



NSW DEPARTMENT OF  
PRIMARY INDUSTRIES

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<http://www.dpi.nsw.gov.au/agriculture/field/winter-cereals/guides/winter-crop-variety-sowing-guide>

# Barley

Paddock selection and nitrogen management is often the key to producing malting quality.

## Sowing time

Sowing time determines the time a crop matures, and ideally flowering and grain fill should be in the cooler part of spring.

Sowing on time maximises the chances of achieving high yields and the malting grade. Sowing after mid-June usually limits yield potential and results in smaller grain and higher protein rendering the grain less likely to be accepted as malting.

## Nutrition

Soil fertility and fertiliser management with attention to nitrogen and phosphorus is essential to optimise yield.

Grain protein below about 10.5% in combination with low yields indicates nitrogen deficiency or soils with high aluminium levels. Where the level of protein is consistently less than 10%, at least 50 kg/ha of nitrogen can normally be used profitably at sowing and up to the 5-leaf stage to increase yields whilst maintaining malting quality. High fertility paddocks usually produce grain protein too high for malting grade. High rates of nitrogen can optimise feed grain yields.

## Sowing depth

Pay close attention to sowing depth, particularly where direct-drilling is practised. The ideal depth is 3–6 cm, but seed should always be sown into moist soil.

## Irrigation

Barley does not tolerate waterlogging, so good paddock drainage and management are essential for high grain yields.

## Seeding rates

Select sowing seed carefully for large size and high germination percentage. A germination test can be conducted if in doubt.

A suggested guide per hectare is:

- plains: 35–50 kg
- slopes: 45–60 kg
- tablelands and partial irrigation: 60–90 kg
- full irrigation: 60–110 kg
- grazing and grain: increase the above rates by 10–20 kg
- cover crops for pastures: 10–20 kg

The lower rates should be used when there is limited sub-soil moisture at sowing, and in the drier areas. High seeding rates tend to decrease grain size and increase screenings in barley.

## Acid soils

Yambla and Tulla are the only varieties tolerant of high soil aluminium (10–15%). Most varieties are very tolerant of high manganese levels.

## Variety choice

When selecting a variety consider:

- Crop use. For grazing and grain recovery, feed grain, or malt grain production?
- Grazing value. When is feed most important? Dual-purpose varieties are most suitable.
- Grain.
  - For retention on farm?
  - For sale as feed grain?
  - For sale as human food?
  - For sale as a malting grade – for the Pool or under contract? Use only malting varieties.
- Disease prevalence. Check variety response to common diseases in the area, see *Variety characteristics and reaction to diseases* table page 37.
- Herbicide Tolerance. Refer to NSW DPI book *Weed Control in Winter Crops*.

See variety details under *Varietal Characteristics* (page 32).

## Management to achieve malting barley

### Paddock selection

- nitrogen status appropriate for expected yield level
- soil pH not less than 5.0<sub>Ca</sub> or soil aluminium more than 5%
- avoid soils prone to waterlogging
- rotation: ideally sow after a root disease break crop
- avoid barley on barley. Barley may be sown after wheat if disease or seed contamination is not a problem.
- avoid varietal contamination

### Variety choice

- appropriate for the environment
- to suit the sowing time
- availability of segregation

### Sowing time

- too early increases the risk of frost damage
- late will increase protein and screenings

### Seeding rate

- too high may reduce grain size and increase lodging especially under irrigation
- too low will reduce yield potential

### Seed treatment

- use appropriate seed dressings to control smuts and foliar diseases

### Phosphorus

- too low will limit yield and increase protein

### Nitrogen

- too low will reduce yield and quality
- excessive nitrogen fertiliser can increase screenings and protein levels

### Timely weed control

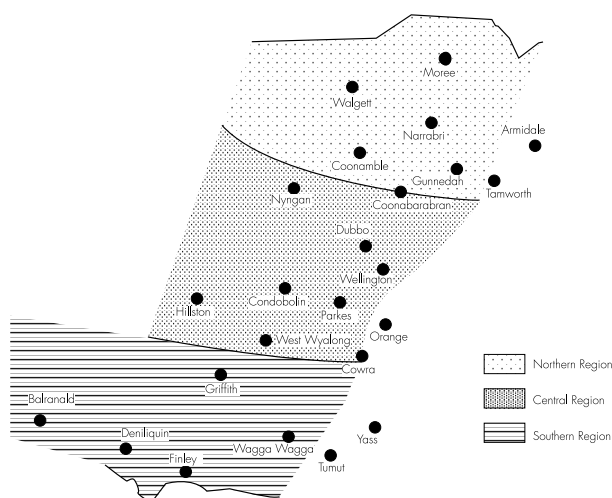
- weeds compete for nutrients and moisture
- reduce contamination

### Care with harvest

- avoid 'skinning'
- try to minimise weather damage
- avoid varietal contamination
- only use grain protectants registered for malting barley.

## Variety selection

Locate your farm on the map, and select an appropriate variety from the following tables after consulting the Varietal characteristics section.



## Varietal characteristics

Refer to tables for suggested sowing times.

**Baudin.** <sup>(D)</sup> Export malting variety only. Better grain size and lower screening levels than Gairdner. Quicker maturing than Gairdner. Short coleoptile – avoid deep sowing. Semi-dwarf with excellent straw strength. Very susceptible to powdery mildew and leaf rust. AWB Seeds.

**Binalong.** <sup>(D)</sup> Short compact feed variety. High yield potential, medium–slow maturity, good standability. Powdery mildew resistant. Partially resistant to common root rot. Susceptible to both the net and spot form of net blotch and leaf scald. ABB Seeds/PlantTech.

**Buloke.** <sup>(D)</sup> Excellent malting quality for the export brewing market, similar to Franklin and superior to Gairdner. Buloke is an early to mid-season maturing variety and has a similar flowering time to Schooner. Grain size is similar to Baudin, superior to Gairdner but inferior to Schooner. Moderately tall, similar to Gairdner. Buloke has a semi-erect growth habit and is more vigorous in early growth than Gairdner. Buloke is moderately resistant to the net form and moderately susceptible–susceptible to the spot form of net blotch, moderately resistant to powdery mildew, moderately susceptible to scald, moderately susceptible–susceptible to leaf rust, susceptible to CCN. Buloke is best adapted to the low-medium rainfall districts. AWB Seeds.

**Capstan.** <sup>(D)</sup> High yielding feed variety. Mid to late maturing. Resistant to CCN. Moderately resistant to powdery mildew, moderately resistant–moderately susceptible to the net form of net blotch. Moderately susceptible to leaf scald, the spot form of net blotch and susceptible to leaf rust. ABB Seeds.

**Cowabbie.** <sup>(D)</sup> Malting variety. Suitable for sowing in southern areas between early May and mid June. Better

grain size than Gairdner. Short with very good straw strength. Susceptible to the net form of net blotch, moderately susceptible to the spot form of net blotch. If planting seed is retained from crops infected with net blotch, seed treatment is recommended. Moderately resistant to leaf scald. If considering growing as a malting variety contact ABB Seeds/Plant Tech to confirm malting acceptance and segregation. ABB Seeds/PlantTech.

**Fitzroy.** <sup>(D)</sup> A high yielding medium to medium-late maturing malting variety with improved spot form of net blotch and leaf rust resistance over Gairdner. Fitzroy has domestic malt accreditation for NNSW. Fitzroy has good grain size especially in the north. Semi dwarf plant with good seedling vigour, of medium height and has good straw strength. Medium maturity, similar to Mackay. Fitzroy is best suited to the more favourable environments of northern NSW and Queensland barley growing areas. Consider seed treatment for powdery mildew. AWB Seeds.

**Flagship.** <sup>(D)</sup> Malting variety. Flagship has good malting qualities, particularly for the SE Asian markets. Flagship is tall, of early to mid-season maturity, and similar in plant type to Schooner. Flagship has excellent early vigour and therefore competes well against weeds, but has moderate straw strength with lodging resistance similar to Schooner. It is resistant to CCN and RLN (*P. neglectus*). ABB Seeds/PlantTech.

**Fleet.** <sup>(D)</sup> High yielding feed variety. A CCN resistant variety which should replace Barque and Mundah. Fleet combines the plant architecture and developmental pattern of Barque, the disease resistance and yield potential of Keel, and the adaptation to deep sandy soils of Mundah. Fleet exhibits an excellent disease resistance profile and good physical grain quality. ABB Seeds/Australian Field Crops Association (AFCA).

**Gairdner.** <sup>(D)</sup> Malting variety. High yielding for early and mid-season planting into favourable conditions. Susceptible to spot form of net blotch and powdery mildew. Consider seed treatments for powdery mildew. Resistant to BYDV. Gairdner is particularly sensitive to high screening values in dry finishes. PlantTech.

**Grimmett.** A reliable malting variety for the northern region. Suitable for mid-season and late plantings, particularly for western areas. Very good grain size. Susceptible to powdery mildew and net blotch. Consider seed treatment for net blotch and powdery mildew.

**Grout.** <sup>(D)</sup> A high yielding, quick maturing feed variety with good grain size, suited to the northern NSW and Queensland grain growing regions. Grout exhibits excellent grain size compared to Tallon, Grimmett, Binalong, Mackay and Gairdner and maintains this grain size advantage in both high and low yielding conditions. Grout will mature up to two weeks earlier than Grimmett and Gairdner from a mid May to mid June plant. Grout has a vigorous seedling with a high tillering ability and erect growth habit. Grout is semi-tall with moderate levels of standability, better than Grimmett and similar to Mackay. Grout has good levels of resistance to the major foliar diseases encountered in

the northern grain growing region, particularly powdery mildew and net form of net blotch. AWB Seeds.

