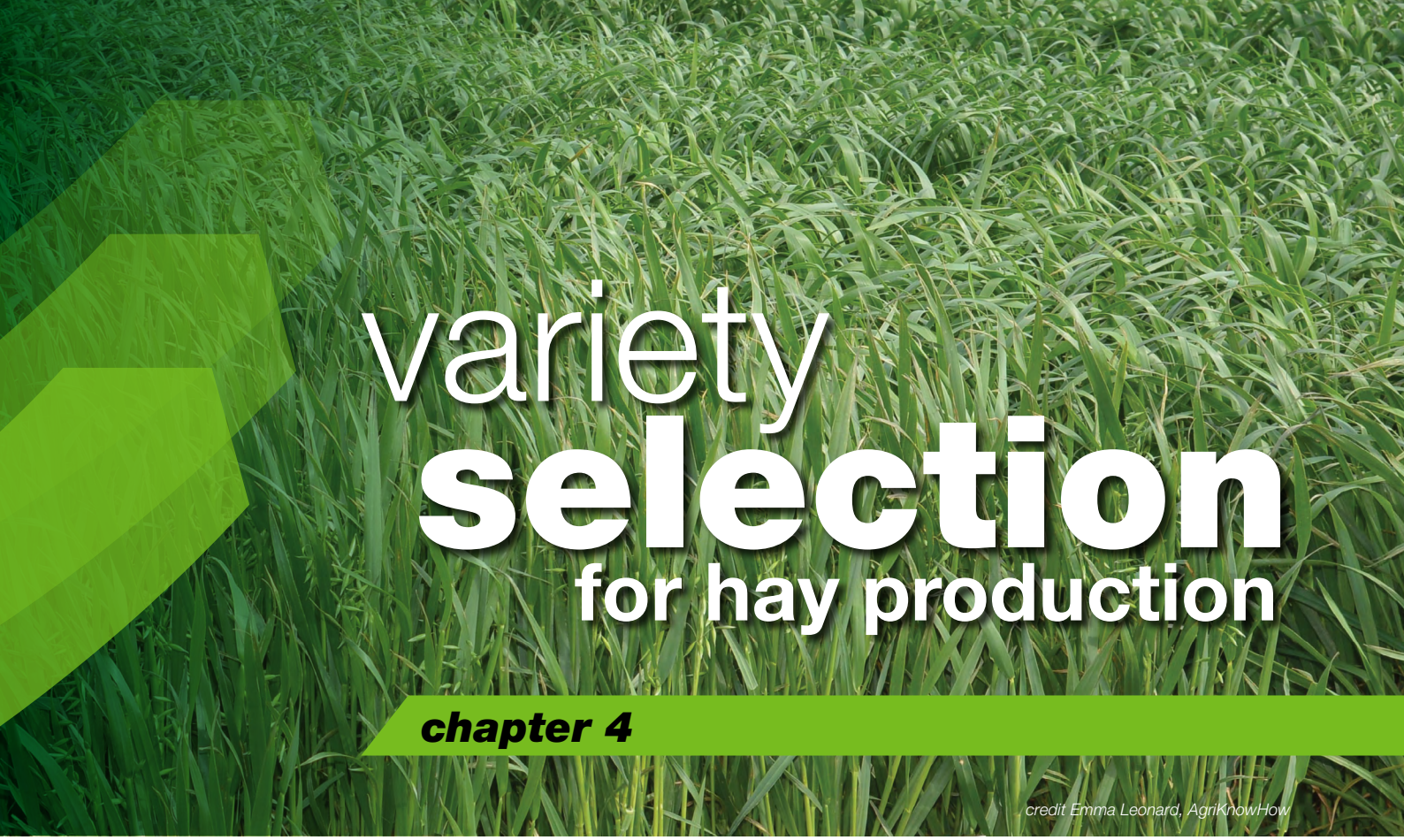

variety selection for hay production

chapter 4

credit Emma Leonard, AgriKnowHow

Choice of variety has a major influence on hay quality and hay processors may only accept certain varieties.

