

Barley planting and disease guide 2013

QLD and NNSW

Barley - advantages

Barley is a crop which fits well into the northern farming systems as a winter cereal crop. Advantages include:

- Less susceptible to frost than wheat.
- Quicker to maturity than wheat.
- Vigorous plant growth and high water use efficiency make barley an excellent choice for double cropping from a summer crop back to a winter rotation.
- Vigorous early growth means barley quickly establishes ground cover for both smothering weeds and producing early grazing.
- Produces more dry matter than wheat leaving very good stubble cover and valuable straw for livestock feeding.
- A good choice for silage, hay or early grazing. When grazed before stem elongation, barley can regrow to produce a good grain crop.
- The differences in foliar disease responses to wheat make barley a good break crop.
- Growers should soil test and record paddock rotations to determine adequate crop nutrition. A 4 tonne per hectare barley crop at 11.5 % protein uses about 144 units of nitrogen and some phosphorus.

Marketing

The malting, brewing and intensive livestock industries (beef, pork, poultry and dairy) are all major consumers of barley and demand often exceeds supply.

Both the feed and the malt industries require barley grain for energy which it provides in

the form of starch. The starch is utilised for weight gain by livestock and is converted to sugars, which are utilised for alcohol fermentation in the brewing process. Large plump bright coloured grain of good hectolitre weight is preferred for both end uses.

Price dockages are made for hectolitre weight and screenings as small seeds affect energy levels and the processing efficiency of the grain. These are also important specifications to both the malt industry and livestock feeders.

Commander, Gairdner, and Navigator will be the preferred varieties for the domestic malting industry in nNSW and Queensland in 2013. The new malthouses at Pinkenba and Sydney may result in more barley being purchased for malting in the northern region. Growers should note that malt accredited varieties may not have the best yield potential or disease resistance. All varieties are acceptable in the feed market.



Choice of variety

The growing conditions for barley in nNSW and QLD are quite different from those of

other barley growing regions of Australia. The crop is grown largely on moisture stored during the summer season. Sporadic in-crop rainfall causes high variability in crop yields and quality. In the southern and western Australia, rainfall during the season is generally more regular.

The northern cropping zone has a much shorter winter season and barley harvest may start as early as October in some areas. Selecting varieties with proven performance in the region is important. When considering a new variety, it is important to compare it with a variety which you have grown before. Factors to take into account for variety selection include:

- Suitability of the variety for the region
- Time of planting
- Available moisture at planting
- Disease risks
- Yield potential
- Standability and straw strength
- Soil nitrogen status i.e. lower starting N levels for malting barley
- Marketing options - malt vs. feed
- Rotation (past crops and future planting intentions)
- Availability of seed

Malting varieties

Gairdner (P)(M)

Gairdner has been the malt quality standard for the region for many years and is a good yielding variety in high yielding situations. It is susceptible to powdery mildew for which a systemic seed treatment is recommended. It is also susceptible to leaf rust and spot form of net blotch. Gairdner performs well on early planting or in irrigated situations, but it is not well suited to western environments because of late maturity. Gairdner is gradually being replaced by Commander as the malting variety preferred by the malting and brewing industry.

Commander (P)(M)

Commander is medium maturity variety that has had good yields across the region. It was the most popular malting barley in 2012. Commander is moderately resistant to leaf rust, and net and spot forms of net blotch, but susceptible to leaf rust. Caution should be taken when planting Commander into high yielding situations because it has weak straw and lodging can be an issue where yields exceed 3.5 t/ha. To avoid lodging plant into lower yielding sites, avoid planting early and do not push plant populations above 1.2 million plants per hectare. Marketed by Viterra.

Navigator (P)(M)

Navigator is a late semi-dwarf variety suited to the domestic malt market. It is recommended for medium to high rainfall areas. Compared to Gairdner, Navigator has better grain quality and higher yield potential. It is resistant to net and spot forms of net blotch, and has good resistance to lodging. Navigator is very susceptible to leaf rust. Marketed by Viterra.

Grimmett (M)

Grimmett has been a reliable malt variety for Queensland and northern NSW for many years, but has been superseded by other varieties for yield and disease resistance. It is medium late variety and is relatively tall and moderately susceptible to lodging. Grimmett is now less preferred by end users as newer varieties have improved malt quality.

Fitzroy (P)(M)

Fitzroy is a semi-dwarf, medium late maturity variety that is accredited for malting. It should be planted early in the season into good sub soil moisture or irrigated situations. Its yield potential is higher than that of Gairdner and grain size is also improved. Fitzroy has good levels of resistance to net form of net blotch, but it is susceptible to powdery mildew, leaf rust and spot form of net blotch. Systemic seed dressing is recommended to provide early control of powdery mildew. Fitzroy is not

recommended for western areas of the region. Marketed by Seedmark.