**Hindmarsh.**<sup>(D)</sup> (Coded VB0324). A quick maturing, high yielding, semi-dwarf feed variety. Quicker maturing than Schooner. It has good grain size, and attractive grain with high test weight. Moderately susceptible to scald. Moderately resistant to the net form of net blotch. Susceptible to the spot form of net blotch. Moderately susceptible to powdery mildew. Resistant and tolerant to CCN. Hindmarsh is expected to enter malt quality accreditation in 2008, with potential for a provisional classification in early 2009 subject to commercial scale malting and brewing assessment. AWB Seeds.

**Mackay.**<sup>(D)</sup> Reliable, high yielding, medium maturity feed variety which can handle tough conditions. Strong straw, best suited to main and late planting times. Good levels of resistance to the net form of net blotch and powdery mildew. ABB Seeds/PlantTech.

**Quasar.**<sup>(D)</sup> Mid-season malting variety available only under contract with Barrett Burston Malting. Malting quality similar to Galaxy. Improved grain size and yield compared to Galaxy. Short with excellent straw strength. Heritage Seeds.

**Schooner.** Major central and southern malting variety. Good grain size. Can be prone to pre-harvest head loss. Very susceptible to powdery mildew and leaf rust.

**Sloop\_Vic.**<sup>(D)</sup> Malting variety with similar quality, yield and growth habit to Sloop. Slightly later flowering than Sloop. Has resistance to CCN and the net form of net blotch. Moderate tolerance to soil boron. Confirm marketing options for malt deliveries before planting. ABB Seeds/PlantTech/Australian Field Crops Association.

**Tantangara.** High yielding feed variety. Short, strong straw. Susceptible to barley grass stripe rust. ABB Seeds/PlantTech.

**Tilga.** High yielding feed variety under drier conditions. Tall with moderate straw strength in high-yielding

situations. Good grain size. Tilga has some light blue aleurone (skin) grain. Moderately resistant to net blotch, susceptible to powdery mildew. Susceptible to loose smut – use a seed dressing.

**Tulla.**<sup>(D)</sup> Acid soils-tolerant, high yielding, semi-dwarf, main-season feed variety. Similar yields to Tantangara on non-acid soils. Large grain size. Good straw strength. Susceptible to net blotch. Very susceptible to powdery mildew. Waratah Seeds.

**Urambie.**<sup>(D)</sup> Feed variety with adaptability to early sowing, having early maturity combined with a cold requirement for initiation of heading. Sowing window is early March (for grazing)–mid June. Yields slightly higher than the feed variety Tantangara and the malting variety Gairdner from early sowings. Resistance to leaf scald and net form of net blotch. A potential replacement for Tantangara for early sowings, but is unique in its adaptability to earlier sowings because of its winter habit. Waratah Seeds.

**Yambli.** Acid soils-tolerant, feed barley suited to earlier sowings. A semi-dwarf, taller than Tantangara. Higher grain yields than Yerong in grazed and ungrazed trials.

**Yarra.**<sup>(D)</sup> Moderately late maturing, semi-dwarf, feed quality variety with excellent straw strength. High yielding with plump grain size and excellent head retention. Best suited to medium to higher rainfall zones. Prostrate early growth habit and is relatively slow in early growth. Yarra flowers 5–7 days later than Schooner. Moderately resistant to leaf rust. CCN resistant. Moderately resistant–moderately susceptible to net form of net blotch. Moderately susceptible–susceptible to spot form of net blotch. Susceptible to leaf scald and powdery mildew. ABB Seeds.

## Northern Region – Varieties

Grazing and grain	Early to mid-season sowings	Mid-season sowings	Mid to late-season sowings
Urambie Yambla	Binalong Capstan Gairdner ♦ Tantangara	Baudin ♦ Buloke ♦ Binalong Capstan Fitzroy ♦ Flagship ♦ Fleet Gairdner ♦ Grimmett ♦ Grout Hindmarsh Mackay Tantangara Yarra	Baudin Buloke ♦ Fitzroy ♦ Flagship ♦ Fleet Grimmett ♦ Grout Hindmarsh Mackay Yarra

♦ May be accepted as malting. Special purpose: Acid soils – Yambla.

## Yield performance experiments from 2000–2007

The number of experiment results is in brackets. The more trials, the greater the reliability.

### Main-season sown

Compared with malting variety Gairdner = 100%

Compared with Binalong for feed = 100%

Variety	Gairdner = 3.41 t/ha	Binalong 3.63 t/ha
Baudin ♦	103 (19)	96 (19)
<b>Binalong</b>	106 (91)	<b>100 (91)</b>
Buloke ♦	106 (13)	100 (13)
Capstan	109 (18)	102 (18)
Fitzroy ♦	108 (50)	102 (50)
Flagship ♦	101 (14)	95 (14)
Fleet	112 (14)	106 (14)
<b>Gairdner ♦</b>	<b>100 (90)</b>	94 (90)
Grimmett ♦	97 (91)	91 (91)
Grout	107 (78)	100 (78)
Hindmarsh	115 (10)	108 (10)
Mackay	106 (91)	100 (91)
Schooner ♦	97 (87)	91 (87)
Tantangara	104 (91)	98 (91)
Yarra	111 (13)	104 (13)

For grazing consider Yambla and Urambie. For grazing and grain recovery consider Urambie. For malting production, consider Fitzroy, Gairdner and Grimmett. For feed grain production, consider Binalong, Capstan, Fleet, Grout, Hindmarsh and Mackay.

## Suggested sowing times

Aim to sow in the earlier part of the indicated optimum time to achieve the maximum potential yield, particularly in the western parts of the region. Selection of the actual date should allow for soil fertility and the risk of frost damage in particular paddocks.

Varieties are listed in preferred order of sowing within each sowing period.

Variety Weeks	March				April				May				June				July		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Yambla, Urambie		>	★	★	★	★	★	★	★	★		<							
Gairdner, Binalong, Capstan							>	★	★	★	★	<							
Tantangara, Baudin, Yarra								>	★	★	★	★	★	<					
Grimmett, Mackay, Fitzroy, Flagship, Fleet, Buloke, Hindmarsh									>	★	★	★	★	★	<				
Grout									>	>	★	★	★	★	★	★	<	<	

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable. Yambla can be sown from late March, if grazed.

AWB Seeds High performance northern region barley varieties advertisement
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## Central Region – Varieties

Grazing and grain	Early to mid-season sowings	Mid-season sowings	Mid to late-season sowings
Urambie Yambla	Baudin ♦ Binalong Capstan Cowabbbie Gairdner ♦ Tantangara Urambie	Baudin ♦ Binalong Buloke ♦ Capstan Cowabbbie Fitzroy ♦ Flagship ♦ Fleet Gairdner ♦ Grout Hindmarsh Mackay Schooner ♦ Tantangara Tilga Tulla	Buloke ♦ Fitzroy ♦ Flagship ♦ Fleet Grout Hindmarsh Mackay Schooner ♦ Tilga Tulla

♦ May be accepted as malting. Special purpose: Acid soils – Yambla, Tulla.

## Yield performance experiments from 2000–2007

The number of experiment results is in brackets. The more trials, the greater the reliability.

### Main-season sown

Compared with malting variety Gairdner = 100%

Compared with Tantangara for feed = 100%

Variety	Gairdner = 2.92 t/ha	Tantangara = 3.01 t/ha
Baudin ♦	103 (20)	100 (20)
Binalong	104 (64)	101 (64)
Buloke ♦	107 (28)	104 (28)
Capstan	106 (31)	103 (31)
Cowabbbie	104 (57)	101 (57)
Fitzroy ♦	106 (27)	103 (27)
Flagship ♦	103 (29)	100 (29)
Fleet	112 (11)	109 (11)
<b>Gairdner ♦</b>	<b>100 (66)</b>	97 (66)
Grout	106 (21)	103 (21)
Hindmarsh	115 (5)	112 (5)
Mackay	106 (55)	102 (55)
Schooner ♦	99 (62)	96 (62)
<b>Tantangara</b>	103 (66)	<b>100 (66)</b>
Tilga	107 (66)	--
Tulla	102 (59)	99 (59)
Urambie	101 (16)	--
Yarra	111 (11)	107 (11)

For grazing consider Yambla and Urambie.

For grazing and grain recovery consider Urambie.

For malting production, consider Baudin, Buloke, Fitzroy, Flagship, Gairdner and Schooner.

For feed grain production, consider Capstan, Hindmarsh, Tantangara, Urambie, Yarra. In western areas, consider Tilga.

## Suggested sowing times

Aim to sow in the earlier part of the optimum time indicated to achieve the maximum potential yield, particularly in the western parts of the region. Selection of the actual date should allow for soil fertility and the risk of frost damage in particular paddocks.

Varieties are listed in preferred order of sowing within each sowing period.

Variety Weeks	March				April				May				June				July		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Yambla, Urambie		>	★	★	★	★	★	★	★	★	★	<							
Gairdner, Binalong, Capstan							>	★	★	★	★	<							
Tantangara, Cowabbbie, Baudin								>	★	★	★	★	<	<					
Mackay, Fitzroy, Tulla, Tilga, Flagship, Fleet, Buloke, Schooner, Hindmarsh									>	★	★	★	★	★	★	★	<	<	<
Grout										>	★	★	★	★	★	★	★	<	<

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable. Yambla and Urambie can be sown from early/mid March if grazed.