Key considerations when selecting an oat variety for hay:

- market suitability;
- region suitability;
- disease resistance in relation to the growing region;
- time of maturity; and
- yield.

Quality and yield sit on either side of the scales, with variety maturity (Figure 4.1) or rainfall the factors that change the balance.

Generally, early maturing varieties are more suited to hay production in low rainfall areas.

Late maturing varieties perform well in higher rainfall areas with a longer growing season. However, older late varieties, such as Glider, have poorer early vigour, reducing competiveness with weeds, ryegrass, wild oats, barley and brome grasses. Breeders have now produced varieties such as Forester, which is late maturing but has early vigour. In seasons with warm moist spring conditions, late maturing varieties can produce higher crop yields. The quality of these large crops will be determined by variety and season.

In medium to high rainfall areas, early sowing of early maturing varieties can lead to hay being downgraded due to rain spoilage during curing. On-going research (AEXCO and GRDC) is evaluating the potential of forage

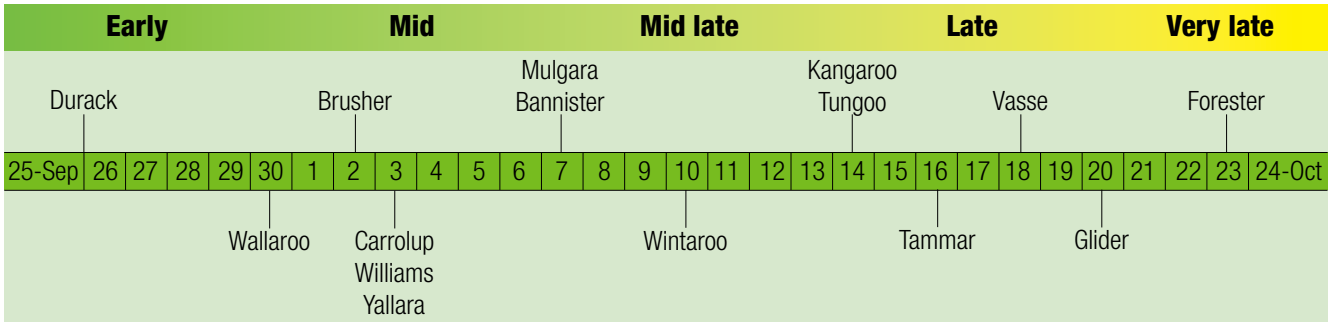

Figure 4.1 Variety maturity time line – *source National Oat Breeding Program 2016.*

Indicative cutting dates based on all varieties sown on the same date in the same year. The relationship between early and very late maturity will remain constant but the date of maturity may be earlier or later depending on the season. Maturity differences between varieties are greater than maturity difference for the same variety sown at different times.

oat varieties, developed for high rainfall/irrigation areas, such as Aladdin and Genie, for hay in dryland medium to high rainfall environments. In these environments, early sowing can result in good yields of quality hay if a wet spring is experienced.

The following summaries of oat varieties most suited to hay production in Australia are based on varieties tested as part of the National Oat Breeding Program (see page 4).

Variety choice is determined by region/rainfall and end use (Tables 4.1 and 4.2), and regional disease pressure (Table 4.3a & b and see Figure 7.1).

Monitoring oat crops for disease is essential as disease interactions can vary between regions (Tables 4.3a & b)

New varieties are in development and the latest variety information is available on release from the respective breeding programs, licensee or seed companies. A more comprehensive variety guide is published annually and can be sourced from the AEXCO website (www.aexco.com.au).

Bannister[Φ]

A dwarf milling variety with high grain yield, released for Western Australia (WA) in 2012. Suited to eastern Australia and WA, it is adapted to low, medium, and high rainfall zones of southern Australia.

Bannister is resistant to leaf rust and moderately resistant to bacterial blight. It is susceptible and intolerant to cereal cyst nematode (CCN).

Seed is available via Seednet.