Feed varieties

Shepherd – (P)

Shepherd is a medium quick maturity variety which has very good yield potential. In comparison to Grout, it has improved grain size and hectolitre weight and better straw strength. Shepherd is resistance leaf rust and most net form of net blotch isolates, but it is susceptible to the spot form of net blotch and a new isolate of powdery mildew. It is a good choice when chasing high forage yield or extra yield potential from an early plant. Marketed by Seednet.

Hindmarsh (P) – Food

Hindmarsh is a semi-dwarf medium quick variety with good yield and plump grain even in tough environments. Deep sowing should be avoided. It produces short erect plants with moderate standability but post ripe straw strength can be an issue. Hindmarsh is classified as food grade which means it should be segregated for marketing. Hindmarsh is accepted into some export markets but it is not a premium malt variety. Marketed by Seednet.

Grout (P)

A quick maturing feed variety with large grain and excellent yield potential. Best areas for planting Grout are central QLD, western QLD and west of the Newell highway in NSW. Coastal and high rainfall environments should be avoided due to high leaf rust susceptibility. In the higher rainfall areas Grout is a good selection for short fallows, double cropping, late plantings or limited moisture situations. Grout has also produced good yields when sown early. Good levels of resistance to powdery mildew, net form of net blotch. Grout is **highly susceptible** to leaf rust and should be monitored from early tillering. Marketed by Seednet.

Oxford (P)

Oxford is a late maturity feed variety of European origin. It has yielded well in NVT trials under long season conditions and adequate rainfall. Not recommended for shorter seasons with the potential for hot or dry finish. Oxford is a short semi-dwarf with good lodging resistance. It is resistant to powdery mildew and leaf rust, but susceptible to net and spot forms of net blotch. Marketed by Seedmark.

Mackay (P)

Mackay has vigorous seedlings with good yield potential and good levels of disease resistance. It is medium maturity seems to handle tough finishes. Mackay is well suited to western and northern environments. Mackay is a taller plant with good straw strength. It was often used as forage barley until it was replaced by Shepherd. Mackay is a good option for growers concerned about leaf rust. Marketed by Seedmark.

Westminster (P)(M)

Westminster is a late maturing European variety accredited for malting in Australia. It is high yielding in high rainfall environments when planted early. Westminster is resistant to powdery and leaf rust, but is susceptible to other foliar diseases. It has good post-ripe head retention. It yielded well in GRDC agronomy trials in Southern Qld in 2010 and 2011. Licensed to GrainSearch Pty Ltd.

Henley (P)(M)

Henley is a late maturing European malting barley accredited for malting in Australia. It has good levels of resistance to powdery mildew and leaf rust, but is susceptible to some isolates of net form of net blotch. Henley's yields have been high when planted early in high rainfall environments. Henley is mid to late maturing from an early plant. Marketed by Seedmark.

Grange (P)(M)

Grange is a late maturing European malting barley accredited for malting in Australia. It has good levels of resistance to powdery mildew and leaf rust, but is susceptible to some isolates of net form of net blotch. Grange has very good straw strength and excellent resistance to lodging. It has performed well in GRDC National Variety Trials in Northern NSW. Marketed by Heritage Seeds.

SY Rattler (P)

SY Rattler is a high yielding mid maturity variety developed by Syngenta. It has resistance to powdery mildew, leaf rust and net form of net blotch. It flowers 6 days before Gairdner. SY Rattler is new to the Northern Region and is being trialled in NVT. Marketed by GrainSearch.

(M) Varieties accredited for malting.

(P) Variety protected by Plant Breeders Rights

Table 1: Northern Region barely variety yields 2009-2011

Variety	Mean Yield (Tonnes/hectare)
Shepherd	5.7
Oxford	5.3
Commander	5.2
Westminster	5.2
Henley	4.8
Hindmarsh	4.6
Grout	4.1
Mackay	4.0
Fitzroy	4.0
Gairdner	3.9
Grimmett	3.8

Table 2: National barley variety trial yield data summary up to 2012 (GRDC)