## Southern Region – Varieties

Grazing and grain	Early to mid-season sowings	Mid-season sowings	Mid- to late-season sowings
Urambie Yambla	Baudin ♦ Capstan ‡ Cowabbie ♦ Gairdner ♦ Tantangara Urambie Yarra ‡	Baudin ♦ Buloke ♦ Capstan ‡ Cowabbie ♦ Fitzroy ♦ Flagship ♦ ‡ Fleet ‡ Gairdner ♦ Hindmarsh ‡ Quasar ♦ Schooner ♦ Sloop_Vic ♦ ‡ Tantangara Tilga Tulla Yarra ‡	Buloke ♦ Fitzroy ♦ Flagship ♦ ‡ Fleet ‡ Hindmarsh ‡ Quasar ♦ Schooner ♦ Sloop_Vic ♦ ‡ Tilga

♦ May be accepted as malting. ‡ CCN areas. Special purpose: Acid soils – Yambla, Tulla.

## Yield performance experiments from 2000–2007

The number of experiment results is in brackets. The more trials, the greater the reliability.

### Main-season sown

Compared with malting variety Gairdner = 100%

Compared with Tantangara for feed = 100%

Variety	Gairdner = 3.20 t/ha	Tantangara = 3.29 t/ha
Baudin ♦	102 (27)	100 (27)
Buloke ♦	106 (41)	103 (41)
Capstan ‡	106 (43)	103 (43)
Cowabbie ♦	101 (67)	98 (67)
Fitzroy ♦	105 (27)	102 (27)
Flagship ♦ ‡	98 (38)	95 (38)
Fleet ‡	109 (8)	106 (8)
<b>Gairdner ♦</b>	<b>100 (75)</b>	97 (75)
Hindmarsh ‡	112 (3)	109 (3)
Quasar ♦	100 (29)	98 (29)
Schooner ♦	96 (75)	93 (75)
Sloop_Vic ♦ ‡	97 (43)	94 (43)
<b>Tantangara</b>	103 (75)	<b>100 (75)</b>
Tilga	105 (83)	-- --
Tulla	100 (69)	97 (69)
Urambie	101 (18)	-- --
Yarra ‡	108 (18)	105 (18)

For grazing, consider Yambla and Urambie.

For grazing and grain recovery consider Urambie.

For malting production, consider Baudin, Buloke, Fitzroy, Gairdner and Schooner.

For feed grain production, consider Capstan, Hindmarsh, Tantangara, Urambie and Yarra. In western areas, consider Tilga.

## Suggested sowing times

Aim to sow in the earlier part of the optimum time indicated to achieve the maximum potential yield, particularly in the western parts of the region. Selection of the actual date should allow for soil fertility and the risk of frost damage in particular paddocks.

Varieties are listed in preferred order of sowing within each sowing period.

Variety Weeks	March				April				May				June				July		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Yambla, Urambie		>	★	★	★	★	★	★	★	★	★	<							
Capstan, Tantangara, Gairdner, Cowabbie, Baudin, Yarra							>	>	★	★	★	★	★	★	<	<			
Fitzroy, Tulla, Tilga									>	>	★	★	★	★	★	★	<	<	
Sloop_Vic, Quasar, Buloke, Schooner, Flagship, Fleet, Hindmarsh										>	★	★	★	★	★	★	★	<	<

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable. Yambla and Urambie can be sown from early/mid March if grazed.

## Diseases

Sound management is the key to minimising losses from disease. Avoid sowing barley into barley stubble and consider carefully barley into wheat stubble. Resistance to some leaf diseases is available in some varieties, and these are preferred if suitable for the purpose.

Paddock management and crop rotation are preferred controls for the root and crown rots. Seed dressings control smuts and delay the build-up of leaf scald and powdery mildew. Consider seed treatments that control powdery mildew on Fitzroy, Grimmatt and Gairdner, especially in northern areas. Sloop\_Vic, Capstan, Flagship, Fleet, Hindmarsh and Yarra have resistance to CCN that can be a problem in the lower Murray Valley.

### Leaf diseases

#### Rusts

Four rusts: stem rust, leaf rust, barley grass stripe rust and wheat stripe rust, can affect barley in NSW but usually are not a problem. However, Baudin is very susceptible to leaf rust. Baudin is being monitored carefully as it may build up leaf rust to threatening levels on other varieties since many widely grown varieties are rated as susceptible. Care should be taken to destroy any Baudin volunteers over summer to prevent build up of leaf rust.

Stem rust is not usually a problem on main-season sowings of barley. It develops at higher temperatures and can develop on very late crops.

Barley stripe rust is a major disease of barley in some overseas countries but is not present in Australia. However,

barley grass stripe rust and wheat stripe rust can develop to a small extent on some barley varieties, particularly if the diseases are severe on nearby barley grass or wheat. **Report any unusually severe infections of stripe rust on barley.**

#### Net blotch

There are two forms, the spot form and the net form. Both forms are spread from infected stubble and the net form also from seed. It can be difficult to distinguish the forms and mixed infections are possible.

The spot form produces small dark brown spots or blotches up to 10 mm long. Blotches are round to oval when small, becoming more straight-sided as they enlarge. Larger blotches are often surrounded by a yellow margin, particularly towards the leaf tip.

The net form also produces small round to oval dark brown spots at first, but these elongate into dark brown streaks along the leaf, often giving a netted appearance. Severely-affected leaves wither. It also infects grain.

Spot form of net blotch is widespread as most varieties are susceptible. The net form has been rare in southern regions because most of the major varieties are resistant, however it is a major disease in the north.

**Use of a seed treatment that will control the seed-borne net form of net blotch is advisable.** Planting seed retained from crops infected with the net form of net blotch should be treated with an appropriate dressing. See *Cereal seed dressings* section (page 94) for details.

## Variety characteristics and reaction to diseases

Variety	Straw strength	Reaction to disease											Issued by	Year registered
		Leaf scald	Net blotch		Powdery mildew	Leaf rust	BGR (Stripe) rust	Crown rot	Common root rot	CCN Resistance/Tolerance	RLN ( <i>P. thornei</i> ) Resistance/Tolerance	RLN ( <i>P. neglectus</i> ) Resistance		
			Net	Spot										
Baudin	medium	MS-S	MR-MS	MS-S	S-VS	VS	MR	-	MS-S	S/T	-	R-MR	Ag WA	2002
Binalong	good	S	VS	S	R	S	-	MS-S	MR	-	-/VT	-	NSW DPI/QDPI&F	2002
Buloke	medium	MR	MR	MS-S	MR	MS-S	R	-	-	S/T	-	-	DPI Victoria	2004
Capstan †	good	MS	MR-MS	MS	MR	S	MS	-	S-VS	R/T	-	MR	University of Adelaide	2002
Cowabie	very good	MR	S-VS	MS	S	S	MR	-	-	S	-	-	NSW DPI	2005
Fitzroy	good	MS	MR-MS	MS-S	S	R	R	-	-	S	-	-	DPI Victoria	2004
Flagship †	Medium	MS	MR-MS	MR-MS	MR	MS-S	MS	-	S	R/T	-	R	University of Adelaide	2006
Fleet	Medium	MR-MS	MR	MR-MS	MS-S	MS	MR	-	-	R/T	-	-	University of Adelaide	2006
Gairdner	medium-good	MR/S-VS	MR	S-VS	S	S	R	S	MS-S	S/T	MR/-	MR	Ag WA	1998
Galaxy	medium	MR-MS	S	S-VS	R	R-MR	R	-	-	-	-	-	Heritage Seeds	1994
Grimmett †	medium	S	S-VS	S	S	S	R	MS	MR	-	R/T	-	QDPI&F	1982
Grout	good	VS	R-MR	S	R	VS	-	MS	MS	-	-	-	QDPI&F	2005
Hindmarsh †	very good	MS	MR	S	MS	-	R	-	-	R/T	MR/-	-	DPI Victoria	2006
Mackay	medium-good	S-VS	MR-MS	S-VS	MR	MS	-	S	MR-MS	-	MR/VT	-	QDPI&F/NSW DPI	2002
Quasar	very good	MR-MS	MR-MS	S	R	R-MR	-	-	-	-	-	-	Heritage Seeds	2005
Schooner	medium	MS-S	MR	MS	VS	S-VS	R	MS-S	S	S/T	MR/-	MR-MS	University of Adelaide	1983
Sloop_Vic †	medium	S	MR	S	MR	MS-S	MR	-	-	R/T	R/-	MS	DPI Victoria	2002
Tantangara	very good	MR-MS	S	VS	VS	MS	S	S	MR-MS	S	-	-	NSW DPI	1995
Tilga	medium	MR	MR	MR	S	S	R	VS	VS	-	-	-	NSW DPI/DPI Victoria	1997
Tulla	good	MR	S	S	S-VS	S	-	-	-	-	-	-	NSW DPI	2003
Urambie *	very good	R	R	VS	MS	MS-S	R	-	-	-	-	-	NSW DPI	2005
Yambla *	good	MR-S	S	S	S	MS	-	-	-	-	-	-	NSW DPI	1998
Yarra †	very good	S-VS	MS	MS	S	R	R	-	S-VS	R/T	-	-	DPI Victoria	2005

‡ = Cereal cyst nematode areas, † = Northern areas only, \* = suitable for grazing and grain recovery.