Brusher[Φ]

A hay variety developed by SARDI and commercialised by AEXCO in 2004. Brusher is a tall line with good early vigour, heading earlier than Wintaroo. It is adapted to low, medium, and high rainfall areas.

It is moderately intolerant to CCN. If there are high levels of the nematode in the soil and favourable seasonal conditions, it will have significantly lower hay yield than tolerant varieties.

It has consistently high digestibility and moderately low grain hull lignin.

Seed is available via AEXCO.

Carrolup[Φ]

Released as a milling variety in 1993 by the then WA Department of Agriculture, Carrolup is a medium tall early to mid season variety that has been widely grown in WA for hay production.

Carrolup is very susceptible to leaf rust.

Although developed for grain, its hay quality is similar to other early to mid season hay varieties.

No specific distributor.

Durack[Φ]

A moderately tall variety measuring between 80 and 90cm, similar in height to Carrolup and Yallara.

Very good early vigour results in maturity a minimum of one week earlier than any variety on the market in 2016.

It has good resistance to lodging and shattering. It is resistant to CCN and its disease profile is likely to require management with fungicides, depending on the season.

Hay yield averaged over low, medium, and high rainfall sites is lower than other longer season varieties. Care will need to be taken to cut this very early maturing variety at the correct growth stage.

Monitoring the crop will be the key to achieving the highest hay quality.

Seed is via Heritage Seeds.

Forester[Φ]

Forester was released in 2012 as a very late hay variety adapted to high rainfall and irrigated cropping regions. It is three weeks later than Wintaroo, seven to 10 days later than Glider and two days later than Targa (Figure 4.1). Forester has excellent early vigour and is an improvement compared to Glider. It has excellent lodging and shattering resistance.

Table 4.1 Oat varieties by end use and ranked to annual rainfall and maturity.

End use	Rainfall - low	Maturity	Rainfall - medium	Maturity	Rainfall - high	Maturity
Oat Hay	Brusher	Early to mid	Wintaroo	Mid	Forester	Very late
	Mulgara	Mid	Mulgara	Mid	Tammar	Late
	Wintaroo	Mid	Tammar	Late	Tungoo	Mid to late
	Wallaroo	Early	Tungoo	Mid to late	Glider	Late
	Carrolup	Early to mid	Kangaroo	Mid to late	Kangaroo	Mid to late
			Brusher	Early to mid	Vasse	Late
			Carrolup	Early to mid		
Milling grain – suited to hay if managed appropriately.	Yallara	Early to mid	Yallara	Early to mid		
	Bannister	Early to mid	Bannister	Early to mid		
	Durack	Very early	Williams	Early to mid		

Always check with your hay buyer before selecting a variety, especially if growing a milling variety for export hay.

Forester has an excellent foliar disease resistance spectrum. It is moderately susceptible to CCN and has good hay colour, but like all late hay varieties, it may not resist hot, dry winds as well as earlier varieties. Forester has excellent hay quality and is an improvement compared to Glider, Tammar, Targa, and Vasse, but similar to Riel.

Seed is available via AGF Seeds, Victoria.

Glider

Released jointly by SARDI and Texas A&M University in 1999, Glider is a late maturing hay variety adapted to high rainfall (>500mm) areas. Glider has poor early vigour and heads about two weeks later than mid season varieties.

It has excellent foliar disease resistance and plant colour.

No specific distributor.

Kangaroo(ϕ)

This hay variety, commercialised from the SARDI Oat Breeding Program by AEXCO in 2006, is a tall mid to late season variety with good early vigour. It heads about four days later than mid season varieties. Kangaroo has been superseded by Tungoo.

Kangaroo has good foliar disease resistance combined with good nematode resistance and moderate tolerance.

It has high grain hull lignin. Hay cut from this variety tends to be high in neutral detergent fibre (NDF) and lower in water soluble carbohydrates (WSC), therefore careful management is required.

No seed is available from suppliers.

Mulgara(ϕ)

Released in 2009 and commercialised by AEXCO, Mulgara is a tall mid season variety with excellent early vigour and good straw strength.

