability (DMD) (% of DM)	Digestability (DOMD) (% of DM)	Est. Metabolisable Energy (MJ/kg DM)	Water Soluble Carbohydrates (% of DM)	Fat (% of DM)	Ash (% of DM)	AFIA Grade for cereal hay
Bannister	28-Aug	1.97	92.9	7.1	20.5	20.0	41.3	82.3	76.6	12.5	13.7	3.8	10.6	A1
Durack	28-Aug	1.98	89.1	10.9	19.8	18.9	40.9	82.7	76.8	12.6	19.2	3.7	8.5	A1
Echidna	28-Aug	1.38	90.6	9.4	22.1	20.5	39.5	80.5	75.0	12.2	11.8	3.8	11.6	A1
Kowari	28-Aug	1.74	89.7	10.3	20.4	18.6	40.0	82.4	76.6	12.6	16.9	3.9	11.2	A1
Mammoth	28-Aug	1.60	91.9	8.1	20.3	20.1	42.0	82.1	76.3	12.5	13.0	3.9	11.8	A1
Mitika	28-Aug	2.14	90.0	10.0	17.8	19.5	41.8	81.9	76.2	12.5	21.2	3.6	8.9	A1
Saia	28-Aug	1.67	92.6	7.4	24.6	21.3	41.0	81.8	76.1	12.5	8.0	4.0	11.5	A1
Williams	28-Aug	1.78	89.6	10.4	21.7	20.1	38.8	82.6	76.8	12.6	15.3	3.8	11.0	A1
Wintaroo	28-Aug	1.87	89.1	10.9	18.8	20.9	42.4	79.9	74.5	12.1	15.3	3.7	11.5	A1

Site Mean (t/ha)	1.79
P Value (0.05)	0.199
I.s.d.	NS
CV%	7.2

NS= Not Significant

Table 8: MFMG 2017 Sherwood oat variety trial, hay yield and feed test results – *Hay Production*.

Variety	Date Cut	Hay Yield DM (t/ha)	Dry Matter (%)	Moisture (%)	Crude Protein (% of DM)	Acid Detergent Fibre (% of DM)	Neutral Detergent Fibre (% of DM)	Digestability (DMD) (% of DM)	Digestability (DOMD) (% of DM)	Est. Metabolisable Energy (MJ/kg DM)	Water Soluble Carbohydrates (% of DM)	Fat (% of DM)	Ash (% of DM)	AFIA Grade for cereal hay
Bannister	17-Oct	6.24	86.0	14.0	8.2	28.7	54.7	63.1	60.2	9.2	18.3	2.9	5.3	B2
Durack	6-Oct	5.65	85.4	14.6	9.1	29.2	55.3	63.5	60.7	9.3	18.8	2.8	5.0	B2
Echidna	12-Oct	5.48	87.4	12.6	8.7	30.9	55.8	59.6	57.3	8.6	18.1	2.8	5.0	C2
Kowari	6-Oct	6.01	85.9	14.1	7.6	32.0	59.8	60.2	57.8	8.7	17.3	2.5	5.2	B3
Mammoth	2-Nov	8.07	89.0	11.0	7.6	31.3	60.7	61.8	59.2	9.0	12.8	2.9	4.3	B3
Mitika	6-Oct	6.06	86.5	13.5	9.9	26.7	51.6	68.2	64.6	10.1	22.9	2.9	4.8	B2
Saia	26-Oct	8.00	92.3	7.7	8.1	35.7	64.0	53.0	51.8	7.5	9.9	2.6	4.2	C2
Williams	12-Oct	6.25	88.5	11.5	9.3	31.4	56.1	59.4	57.1	8.6	16.8	2.8	5.9	C2
Wintaroo	17-Oct	8.23	86.7	13.3	8.1	31.6	58.6	59.3	57.1	8.6	16.2	2.6	4.9	C2

Site Mean (t/ha)	6.67
P value (0.05)	<.001
I.s.d.	0.87
cv%	5.5

Table 9: MFMG 2017 Sherwood oat variety trial, grain yield and quality results – Grain Production.

Variety	Yield t/ha	% Site Mean	Test Weight (kg/hl)	1000 grain weight (g/1000 seeds)	Screenings (% < 2.00mm)	Protein (%)	Oil (fat) (%)	Groat (%)
Bannister	3.38	124	50.8	37.0	4.6	12.1	8.1	74.1
Durack	2.27	83	54.6	35.4	3.8	15.6	7.5	77.9
Echidna	2.65	97	48.2	33.6	6.6	12.7	6.8	73.3
Kowari	2.69	99	50.9	37.0	2.8	15.1	7.0	75.3
Mammoth	2.39	88	46.4	29.2	16.6	14.4	6.4	70.4
Mitika	3.12	114	52.5	39.6	2.2	15.2	7.2	77.9
Saia	1.17	43	54.3	20.4	70.0	19.1	5.9	77.8
Williams	4.16	153	48.5	34.6	8.0	13.4	7.0	72.8
Wintaroo	2.71	99	50.3	40.0	5.2	14.9	7.9	76.8

Site Mean (t/ha)	2.73
P Value (0.05)	0.001
I.s.d.	0.974
CV (%)	10.8

Variety end-use is important when making varietal selection; certain varieties are preferred for particular end-uses, so check with hay processors and millers prior to selection. Information according to annual rainfall, variety end-use, long term yield, hay and grain production comparisons, agronomic features, disease resistance, and grain and hay quality can be found in the SARDI 2018 Oats Sowing Guide which is available on-line at <https://grdc.com.au/2018SowingGuideSA>

Notes on Selected Varieties

Below are some notes on recently released milling varieties relevant to the South East region.