- = Insufficient data, MR = Moderately Resistant; MS = Moderately Susceptible; R = Resistant; S = Susceptible; VS = Very Susceptible; Ag WA = Agriculture Western Australia; NSW DPI = NSW Department of Primary Industries; QDPI&F = Queensland Department of Primary Industries and Fisheries; DPI Victoria = Department of Primary Industries, Victoria

## Scald

This is the major leaf disease in the higher rainfall areas of central and southern NSW. It can reduce grain yield of susceptible varieties by more than 30%.

Fungicide seed treatment gives useful early control. One fungicide spray at late stem elongation gives economic responses in crops with high yield potential.

### PLS (Physiological leaf spotting)

Under some circumstances barley plants may develop various forms of leaf spots that are not caused by a pathogen. Spots may vary from tiny white flecks to dark-brown or black blotches. These can easily be mistaken for diseases. Some varieties are more prone to PLS than others and growers are advised to consult their district agronomist or adviser if uncertain of the causes of leaf spotting.

### Powdery mildew

Powdery mildew can occasionally be severe on seedlings and tillering barley in northern and central NSW and is favoured by high humidity but reduced by rain. Foliar fungicides are often applied but in many cases after powdery mildew has damaged the crop. Some seed treatments give effective and economic control of the seedling disease in areas where powdery mildew develops often. See *Cereal seed dressings* section (page 94) for details.

### Management of diseases with foliar fungicides

The use of foliar fungicides in disease management is increasing and can give impressive returns when managed correctly. Application of foliar fungicides should be an economic decision based on the following factors

- Accurate disease diagnosis
- Yield potential
- Potential loss (varietal susceptibility, growth stage, effect on yield and quality)
- Effective time of spraying
- Cost of fungicide and application
- Duration of control
- Amount of disease present
- Future epidemic development (weather) and
- Stock/harvest withholding periods.

With most diseases, application should aim to protect the flag-1 leaf. Losses to diseases in the vegetative stage are relatively small in comparison to infection of the adult plant. Consequently, in most cases, spraying at this stage is not worthwhile. In areas where powdery mildew often occurs severely on seedlings, an appropriate seed dressing gives better and more economic control than spraying.

Duration of control varies with fungicide and rate of application; therefore, early sprays may require repeat applications. There are relatively few chemicals registered for disease control in barley and growers are advised to check with their local supplier or district agronomist for details of available fungicides.

## Root and crown diseases

Barley is susceptible to the same root diseases as wheat. Field symptoms and yield losses are usually not as severe as for wheat because of barley's earlier maturity and generally later sowing time. As with wheat, control relies on effective rotations.

### Smuts

There is a nil tolerance for smuts for both malting and feed barley receivals. Grain appearance is damaged by smuts, making it less attractive for human and animal consumption. Control is readily achieved with seed dressings. Treat all seed for sowing each year.

Use of a seed dressing that will also control scald and powdery mildew is advisable.

Do not sow untreated seed from a crop with any head smut. See *Cereal seed dressings* section (page 94) for details.

### Black point

This darkening of the grain coat at the embryo (shoot) end can occur during wet periods from flowering to harvest. All varieties can be affected, depending on seasonal conditions. There are no known control measures.

Badly discoloured grain is unacceptable for malting, although affected seed is usually satisfactory for sowing. For further information on diseases, refer to listed publications.

## Marketing

Barley may be freely traded on both the domestic and export markets.

Take care not to over-thresh barley at harvest, which results in damage to the grain. Ideally, markets seek malting barley with 10.5% protein.

Feed barley is traded through major traders and private merchants, or direct to domestic end-users like stockfeed manufacturers, feedlots and other farmers. Prices tend to be lower around harvest time, and are usually higher during winter.

Barley is more difficult than most other cereals to store for more than three months, because of its susceptibility to grain insect attack.

### Malting varieties

To be able to market varietal pure malting barley demanded locally and internationally, only two-row varieties – subject to availability of segregation and meeting the quality standards listed will be accepted.

### Feed varieties

NSW Feed Barley No. 1: 2-row varieties with white aleurone layer only.

## Disease and crop injury guide – barley

Disease/Cause	Symptoms	Occurrence	Survival/Spread	Control
<b>Foliar Diseases</b>				
<b>Scald</b> <i>Rhynchosporium secalis</i>	'Scalded' patches with dark brown margins on leaf.	More common and severe in south, favoured by wet weather.	Rain-splashed spores from barley and grass residues and infected leaves.	Resistant varieties; seed and foliar fungicides; avoid sowing into barley and barley grass residues.
<b>Net blotch—net form</b> <i>Pyrenophora teres f. teres</i>	First, as small elliptical dark brown spots which elongate into fine, dark brown streaks on the leaf blades giving a netted appearance. Severely affected leaves wither. It also infects heads.	Favoured by wet weather and early sowing.	Air-borne spores from infected plants and stubble. Carried on seed.	Resistant varieties; rotation with other crops. Stubble removal. Clean seed. Treat seed. Appropriate foliar fungicides.
<b>Net blotch – spot form</b> <i>Pyrenophora teres f. maculata</i>	Small, dark brown, round to oval spots or blotches up to 10 mm long becoming more straight-sided as they enlarge. Larger blotches are often surrounded by a yellow margin, particularly towards the leaf tip.	Favoured by wet weather and early sowing.	Air-borne spores from infected plants and stubble.	Resistant varieties; rotation with other crops. Stubble removal. Foliar fungicides.
<b>Powdery mildew</b> <i>Blumeria graminis f.sp. hordei</i>	White to grey cottony fungal growth on leaf and leaf sheath.	More in north and south-west crops, more in winter and early spring.	Air-borne spores from infected trash and infected plants.	Resistant varieties; Seed and foliar fungicides.
<b>Leaf rust</b> <i>Puccinia hordei</i>	Very small pustules of orange-brown powdery spores on leaves and leaf sheaths.	Favoured by moist conditions and temperatures around 15°C.	Air-borne spores from living plants.	Resistant varieties; clean fallows; foliar fungicides to protect flag to flag-2 leaves. Monitor very susceptible varieties regularly.
<b>Stripe rust</b> <i>Puccinia striiformis</i>	Pustules and stripes of yellow powdery spores on leaves.	Barley stripe rust is not currently in Australia. Some varieties may develop small amounts of barley grass stripe rust and wheat stripe rust. Promoted by cool nights (10–15°C) with heavy dews.	Air-borne spores from living plants.	Rarely required. Varieties such as Skiff and Tantangara may show some infection. Resistant varieties, foliar fungicides.
<b>Stem rust</b> <i>Puccinia graminis</i> spp.	Elongate pustules of dark brown spores on stems, leaves and awns.	Favoured by warm (15–30°C) moist conditions. Only likely to be a problem in very late crops or where crops are in close proximity to other infected cereal crops.	Air-borne spores from living plants.	Clean fallows. Resistant other cereals (wheat, rye, triticale); avoid sowing very susceptible varieties; foliar fungicides.
<b>PLS</b> (Physiological leaf spotting)	Range from tiny white flecks to conspicuous dark brown to black spots and blotches on leaves.	Most prevalent under mild, moist growing conditions. Some genotypes are more susceptible. Grimmer often develops white flecking; Gairdner prone to brown blotching.	Not a pathogen. (Note that some brown flecking may be a resistant reaction to other diseases and in some areas a reaction to adverse soil mineral levels.)	Avoid susceptible varieties. Check cause to see whether any action is required.
<b>Sunblotch</b> (Physiological reaction to nutrient stress and sunlight)	Orange to dark brown spots more common on upper surface of leaf, leaf death.	Sporadic in occurrence. Conditions causing it yet to be defined.	Not a pathogen.	No control yet developed.
<b>Virus Diseases</b>				
<b>Barley yellow dwarf</b> <i>Barley yellow dwarf virus (BYDV)</i>	Yellowing, dwarfing of infected plants, reduced seed set.	Most common near perennial grass pastures and in early sown crops.	Transmitted by aphids from infected grasses and cereals.	Most varieties have some tolerance.
<b>Wheat streak mosaic</b> <i>Wheat streak mosaic virus (WSMV)</i>	Light green leaf streaks and blotches, stunting of plants, reduced seed set.	Not yet observed in barley. Has occurred in wheat in southern irrigation areas and early sown grazing wheat crops on the tablelands and slopes.	Transmitted by the wheat curl mite.	No control required.
<b>Root and Crown Rots</b>				
<b>Take-all</b> <i>Gaeumannomyces graminis</i> var. <i>tritici</i>	Blackening of roots and crown, stunting, 'white heads', pinched grain.	More common in south, favoured by wet winter and early spring, then dry. Less severe on barley than on wheat.	Soil-borne on grass and cereal residues.	Crop rotation to provide one year free of grass hosts.
<b>Crown rot</b> <i>Fusarium pseudograminearum</i>	Browning of roots and stem bases, stunting, 'white heads', pinched grain.	More common in north and western areas, favoured by cyclic wet/dry soil during season.	Soil-borne on grass and cereal residues.	Crop rotation. Grass weed control. Balance inputs to available soil water.