Mulgara has excellent disease resistance. It is resistant and tolerant to CCN and stem nematode (SN). Compared to Wintaroo, Mulgara has improved leaf rust, bacterial blight and red leather leaf resistance.

Hay yield is lower than Wintaroo, but hay quality is better than Wintaroo. Mulgara also retains good hay colour and resists brown leaf tipping.

Care must be taken to ensure correct seeding rates as Mulgara has high 1000 grain weight (Table 4.4).

Seed is available via AEXCO.

Tammar(ϕ)

A medium tall late variety that matures four to seven days later than Tungoo, Tammar was released by SARDI in 2011.

Tammar also has an excellent disease resistance profile. It is moderately resistant to stem and leaf rust, septoria, barley yellow dwarf virus (BYDV), and bacterial blight. Tammar is the first late variety available with resistance to CCN and SN, tolerance to CCN, and moderate tolerance to SN.

Hay quality of Tammar is improved compared to Kangaroo. It has high crude protein and hay digestibility with lower WSC than Mulgara and Brusher, but higher than Kangaroo.

Seed is available via AEXCO.

Tungoo(ϕ)

Released in 2010 as a medium tall mid to late season variety with an excellent disease resistance profile, Tungoo replaces Kangaroo.

Tungoo combines resistance and moderate tolerance to CCN and SN. It also is resistant to leaf rust and the only variety with red leather leaf resistance. Tungoo is moderately resistant to BYDV, septoria, and bacterial blight and moderately susceptible to stem rust. It has the best combination of disease resistance compared to all other varieties except Tammar.

Hay yield is slightly lower than Kangaroo, but Tungoo's hay quality is an improvement compared to Kangaroo.

Seed is available via AEXCO.

Compressed 23kg bales ready for export. Check your chosen variety is accepted by your hay buyer.

credit Balco

Vasse[Φ]

Released by the Department of Agriculture Western Australia in 1997 as a hay variety, Vasse is a 'tall dwarf', late maturing variety adapted to high rainfall, long season areas of WA. Because its stem diameter tends to be coarse, it is not generally sought after for the export market.

Wallaroo

Released by the Department of Agriculture, South Australia in 1987, Wallaroo is a CCN resistant and tolerant hay variety. It is an early variety suited to the low to medium rainfall areas. Wallaroo is a tall variety with good early vigour.

Williams[Φ]

Williams is a tall milling variety, which has some potential for hay, released in 2013 by Heritage Seeds. It is an early to mid season variety similar to Yallara, but three to seven days later than Mitika.

Although classified as moderately susceptible to septoria, Williams has the highest level of septoria resistance compared to all other current oat varieties. It is currently 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 to BYDV. It is susceptible and intolerant to CCN.

It has similar hay yield compared to other hay varieties at South Australian (SA) trial sites at Pinery and Turretfield, but lower hay yield at Riverton. Hay quality is also similar to hay varieties, except for slightly higher crude protein. Care must be taken to achieve high plant populations to reduce stem thickness.

Check that export companies will accept Williams for hay, especially in WA.

Seed is via Heritage Seeds.

Wintaroo[Φ]

A hay variety released in 2003 as a replacement for Marloo, which in turn replaced Swan. Wintaroo is a tall mid season oat with good early vigour. It resists brown leaf tipping by hot northerly winds better than other varieties and is adapted to low, medium, and high rainfall locations.

Wintaroo also has low grain hull lignin, making it an option for feed grain. Wintaroo maintains good colour longer than most varieties, so care is needed to assess the crop for optimum cutting time to ensure good quality.

Seed is available via AEXCO.

Yallara[Φ]

A medium tall early to mid season variety that is similar to Euro for flowering and maturity. Yallara, released in 2009 by ABB Seeds, is a milling line but has potential for hay.

Yallara is a Euro look-alike with improved leaf and stem rust resistance depending on pathotype. It is resistant but intolerant to CCN. It is moderately susceptible to BYDV, bacterial blight, and septoria. It is susceptible and intolerant to stem nematode and susceptible to red leather leaf.