Information sourced from the 2018 SARDI Sowing Guide and provided by Pamela Zwar, Sue Hoppo, Peter McCormack, Mark Hill, Peter Wheeler, KerryLee McMurray and Michelle Williams, SARDI.

Williams is a tall milling variety commercialised by Heritage and released in Western Australia in 2013. Williams, formerly known as the breeding line WA2332, is a high yielding early to midseason variety with similar maturity compared to Yallara. It is three to seven days later maturing than Mitika. Williams is 15 cm taller than Mitika, 5 cm taller than Bannister, and 15 cm shorter than Yallara. Although classified as MS for septoria, Williams has the highest level of septoria resistance compared to all other current oat varieties. It is resistant to leaf rust and depending on the stem rust pathotype present can range from moderately resistant to susceptible. Williams is resistant to bacterial blight and moderately resistant to moderately susceptible for BYDV. It is susceptible and intolerant to CCN. Williams has similar grain yield to Bannister with slightly inferior grain quality. Screenings are similar to Wombat and can be high, especially in the low rainfall regions. Williams has high B-glucan levels. Williams averages slightly lower hay yield compared to other hay varieties. Hay quality is similar to Wintaroo with slightly lower water soluble carbohydrates and slightly higher crude protein.

Bannister is a dwarf milling variety with high grain yield released for Western Australia in 2012. Bannister is suited to eastern Australia as well as Western Australia. It is adapted to low, medium, and high rainfall zones of Southern Australia. It is 13 cm taller than Mitika and heads about 3 to 4 days later than Mitika. Seednet is the commercial partner. Bannister is resistant to leaf rust and moderately resistant to bacterial blight. It is susceptible and intolerant to CCN. Bannister has slightly lower hectolitre weight and slightly higher screenings compared to Mitika. It is similar to Mitika for groat percent.

Wombat is a dwarf milling variety commercialised by Seednet. It is similar in height to Possum and slightly taller than Mitika. It is a midseason variety flowering about six days later than Mitika. Wombat is the first dwarf milling variety with CCN resistance and tolerance. It is also moderately tolerant and moderately resistant to stem nematode. It has improved BYDV resistance compared to other dwarf varieties and improved bacterial blight resistance compared to other dwarf varieties except Mitika. Wombat has high hectolitre weight and low screenings compared to the feed variety Potoroo, which was the first dwarf variety with CCN resistance and tolerance. It also has high groat percent, slightly higher than Mitika. Wombat can have slightly higher screenings than Mitika, Yallara and Possum depending on seasonal conditions. Wombat will develop leaf reddening symptoms similar to Mitika and Possum post flowering. This does not affect grain yield or quality.

Mitika is an early maturing dwarf milling oat developed by SARDI and now commercialised by Heritage Seeds. It is resistant to leaf rust and moderately resistant to stem rust and bacterial blight. However, Mitika is susceptible to CCN, BYDV, septoria and red leather leaf and intolerant to CCN and stem nematode. Mitika is a milling quality oat with high hectolitre and grain weight, low screenings percent and moderately high groat percent. It is also a high feed value oat with low hull lignin and high grain digestibility. Mitika averages higher levels of Beta-glucan than Possum, Yallara and Euro. It is recommended for all rainfall zones where CCN or stem nematode is not a problem.

Kowari oats, released in September 2017, is a new potential milling oat variety with dwarf stature measuring 65 to 70 cm. It is slightly taller than Mitika. It has a maturity similar to Mitika, but is 2 to 8 days earlier to head than Yallara, 8 to 10 days earlier than Bannister and 3 to 10 days earlier than Williams. Kowari is 4 to 8 days later to head than Durack. Kowari is a cross between Mitika and WAOAT2099 and was tested as the breeder's line 03198-18. It has similar grain yield to Mitika and Kojonup, but lower than Bannister and Williams. The grain quality is excellent. Kowari has slightly lower hectolitre weight and similar 1000 grain weight when compared to Mitika. It combines high beta-glucan with low screenings. Kowari has high protein and slightly higher groat percent compared to Mitika. The trait of interest for this variety is improved beta-glucan content. The beta-glucan content was measured using the Megazyme method. Kowari has 5.2% (dm basis) compared to 4.7% for Mitika and Kojonup. Like Mitika, it also has low hull lignin. Heritage is the commercial partner. Approximately 85t was produced in 2016 and a further bulk up occurred in 2017 for commercial sale and test mill.

Notes on Selected Forage Oat Varieties

Mammoth is a true forage oat, with excellent establishment vigour. Mammoth is a new true forage oat with excellent establishment vigour. It was identified in 2007 from the Heritage Seeds' program that specifically targeted high forage yield and quality for southern Australia. In particular, the program looked at early establishment vigour and winter yield to select Mammoth. Mammoth has shown excellent autumn and winter performance, and good overall yield in multiple locations over a number of years. Improved BYDV tolerance gives the producer confidence that yield losses due to early aphid infestations are mitigated to a large degree. Mammoth has been developed to offer speedy, high yielding forage and is very suitable for silage and hay production. Mammoth oats are an option for over-sowing & direct drilling into under-performing pastures. (Accessed online at www.heritage-seeds.com.au).

Further information on other milling and oaten hay varieties is available from the SARDI sowing guide <https://grdc.com.au/2018SowingGuideSA>

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