## Disease and crop injury guide – barley (continued)

Disease/Cause	Symptoms	Occurrence	Survival/Spread	Control
<b>Root and Crown Rots (continued)</b>				
<b>Common root rot</b> <i>Bipolaris sorokiniana</i>	The root between the crown and seed is always dark; roots and sometimes the stem base are brown; white heads, pinched grain.	Scattered through the crop.	Soil-borne on grass and cereal residues; as spores in the soil.	Crop rotation.
<b>Eyespot</b> <i>Tapesia yallundae</i>	Lodging, 'eyespot' with sharp bend in stem 3–5 cm above ground.	South and central west slopes, eastern Riverina. Less severe on barley than on wheat.	Rain-splashed spores from crop or grass residue during winter.	Crop rotation.
<b>Smuts</b>				
<b>Loose smut</b> <i>Ustilago tritici</i>	Black powdery heads on diseased plants, black lumps in harvested grain.	Statewide, presence may make grain unacceptable to maltsters.	Air-borne spores infect developing seeds at flowering.	Seed-applied fungicides.
<b>Covered smut</b> <i>Ustilago segetum</i> var. <i>hordei</i>	Ball of black powder replaces the seed.	Statewide, presence may make grain unacceptable to maltsters.	Spores on seed coat infect seedling before emergence.	Seed-applied fungicides, resistant varieties.

## Quality standards

Quality standards determined by the National Agricultural Commodities Marketing Association (NACMA) applying to individual loads.

Quality	Malting Barley No.1 Specifications	NSW Feed Barley No.1 Specifications
Grains	Must be two-row of approved variety, 95% varietal purity minimum, with a white aleurone layer of the current season and of sound, ripe, merchantable condition.	Must be two-row varieties with white aleurone layer.
Moisture	Not more than 12.5%. Regional variations may apply.	Not more than 12.5%.
Protein	Not more than 12% dry basis. Minimum 9.0% dry basis.	No limits.
Test weight	Not less than 65 kg/hL.	Not less than 62.5 kg/hL.
Retention (% by weight)	Above 2.5 mm Agtator screen. Min 70.0%	No limit.
Screenings (% by weight)	Below 2.2 mm Agtator screen. Max 7.0% (Franklin variety 8%)	Max 15%
Germinative Energy Min (%)	Not less than 95%.	N/A
Germinative Capacity Min (%)	Not less than 98%.	N/A
Falling Number Min (Seconds) or RVA min	300 130	No limit. No limit.
Sprouted Grains (count 100 grains)	Nil.	Free from root system.
Skinings	Not more than 15% by count.	No limit.
Split/Cleaved barley	1% by count.	No limit.
Black tip/pink or other grains discoloured by field fungi	Not more than 10% by count in total. Field fungi by count Max 5%.	No limit.

In addition to the above specifications, samples must meet Weed Seeds and other Foreign Seeds and Objectionable Matter standards.

**Grain insect treatment. WARNING:** Malting barley may only be treated with Alphos®, Celphide®, Dichlorvos 1140, Fenitrothion 1000, Fumitoxin®, Gastion®, Methoprene/IGR, Phostoxin® or Quickphos® for insect control. Grain treated with other insecticides may not be accepted. Refer to *Grain insects – options for control* section (page 91) for more details.

## Further reading

QDPI&F – *Barley Planting Guide*  
 NACMA – *Barley Receival Standards*  
 GRDC – *Wheat and Barley Leaf Symptoms: The Back Pocket Guide*

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# Oats

## Crop management

This widely adapted and reliable cereal is the major rotation crop used and is also the major winter grazing crop. Ease of establishment at comparatively low cost are benefits attracting producers.

Its adaptability to acid soils, use for hay and silage, for pasture renovation, and especially its suitability for broadleaf weed control by in-crop herbicides, and usefulness for grazing-out are unrivalled advantages. The ability to tolerate some cereal diseases such as take-all, crown rot and common root rot are rotation benefits.

## Sowing

Except for very high tableland areas, January and February sowings should be avoided. Hot conditions, soil temperatures consistently above 25°C, and rapidly drying soils can cause patchy establishment.

Optimum sowing times are shown for each variety in the respective zones. Sowing later than recommended times increases the risk of lower yields. In wet acid soil conditions, sow grain only varieties at the earliest recommended time.

Direct-drilling of early sown varieties is easier in paddocks cropped the previous year. New paddocks can be direct-drilled early with machinery that gives adequate penetration and minimum soil disturbance following chemical fallow. Early forage production from direct-drilled crops is less than from conventionally sown crops.

A sowing depth of 5 cm is ideal, but can be sown as deep as 7 cm if seeking soil moisture.

## Nutrition

Apply fertiliser at above the normally recommended rates to crops used for grazing and grain, as they have a longer productive period than grain only crops.

To achieve grain protein of 10% and above in high yielding varieties like Mitika and Possum, avoid sowing into low fertility paddocks.

## Seeding rates

Heavy seeding rates give rapid growth rates and high forage yields. Use high rates where dense weed populations are expected, when conditions are likely to be wet during winter, in low pH soils, and/or in paddocks with low soil fertility, or if the seed quality is substandard.

### Higher Tablelands/Tablelands/Slopes

- 80–120 kg/ha, grazing and grain
- 60–80 kg/ha, grain only

### Slopes/Plains

- 60–80 kg/ha, grazing and grain
- 40–60 kg/ha, grain only

### Early sown – grazing only

- 100–130 kg/ha

### Irrigation

- 100–150 kg/ha, grazing and grain
- 80–120 kg/ha, grain only

## Hay production

- 60–100 kg/ha dryland
- 80–140 kg/ha irrigated

## Grazing

The ideal stage to start grazing is when plants are well anchored and the canopy has closed. Continuous grazing may be better for fattening stock than rotational grazing. Maintain adequate plant material to give continuous and quick regrowth, e.g. a minimum of 1000–1500 kg/ha of dry matter.

For the best recovery after grazing, do not graze below 5 cm for prostrate varieties, and 10 cm for more erect types. The higher grazing height is particularly important with the erect growing varieties. Over-grazing greatly reduces the plant's ability to recover.

(See *Managing grazing cereals*, page 54).

## Grazing value

Financial returns from grazing can be based on:

- Changes in body weight throughout the grazing period. Weight gains of 1.2 kilograms per head per day for steers, and 200 grams per head per day for lambs are common.
- Stock value before and after grazing.
- Current agistment rates for stock.
- Hand feeding costs for the same period.

On the Tablelands and Slopes, grazing oats significantly reduces the grazing pressure on pastures and can often reduce the necessity for hand feeding during winter.

On the Slopes and Plains, grazing oats enables autumn spelling of lucerne pastures.

## Grain recovery

An accurate method for assessing the correct time for stock removal is to find where the immature head is in the stem (split it open and look above the highest node); if stock graze the immature head, yields are drastically reduced as plants have to re-tiller. August is traditionally the month when stock are removed from grazed crops to allow optimum grain recovery for harvest. In drier areas and on lower fertility paddocks, earlier stock removal should improve grain recovery. With later maturing varieties on the Tablelands, stock removal can be delayed with little overall reduction in grain recovery.

## Weeds

Previous season planning to prevent annual weeds, especially grass weeds from seeding by pasture cleaning, topping or early fallow, helps to reduce in-crop weeds and improves crop production.

Some post sowing pre-emergent herbicides are registered and early post-emergent herbicides will control annual ryegrass, but timing is critical. Broadleaf weeds can be effectively controlled with either early or late post-emergent herbicides, but again, timing is most important.

Higher seeding rates and narrow row spacings improve competition against weeds. Maintain crop canopy (bulk) to discourage weed recovery.

## Diseases

Barley yellow dwarf virus (BYDV) is transmitted by aphids. Early sown crops are more at risk. Sow tolerant varieties or be prepared to control aphids to prevent disease transmission. Rusts can be managed by selecting appropriate varieties for sowing and grazing management (see *Managing grazing cereals*, page 54).

## Insects

Earth mites and armyworm commonly affect crops. Earth mites can affect young crops, so monitor and control as necessary. They should be suppressed in the previous spring by applying an insect spray with the fallow weed control program.

Armyworms can severely attack the ripening crop and should be monitored. Chewing of leaf margins and/or oat spikelets on the ground are sure signs of armyworm presence. Always inspect the most dense areas of the crop.

## Producing quality grain

There are strong domestic and export markets with premium payments for oats with a high test weight (kg/hL) – see varietal tables. Producers aiming at milling markets should consider Mitika, Possum or Mortlock.

For high-quality feed oats for livestock consider low husk lignin varieties Mannus or Yiddah and avoid over-grazing crops or grazing too late into early spring. Crops maturing under hot, dry conditions result in low grain quality.

Choose paddocks with good soil moisture retention characteristics. Use moderate seeding rates and sow at the suggested time. Pay attention to weeds and provide adequate nutrition, but be careful not to apply excessive fertiliser rates (especially nitrogen) which can result in delayed maturity.

## Marketing

Before harvest, careful weed and insect control ensure the best quality product to market. In crops used for hay, ensure even curing after cutting.

Prevent grain contamination by weed seeds and insects. If the grain is to be stored for longer than three months, protect against insects. Store in the best possible facilities to ensure a quality product.

Grain size, plumpness, variety, husk lignin content, protein and hectolitre weight are the buyers' criteria for feed grain sales. To aid marketing, samples should be protein and energy tested with premiums sought. Varieties and samples vary considerably.