Yallara has excellent grain weight and quality, and was evaluated for hay production. Although hay yield is lower than popular hay varieties in medium to high rainfall zones, it has excellent hay quality.

Seed is available via Seednet.

Table 4.2 Average hay yield (t/ha) for oat varieties tested in four states 2011 to 2014
– source National Oat Breeding Program.

Variety	New South Wales	South Australia	Victoria	Western Australia	All states
Early – mid season varieties					
Bannister	11.5	10.4	10.2	9.9	10.2
Brusher	11.3	10.4	10.2	9.5	10.1
Carrolup	11.6	9.9	10.5	8.8	9.7
Durack	11.3	9.8	10.2	8.0	9.3
Mulgara	11.0	10.1	10.2	9.4	9.9
Wallaroo	11.9	9.7	10.2	9.3	9.7
Williams	11.3	10.0	10.1	8.9	9.7
Wintaroo	11.6	10.6	10.5	10.0	10.4
Yallara	12.3	10.7	10.5	9.5	10.3
Mid-late to very late varieties					
Forester	10.4	9.7	10.0	9.7	9.8
Glider	10.5	9.5	9.8	9.3	9.5
Kangaroo	11.2	10.0	9.8	9.5	9.8
Tammar	11.0	10.3	10.1	9.3	9.9
Tungoo	10.4	9.9	9.9	8.7	9.5
Vasse	11.0	10.7	10.2	9.9	10.3
No. sites	1	12	8	11	32

Table 4.3a Disease reactions in SA and Victoria for oat varieties grown for hay
– source National Oat Breeding Program 2016.

Notes for Tables 4.3a and b

Where no data is available for a disease a dash is used.

Disease reactions may be different depending on the region.

Rust and BYDV reactions may vary in different regions and seasons depending on prevalent pathotype/serotype.

If soil testing has eliminated CCN and SN as a limitation, the next disease limitation should be used for variety selection. Colours associated with varieties indicated the highest level of resistance available for the priority diseases in different regions as illustrated in Figure 7.1

Variety	Stem rust	Leaf rust	BYDV	Septoria	Bacterial blight	CCN		Stem Nematode		Red leather leaf
						R	T	R	T	
Early – mid season varieties										
Bannister	MR-S	R	MS	-	MR-S	VS	I	-	MI	MS
Brusher	MS-S	MR-MS	MS	MS	MR-MS	R	MI	MS	I	MS
Carrolup	MS	S	MS	S-VS	MR-S	S	I	-	-	S
Durack	S-VS	R-S	MS-S	MS	MR-S	R	-	NA	I	MS
Mulgara	MS-S	MR	MS	MS	MR	R	MT	R	MT	MS
Wallaroo	S	S	MS	S	S	R	MT	MS	MI	MS
Williams	MR-S	R	MR-MS	MS	R	S	I	-	I	MS
Wintaroo	S	MS	MR-MS	MR-MS	MR	R	MT	MR	MT	MS
Yallara	MR-S	R	MS	MS	MR-MS	R	I	S	I	MS
Mid-late to very late varieties										
Forester	R-S	MR-MS	MR-S	MR	MS-S	MS	MI	S	I	R-MR
Glider	R-S	R	MS-S	S	R-MR	MS	MT	R	T	R
Kangaroo	MS-S	MS	MR-S	MR-MS	MR-MS	R	MT	MS	MI	MS
Tammar	MR-S	MR	MS	MR	MR	MR	MT	R	MT	R-MS
Tungoo	MS-S	MR	MR-MS	MR	MR	R	MT	R	MT	R
Vasse	S	MS	MS-S	MS	MS	VS	MI	-	MI	-

Table 4.3b Disease reactions in WA for oat varieties grown for hay.