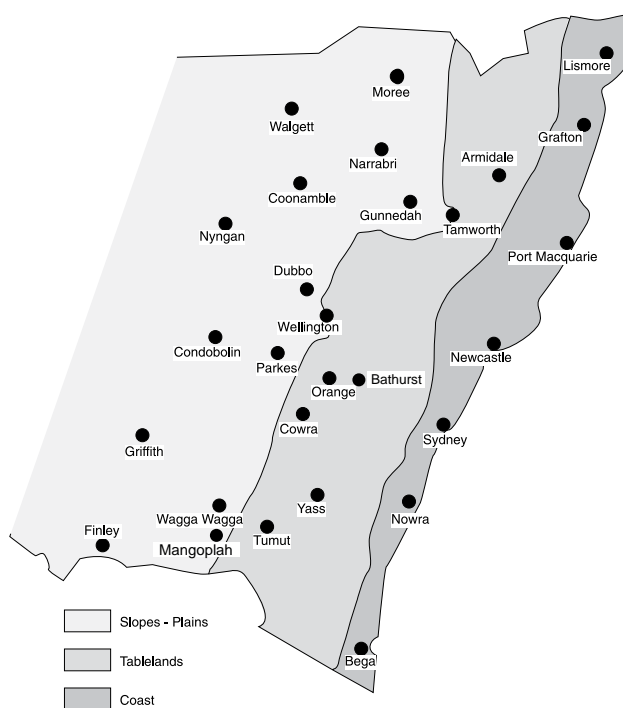
Collect a representative running sample at harvest by sampling each truckload as a marketing aid.

**Mitika, Possum and Mortlock are accepted milling varieties. Echidna may also be accepted.**

## Variety selection

When selecting a variety consider:

- **Region.** (see map).
- **Crop use.** For grazing only, or for dual-purpose grazing and grain, for hay, for silage, or for grain only?
- **Grazing value.** When is feed most important – in early or late winter?
- **Hay.** Freedom from leaf and stem diseases, freedom from lodging, and maturity to cutting time?
- **Grain.**
  - For retention on-farm or for sale?
  - For retention ... high yields, husk lignin content?
  - For sale ... market requirements? White or cream in colour, 'attractive'?
  - For feed... high test weight, protein and husk lignin content?
  - For milling? As specified by milling companies.
- **Herbicide Tolerance.** Refer to NSW DPI book *Weed Control in Winter Crops*.



Locate your farm on the map, and select an appropriate variety from the following tables after consulting the Varietal Characteristics section.

## Higher Tablelands – Varieties

Tablelands areas above 800 m.

Variety	Grazing		Straw strength after grazing	Grain maturity	Test weight (kg/hL)	Grain lignin content*	Diseases		Acid soils – sensitivity to aluminium
	Early dry matter production	Grazing recovery					Rusts †	BYDV	
Bass	medium	excellent	good	late	medium	low	S	T	Tol
Bimbil	medium	excellent	good	early–mid	high	low	S	MS	–
Blackbutt	slow	excellent	good	late	low–medium	medium <sup>‡</sup>	S	MT	Tol
Eurabbie	quick	excellent	very good	late	low–medium	low	S	VS	Tol
Mannus	medium	excellent	good	mid	high	low	MS	MS	–
Nile	quick	excellent	good	very late	medium	low	S	T	Tol

– = Insufficient data, Int = Intermediate, MR = Moderately Resistant, MS = Moderately Susceptible, MT = Moderately Tolerant, S = Susceptible, Sen = Sensitive, Tol = Tolerant.

† Field resistance to the rusts on crops differ depending on season, maturity and strains present.

\* Refer to *Feeding value of oats grain*, page 49. ‡ Lignin content of Blackbutt can be variable.

### Suggested sowing times

Varieties are listed in preferred order of sowing within each sowing period.

#### Dual-purpose – grazing and/or grain recovery

Variety Weeks	January		February				March				April				May		
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Blackbutt, Nile, Bass	>	★	★	★	★	★	★	★	★	★	<	<					
Eurabbie			>	>	★	★	★	★	★	★	★	★	★	★	<	<	
Mannus, Bimbil					>	>	★	★	★	★	★	★	★	★	<	<	

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable.

### Yield performance experiments from 2004 to 2007.

The number of experiments is shown in brackets. The more trials, the greater the reliability.

#### Dual-purpose

Compared with Eurabbie = 100%

Variety	1st Grazing DM Eurabbie = 2.25 t/ha	2nd Grazing DM Eurabbie = 2.90 t/ha	Grain Recovery Eurabbie = 2.90 t/ha
Bass	92	95	88
Bimbil	88	90	73
Blackbutt	88	92	83
<b>Eurabbie</b>	<b>100</b>	<b>100</b>	<b>100</b>
Mannus	84	85	83
Nile	94	95	94

Consider Nile, Bass and Blackbutt for very early sowing.

Eurabbie is outstanding for grain recovery after grazing.

Mannus is outstanding for grain quality.

## Tablelands/Slopes – Varieties

Variety	Grazing		Straw strength after grazing	Grain maturity	Test weight (kg/hL)	Grain lignin content*	Diseases		Acid soils – sensitivity to aluminium
	Early dry matter production	Grazing recovery					Rusts †	BYDV	
Bimbil	medium	excellent	good	early–mid	high	low	S	MS	–
Blackbutt	slow	excellent	good	late	low–medium	medium <sup>∅</sup>	S	MT	Tol
Cooba ▲	medium	excellent	fair	early–mid	high	low	S	MT	Int
Coolabah	quick	moderate	fair	early	medium	high	S	MT	Sen
Eurabbie	quick	excellent	very good	late	low–medium	low	S	VS	Tol
Mannus	med	excellent	good	mid	high	low	MS	MS	–
Mitika	quick	poor	very good	early–mid	high	low	R	S	–
Mortlock ▲	quick	poor	good	early	high	high	S	MT	Tol
Possum	quick	poor	very good	early–mid	high	high	S	MS	–
Yarran ▲	medium	moderate	good	early	high	low	S	VS	Int
Yiddah	slow	excellent	good	early	high	low	MR	MT	–

– = Insufficient data, Int = Intermediate, MR = Moderately Resistant, MS = Moderately Susceptible, MT = Moderately Tolerant, S = Susceptible, Sen = Sensitive, Tol = Tolerant.

† Field resistance to the rusts on crops differ depending on season, maturity and strains present. ▲ Outclassed, Yarran (BYDV), Echidna (grain quality), Cooba (grain yield), Mortlock (grain yield).

\* Refer to *Feeding value of oats grain*, page 49. ∅ Lignin content of Blackbutt can be variable.

### Suggested sowing times

Varieties are listed in preferred order of sowing within each sowing period.

#### Dual-purpose – grazing and/or grain recovery

Variety	Weeks	February		March				April				May			
		3	4	1	2	3	4	1	2	3	4	1	2	3	4
Blackbutt		>	★	★	★	★	<	<	<	<					
Eurabbie		>	★	★	★	★	★	★	<	<					
Cooba ▲			>	★	★	★	★	<	<	<	<				
Mannus, Bimbil, Yiddah					>	★	★	★	★	<	<				
Coolabah, Yarran ▲						>	★	★	★	<	<				

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable.

Warning: High soil temperatures (> 25°C) with early sowings may reduce germination and establishment.

#### Grain only

Variety	Weeks	May				June		
		1	2	3	4	1	2	3
Mitika, Possum, Mortlock ▲		>	★	★	★	<	<	<

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable.

### Yield performance experiments from 2004 to 2007.

The number of experiments is shown in brackets. The more trials, the greater the reliability.

#### Dual-purpose

Compared with Bimble = 100%

Variety	1st Grazing DM Bimble = 2.03 t/ha	2nd Grazing DM Bimble = 2.26 t/ha	Grain Recovery Bimble = 1.97 t/ha
Bimbil	100	100	100
Blackbutt	103	101	110
Cooba ▲	107	110	83
Coolabah	113	95	117
Eurabbie	115	110	133
Mannus	101	97	109
Yarran ▲	104	98	105
Yiddah	107	114	90

#### Grain only

Compared with Echidna = 100%

Variety	Echidna = 3.38 t/ha
Echidna ▲	100 (33)
Mitika	97 (16)
Mortlock ▲	80 (18)
Possum	98 (21)

Preferred milling varieties are Mitika, Mortlock and Possum.

Preferred variety for feeding grain to livestock is Mitika.

Consider Eurabbie or Blackbutt for the Tablelands, or areas with later maturity. Eurabbie is outstanding for grain recovery after grazing. Preferred varieties for feeding grain to livestock are Mannus, Yiddah and Yarran.

## Slopes/Plains – Varieties

Variety	Grazing		Straw strength after grazing	Grain maturity	Test weight (kg/hL)	Grain lignin content*	Diseases		Acid soils – sensitivity to aluminium
	Early dry matter production	Grazing recovery					Rusts †	BYDV	
Bimbil	medium	excellent	good	early–mid	high	low	S	MS	–
Cooba ▲	medium	excellent	fair	early–mid	high	low	S	MT	Int
Coolabah	quick	moderate	fair	early	medium	high	S	MT	Sen
Eurabbie	quick	excellent	very good	late	low–medium	low	S	VS	Tol
Mannus	medium	excellent	good	medium	high	low	MS	MS	–
Mitika	quick	poor	very good	early–mid	high	low	R	S	–
Mortlock ▲	quick	poor	good	early	high	high	S	MT	Tol
Possum	quick	poor	very good	early–mid	high	high	S	MS	–
Yarran ▲	medium	moderate	good	early	high	low	S	VS	Int
Yiddah	slow	excellent	good	early	high	low	MR	MT	–

– = Insufficient data, Int = Intermediate, MR = Moderately Resistant, MS = Moderately Susceptible, MT = Moderately Tolerant, S = Susceptible, Sen = Sensitive, Tol = Tolerant, VS = Very Susceptible.