Variety	Stem rust	Leaf rust	BYDV	Septoria	Bacterial blight	CCN		Stem Nematode		Red leather leaf*
						R	T	R	T	
Early – mid season varieties										
Bannister	MR-S	R	MS	S	MR-S	VS	I	-	MI	-
Brusher	MR-S	R-MS	MR-MS	S-VS	MR-MS	R	MI	-	-	-
Carrolup	MS	S	MS	S-VS	MR-S	S	I	-	-	-
Durack	MR-MS	R-S	MS-S	S-VS	MR-S	R	-	-	-	-
Mulgara	MR-MS	MR	MS-S	MR-S	MR	R	MT	-	-	-
Wallaroo	MS-S	VS	MS	S-VS	S	R	MT	-	-	-
Williams	MR	R	MR-MS	MS	R	S	I	-	-	-
Wintaroo	MR	S-VS	MS-S	S-VS	S	S	I	-	-	-
Yallara	MR-MS	R	MR-MS	MS-S	MR-MS	R	I	-	-	-
Mid-late to very late varieties										
Forester	R	R-MS	MS	MS-S	MS-S	MS	MI	-	-	-
Glider*	-	-	-	-	-	-	-	-	-	-
Kangaroo	R-S	MS-S	MR-S	MS-S	MR-MS	R	MT	-	-	-
Tammar	R-MR	R-MR	MS-S	MS	MR	MR	MT	-	-	-
Tungoo	MR-S	R-MS	MR-MS	MS-S	MR	R	MT	-	-	-
Vasse*	-	-	-	-	-	-	-	-	-	-

Key to Tables 4.3a & b:

Disease names: CCN - cereal cyst nematode, BYDV - barley yellow dwarf virus

Disease reactions: R - resistant, MR - moderately resistant, MS - moderately susceptible, S - susceptible, VS - very susceptible, T - tolerant, MT - moderately tolerant, MI - moderately intolerant, I - intolerant, VI - very intolerant.

** No disease data from WA for these varieties - see Table 4.3a for a guide.*

Table 4.4 Agronomic and hay quality characteristics for oat varieties grown for hay *– source National Oat Breeding Program.*

Variety	Height	Early vigour	1000 grain weight (g)	Hay quality					Stem diameter	Hull lignin
				Digest-ibility	WSC	Crude protein	ADF	NDF		
Early – mid season varieties										
Bannister	TD	3	31.0	H	M	M	L	ML	M	H
Brusher	T	3	32.9	MH	MH	M	M	M	M	ML
Carrolup	MT	4	31.4	M	M	M	M	M	M	H
Durack	MT	2	32.6	MH	M	M	M	M	M	H
Mulgara	T	3	35.5	M	M	M	M	M	M	H
Wallaroo	T	3	33.1	M	M	M	M	M	F	L
Williams	MT	2	28.8	M	ML	MH	M	M	MT	H
Wintaroo	T	3	33.7	M	M	M	M	M	M	L
Yallara	MT	2	31.9	M	H	ML	M	M	MF	MH
Mid-late to very late varieties										
Forester	T	3	32.0	H	MH	M	L	L	MT	H
Glider	T	8	31.2	M	M	M	M	M	F	ML
Kangaroo	MT	3	31.6	M	L	M	H	H	MF	H
Tammar	MT	4	29.9	M	ML	M	M	MH	MF	L
Tungoo	T	6	29.4	M	ML	MH	M	MH	M	H
Vasse	D	4	31.4	M	H	M	M	M	T	H

Key Table 4.4:

Height: T - tall, MT - medium tall, D – dwarf, TD – tall dwarf

Early vigour scores: 1 - excellent early vigour and 9 - poor

1000 grain weight average weight from trials 2010 to 2014 - these weights are only indicative

Maturity scores: E - early, EM - early to midseason, M - midseason, ML - mid to late season, L - late, and VL - very late

Hay quality: WSC - water soluble carbohydrate, ADF - acid detergent fibre, NDF - neutral detergent fibre

Hay quality scores: H - high, MH - medium high, M - medium, ML - medium low, and L - low

Stem diameters: F=fine, MF=medium fine, M=medium, MT= medium thick, T=thick

Hull lignin - the amount of lignin found in the hull of the grain: L - low, M - medium, and H - high