† Field resistance to the rusts on crops differ depending on season, maturity and strains present. ▲ Outclassed, Yarran (BYDV), Echidna (grain quality), Cooba (grain yield), Mortlock (grain yield).

\* Refer to *Feeding value of oats grain*, page 49.

### Suggested sowing times

Varieties are listed in preferred order of sowing within each sowing period.

#### Dual-purpose – grazing and/or grain recovery

Variety Weeks	February	March				April				May		
	4	1	2	3	4	1	2	3	4	1	2	3
Eurabbie, Cooba ▲	>	★	★	★	★	★	<	<	<	<		
Mannus, Bimbil, Yiddah			>	★	★	★	★	★	★	<	<	<
Coolabah, Yarran ▲				>	★	★	★	★	★	<	<	<

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable.

Warning: High soil temperatures (> 25°C) with early sowings may reduce germination and establishment.

#### Grain only

Variety Weeks	May				June			
	1	2	3	4	1	2	3	4
Possum, Mitika	>	★	★	★	★	<	<	
Mortlock ▲, Yarran ▲	>	★	★	★	★	★	<	

> Earlier than ideal, but acceptable. ★ Optimum sowing time. < Later than ideal, but acceptable.

### Yield performance experiments from 2004 to 2007.

The number of experiments is shown in brackets. The more trials, the greater the reliability.

#### Dual-purpose

Compared with Bimble = 100%

Variety	1st Grazing Bimble = 1.96 t/ha	2nd Grazing Bimble = 2.28 t/ha	Grain Recovery Bimble = 1.59 t/ha
Bimbil	100	100	100
Cooba ▲	105	120	93
Coolabah	115	106	108
Eurabbie	115	119	122
Mannus	98	111	101
Yarran ▲	104	96	112
Yiddah	108	121	99

For the Slopes, consider Eurabbie, Mannus, Bimbil and Yiddah for grazing, and especially Eurabbie and Mannus for grain recovery. For the Plains consider Yarran, Yiddah and Coolabah for grazing and especially Yiddah for grain recovery.

Preferred varieties for feeding grain to livestock are Mannus, Yiddah and Yarran.

#### Grain only

Compared with Echidna = 100%

Variety	Echidna = 2.84 t/ha
Echidna ▲	100 (36)
Mitika	100 (16)
Mortlock ▲	84 (19)
Possum	100 (23)

Preferred milling varieties are Mitika, Possum and Mortlock.

Preferred variety for feeding grain to livestock is Mitika.

## Hay varieties

Variety	Grazing		Straw strength after grazing	Maturity	Diseases			Acid soils – sensitivity to aluminium
	Early dry matter production	Grazing recovery			Bacterial blight	Rusts †	BYDV	
Bass	medium	excellent	good	late	–	S	T	Tol
Bimbil	medium	excellent	good	early–mid	R	S	MS	–
Blackbutt	slow	excellent	good	late	R	S	MT	Tol
Cooba ▲	medium	excellent	fair	early–mid	R	S	MT	Int
Coolabah	quick	moderate	fair	early	R	S	MT	Sen
Nile	quick	excellent	good	very late	R	S	T	Tol
Yarran ▲	medium	moderate	fair	early	R	S	VS	Int
Yiddah	slow	excellent	good	early	–	MR	MT	–
<b>Specialist hay varieties</b>								
Brusher	medium	–	good	early–mid	MS	MS	MS	–
Kangaroo	–	–	–	–	MR	MR	MR	–
Wintaroo	medium	–	fair–good	mid	MS	S	MS–MR	–

– = Insufficient data, Int = Intermediate, MR = Moderately Resistant, MS = Moderately Susceptible, MT = Moderately Tolerant, S = Susceptible, Sen = Sensitive, Tol = Tolerant.

† Field resistance to the rusts on crops differ depending on season, maturity and strains present. ▲ Outclassed, Yarran (BYDV), Cooba (yield).

Select more than one variety, with at least one from the early maturing group and another from mid or late maturing group.

## Forage, silage or hay varieties

Variety	Growth habit	Speed to grazing	Maturity	Diseases	
				BYDV	Leaf rust
Barcoo	semi-prostrate	medium	mid	–	R *
Bass	semi-prostrate	medium	late	T	S
Blackbutt	prostrate	slow	late	MT	S
Culgoa II	semi-prostrate	slow	early mid	–	S
Enterprise	erect	medium	very late	–	S
Eurabbie	semi-prostrate	medium	late	S	S
Galileo	semi-erect	quick	late	MT	MR
Graza 50	erect	quick	late	–	S
Graza 68	semi-erect	medium	late	MT	S
Gwydir	semi-prostrate	medium	late	–	R *
Lordship	semi-erect	very quick	late	T	S
Mannus	prostrate	medium	late	MS	MS
Moola	semi-erect	medium	late	–	S
Nile	semi-prostrate	medium	very late	T	S
Nugene	semi-erect	quick	late	–	R *
Quamby	erect	medium	very late	–	S
Saia	erect	medium	early	T	S
Taipan	erect	quick	late	–	R *
Volta	semi-erect	medium	mid–late	I	R
Warrego	semi-prostrate	medium	mid–late	–	S

– = Insufficient data, I = Intolerant, MR = Moderately Resistant, MS = Moderately Susceptible, MT = Moderately Tolerant, S = Susceptible, Sen = Sensitive, Tol = Tolerant.

\* Virulent pathotypes have been detected for these cultivars, however, they are not common. Crops should therefore be inspected regularly for the presence of leaf rust.

### Forage only varieties

#### Suggested sowing times

Mid-February to early April for all varieties. As Saia has a much smaller seed than other varieties, use lower seeding rates, for instance, 60–80 kg/ha.

As many of these varieties are late/very late for grain maturity, they may not be suitable for grain production in many regions.

### Grazing management

Grazing management of more erect types needs to be different to the usual heavy grazing of dual-purpose grazing and grain varieties. Avoid heavy grazing to below 10 cm if plant recovery is expected. More upright varieties are best suited to grazing with cattle. **For coastal regions, consider varieties with best available rust resistance.**

## Varietal characteristics

Most varieties are suitable for grazing. Variety selection depends on the crop use, sowing date, likely diseases, and tolerance to acid soil, grain quality and possible market outlet.

**Growers are warned that there are now no commercial varieties with resistance to all the current field strains of stem rust.**

**Barcoo.**<sup>(D)</sup> Semi-prostrate type suitable for early-mid-season sowing, grazing and grain recovery. Released by Pacific Seeds in 1996.

**Bass.**<sup>(D)</sup> Suitable for early sowings on the higher Tablelands. It provides extended grazing with good grain recovery. Strong straw. It has good BYDV tolerance. Released by the Tasmanian Institute of Agricultural Research and the Department of Primary Industries, Water and the Environment in 1998.

**Bimbil.** Dual-purpose type suitable for early to mid-season sowing, grazing and grain recovery. It has a winter growth habit, but should be sown after Cooba. Early and total dry matter production are similar to Cooba. Grain yield and grain recovery after grazing are better than Cooba. Straw is shorter and stronger than Cooba but it may still lodge. Has high groat (grain with husk removed) percentage, higher than Cooba. Bred by NSW DPI at Temora; released in 1993.

**Blackbutt.** Popular on the higher Tablelands and Tablelands/Slopes, especially for early sowing. It provides extended grazing with excellent grain recovery. The straw is strong and of medium height. It has good resistance to frost damage after grazing. Late maturing. Tends to have small grain and a low test weight. Bred by NSW DPI at Glen Innes; released in 1975.

**Brusher.**<sup>(D)</sup> A tall mid-season hay variety. Resistant and moderately intolerant to CCN. Released by SARDI 2003. AEXCO.

**Cooba.** Suitable for early sowing, extended grazing and good grain recovery in most areas. Early growth is slow. It is mid-season maturing. It has medium straw height and strength, average grain size, low husk percentage, high test weight and high groat (grain with husk removed) percentage. Bred by NSW DPI at Glen Innes, selected at Temora; released in 1961.

**Coolabah.** Suitable for lenient grazing and good recovery for grain in most areas. Quick early growth. Early maturing. Straw of medium height and strength. Fairly long grain, satisfactory test weight, high husk percentage. Bred by NSW DPI at Temora; released in 1967.

**Culgoa II.** A semi-prostrate variety mainly for grazing. Slow initial growth. Released by QDPI&F in 1991.

**Enterprise.**<sup>(D)</sup> An erect grazing forage oat. It provides good early grazing. Poor recovery after hard grazing and/or frosting. After grazing, grain maturity is much later than Blackbutt. Released by Heritage Seeds in 1993.

**Eurabbie.** Winter habit, similar maturity to Blackbutt and later than Cooba by about 10 days. Semi-dwarf, taller than

Echidna when ungrazed. Can be very short after heavy late grazing, possibly resulting in harvesting difficulties. Grazing management is crucial for high grain recovery yields at sufficient height. Has shown remarkable grain recovery yields, despite its susceptibility to BYDV. Grain quality is generally inferior and very similar to Blackbutt in Tablelands/Slopes situations. Generally lower quality than Cooba from Slopes/Plains samples. Bred by NSW DPI at Temora; released in 1998.

**Galileo.**<sup>(D)</sup> A forage oat that has good emergence, vigour and early growth. Good dry matter production for early grazing. Late maturing, similar to Enterprise. Very good resistance to BYDV. Moderately resistant to leaf rust. Released in 2006 by Heritage Seeds.

**Graza 50.**<sup>(D)</sup> An erect, quick growing grazing variety developed by Agriculture Canada. Released by Pioneer Hi-Bred in 1994. Austgrains International.

**Graza 68.**<sup>(D)</sup> A semi-erect, medium growing grazing variety developed by Agriculture Canada. Released by Pioneer Hi-Bred in 1998. Austgrains International.

**Gwydir.**<sup>(D)</sup> Semi-prostrate grazing variety developed jointly by University of Queensland/QDPI&F/Pacific Seeds. Released by Pacific Seeds in 1999.

**Kangaroo.**<sup>(D)</sup> A tall, mid-late season hay variety. High husk lignin. Released by SARDI in 2005. AEXCO.

**Lordship.**<sup>(D)</sup> A long season, late maturing variety. Maturity similar to Enterprise and Graza 50. Excellent early vigour and forage production. Will grow tall if ungrazed but is moderately resistant to lodging. Good BYDV resistance. Released by Heritage Seeds in 2000.

**Mannus.**<sup>(D)</sup> (Coded MA5488) A tall, strong strawed, mid maturing variety for feed grain. Grain yield after grazing is similar to Eurabbie on the Tablelands/Slopes but lower on the Slopes/Plains. Physical grain quality is better than Eurabbie. Large uniform grain size with high test weight, high groat percentage. Medium protein and fat content. Low lignin husk. Moderately susceptible to BYDV, better than Eurabbie and Yarran. Bred by NSW DPI at Temora. Released by NSW DPI in 2006. Waratah Seeds.

**Mitika.**<sup>(D)</sup> A semi-dwarf early to mid-season milling oat. Improved stem rust, leaf rust and bacterial blight compared to Possum. Very susceptible and intolerant to CCN. A high feed value oat with low husk lignin and high grain digestibility. Released by SARDI in 2005. PlantTech.

**Moola.**<sup>(D)</sup> Grazing variety with rapid early growth developed by Agriculture Canada and released in 1998 by QDPI&F.

**Mortlock.** Medium height, strong strawed grain oat. Can be leniently grazed. It has a consistently high test weight, protein content and lower screening losses with light coloured grain, but discolours easily. If not grazed, it outyields Cooba and has better leaf rust resistance. Low yielding compared to Mitika and Possum. Released by Agriculture Western Australia in 1983.

**Nile.** A medium height, late maturing variety, producing good winter grazing in Tableland districts. Grain recovery yields depend heavily on good late-spring finishing

conditions. It has good BYDV tolerance. Released by Tasmanian Department of Agriculture in 1982.

**Nugene.**<sup>(D)</sup> A semi-erect grazing oat with quick early growth. Late maturing after grazing. Released by QDPI&F and Heritage Seeds in 2000. Heritage Seeds.

**Possum.**<sup>(D)</sup> A semi-dwarf, early to mid-season milling oat with better milling quality and fewer screenings than Echidna. Maturity and plant height similar to Echidna. Improved stem rust and septoria resistance compared to Echidna. Very susceptible and intolerant to CCN. Slightly higher yielding than Echidna. Released by SARDI in 2003. AWB Seeds.

**Quamby.** Very erect, similar to Enterprise. Very late maturing. If grazed when tall, does not recover well. Released by Tasmanian Department of Agriculture in 1988.

**Quoll.**<sup>(D)</sup> High yielding semi-dwarf grain oat. Resistant to oat leaf rust and some resistance to oat stem rust. Released by SARDI in 1999. PlantTech.

**Saia.** Grazing only type. Has a much smaller seed than most other varieties, so use lower seeding rates. Produces early feed and extended grazing. Recovery from grazing is sometimes poor. Tall, fine, weak straw. Highly tolerant to aluminium and manganese toxicity. Its blackish grain can be regarded as a contaminant if mixed with white grained varieties. Introduced from Brazil.

**Taipan.**<sup>(D)</sup> Erect plant with quick early growth and high dry matter yields. Ideally suited to cattle, particularly in a continuous grazing situation. Released by Pacific Seeds in 2001.

**Volta.**<sup>(D)</sup> A semi-erect leaf rust resistant grazing variety. Late maturing. Selected for Queensland and northern NSW. Released by Queensland Department of Primary Industries and Heritage Seeds in 2003. Heritage Seeds.

**Warrego.**<sup>(D)</sup> A semi-prostrate grazing oat with quick early growth. Developed by North Dakota State University and released by Pacific Seeds in 1999.

**Wintaroo.**<sup>(D)</sup> A tall, mid-season hay variety. Resistant and moderately tolerant to CCN. Low husk lignin. Released by SARDI in 2002. AEXCO.

**Yarran.** A medium height, early mid-season maturing variety for feed grain. It performs better than Coolabah for grain recovery, or grain only on the Slopes/Plains, but is slightly inferior to Coolabah for grazing production. In very dry years it outyields Echidna in grain only trials. Large grain with a high test weight, protein percentage and medium to low husk content. Very susceptible to BYDV. Bred by NSW DPI at Temora; released in 1988.

**Yiddah.**<sup>(D)</sup> A tall, strong strawed, early maturing variety for feed grain. It can be sown earlier than Yarran and has quicker early feed production. Grain yield after grazing is similar to Yarran. Physical grain quality is better than Yarran. Very large grain with high test weight and protein percentage and low husk content. Low lignin husk. Moderate tolerance to BYDV, effective stem and some leaf rust resistance. Bred by NSW Department of Primary Industries at Temora; released in 2001. Waratah Seeds.

## Diseases

Significant production losses can result from either stem or leaf rust. There are no remaining genetic resistances available to protect crops from stem rust. No variety has full resistance to stem rust and very few have field tolerance to leaf rust.

Producers wishing to minimise losses from rusts should avoid sowing later maturing varieties and applying late irrigations.

Waratah Seed Company oat advertisement

## Disease guide – oats

Disease/Cause	Symptoms	Occurrence	Spread	Control
<b>Foliar Diseases</b>				
<b>Bacterial stripe blight</b> <i>Pseudomonas striafaciens</i> pv. <i>striafaciens</i>	Water soaked stripes on leaves, drying to tan/red stripes, leaf death.	More severe in early maturing crops in wetter seasons.	Rain splash, insects, seed-borne.	Nil
<b>Leaf rust</b> <i>Puccinia coronata</i> f.sp. <i>avenae</i>	Orange powdery pustules on upper leaf surface.	In wet seasons; more important on the coast.	Air-borne spores from living plants.	Graze infected crops in autumn, resistant varieties. Foliar fungicides.
<b>Leaf spots</b> Several fungi	Leaf spots, leaf death.	Usually minor.	Depends on disease.	None.
<b>Stem rust</b> <i>Puccinia graminis</i> f.sp. <i>avenae</i>	Reddish-brown, powdery, oblong pustules with tattered edges on leaf and stem; progressive death of plant.	More important inland, from spring to summer in warm, wet weather.	Air-borne spores from living plants.	Early maturing varieties to avoid rust.
<b>Virus Disease</b>				
<b>Barley yellow dwarf</b> <i>Barley yellow dwarf virus</i> (BYDV)	Yellowing, dwarfing of infected plants, floret blasting, leaf reddening in some varieties.	Most common near perennial grass pastures and in early sown crops.	Transmitted by aphids from infected grasses and cereals.	Resistant and tolerant varieties; controlling aphids, seed treatments.
<b>Smuts</b>				
<b>Smuts</b> <i>Ustilago avenae</i> , <i>U. segetum</i> var. <i>hordei</i>	Replacement of florets by black sooty mass.	Statewide.	Spores on or in the seed infect the seedling after sowing.	Thorough treatment of seed with appropriate fungicide.

## Feeding value of oats grain

The GRDC-supported *Premium Grains for Livestock Production* project has demonstrated large differences between varieties in whole grain digestibility. Cattle feeding trials have subsequently demonstrated these differences translate into large differences in grain digestibility.

Most of the difference in whole grain digestibility is caused by varietal differences in the lignin content of the oat hull. Where varieties have a high hull lignin content, digestion of both the hull and the underlying grain is poor. Hull lignin content is assessed using a simple staining test (phloroglucinol stain test). A list of lignin ratings of a range of oat varieties is presented in the following table.

While other seasonal factors affect whole grain digestibility, varieties with high hull lignin rating will inherently have low whole grain digestibility. NIR tests have been developed to measure the feeding value of grains.

Feed quality tests can accurately measure whole grain digestibility, protein levels and metabolisable energy. For livestock feeding grain protein is an important attribute. Oats can vary widely in protein levels due to varietal factors, paddock variability, fertiliser inputs and yield levels. Oats with low protein levels (< 12%) may limit growth rates of young animals.

### Oaten hay

For information on quality and marketing of oaten hay, including exports contact the Australian Fodder Industry Association (AFIA) (see page 103 for details).

### Hull lignin rating of a range of oat varieties

– Low is better ruminant feed value

Low	Medium	High
Bass	Blackbutt (variable)	Carrolup
Bimbil		Coolabah
Carbeen		Echidna
Cooba		Graza 50
Eurabbie		Kangaroo
Graza 68		Mortlock
Mannus		Nugene
Mitika		Possum
Nile		
Wintaroo		
Yarran		
Yiddah		

### Further reading

Agfact P3.2.2, *Oats*

Agfact E3.8, *Grain storage-underground pits*

Agnote DPI-367 *Cereals for grazing*

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