Variety	SEQ			QLD Total		
	Yield (Kg/Ha)	% of Gairdner yield	Number of trials	Yield (Kg/Ha)	% of Gairdner yield	Number of trials
Bass	3512	95	5	3389	98	15
Binalong	3836	104	2	3515	101	8
Capstan				3501	101	4
Commander	3981	108	6	3699	106	16
Dash				3553	102	4
Fathom	3915	106	4	3719	107	12
Fitzroy	3642	99	6	3494	101	16
Flagship	3675	100	2	3487	100	8
Fleet	4057	110	3	3718	107	12
Flinders	3725	101	4	3484	100	12
Gairdner	3672	100	6	3465	100	20
Grimmett	3453	94	6	3288	95	20
Grout	3617	98	6	3467	100	20
Hannan	3731	101	1	3512	101	7
Henley	3939	107	6	3643	105	13
Hindmarsh	3713	101	5	3539	102	19
Kaputar				3452	99	6
Lockyer	3946	107	2	3697	106	4
Mackay	3885	106	6	3607	104	20
Macquarie	3887	106	3	3681	106	3
Navigator	3423	93	3	3348	96	10
Oxford	4140	112	6	3790	109	16
Roe	3483	95	2	3413	98	8
Scope	3595	98	6	3395	98	12
Shepherd	3917	106	6	3627	104	20
Skiff	3820	104	2	3596	103	8
Skipper	3771	102	6	3586	103	16
Tallon				3350	96	4
Urambie	3826	104	2	3746	108	4
Vlamingh	3642	99	2	3426	99	8
Westminster	3860	105	4	3653	105	4
Wimmera	3806	103	4	3538	102	12

Maximising returns

The major determination of barley profitability is yield. To maximise yield it is important to ensure that the crop has every chance to succeed.

- Select a suitable variety for your planting time and area, taking into consideration yield potential and disease risks. Leaf rust, net blotches and powdery mildew are the more important diseases for which selection of resistant varieties can improve performance and reliability.
- Treat seed with appropriate fungicidal dressing as smuts and net blotch (net form) may be seed borne.
- Plant into good soil moisture and aim for plant populations of 100 plants/m² (1,000,000 plants/ha) or higher. To achieve this, seeding rates of 40 – 60 kg/ha are needed. It will depend on number of seeds per kg and estimated establishment rate. For example for a seed count of 25,000 seeds per kg you need 40 kg to plant 1 million seeds. Taking into consideration an establishment rate of 80% would require 50 kg to be planted.
- Seed dressings with systemic insecticides such as imidacloprid have also been shown to have a net benefit for aphid control and yield improvement.
- Plant populations of below 800,000 plants/ha are likely to have reduced yield potential and provide less weed competition.
- Use adequate nitrogen fertiliser but do not over fertilise as this will encourage excessive vegetative growth and could result in lodging. Phosphorus, zinc and sulphur levels are important as well as nitrogen. A starter fertilizer is recommended.
- Growers should record paddock rotations or soil test to have adequate nutrition. Growing a 4 tonne per hectare barley crop at 11.5 % protein needs 144 units of nitrogen, and adequate phosphorus. In

2011 low protein grain was common so soil fertiliser levels need to be checked.

- Inspect crop regularly for insect infestations and foliar diseases and consult your agronomist about potential control methods.

Determining planting time

Optimum planting times are a balance between frost risks at heading and lower yields caused by a hot, dry finish. Bbarley can tolerate a 1°C lower frost than wheat, but a frost of -4°C at head height during flowering can cause yield losses of 5-30%. A frost of -6°C or lower at head height can cause much higher yield losses.

- Early planting of barley generally increases yield potential.
- Later planting and later flowering generally results in declining yield potential due to higher temperatures after heading.
- Planting too early can result in the crop running quickly to head if conditions are warm during late autumn and early winter.
- Periods of hot dry temperatures during spring can reduce grain fill period and affect yield and grain size, particularly if night temperatures don't fall below 15°C.
- A strongly negative SOI (Southern Oscillation Index) is considered an indicator of late frosts.

Table 3: Barley delivery quality specifications (this is a guide only please check specifications before delivery as they may change)

	Feed	Malt
Barley variety	Any variety	Commander, Gairdner, Navigator
Grain test weight (min)	62.5kg/hl	65 kg/hl
Moisture (max)	12.5%	12.5%
Grain protein (@ 0% moisture).	N/A	9% - 12%.
Retention by weight above the 2.5 mm screen (% min)	N/A	70%
Screenings (% by weight below 2.2 mm) max	30%	7%
Falling number min (seconds)	N/A	300

Marketing malting barley

The northern region market is largely a domestic market, supplying malt for breweries in Brisbane, Yatala and Sydney. However in times of excess supply, malt is exported from the northern region to Asian markets. Some of the quality traits required by international markets are different from those required by domestic brewers and therefore not all varieties may be acceptable in international markets. The following table is an indication of buyer preferences.

With a new malt house operating at Pinkenba wharves near Brisbane, malt quality barley from Qld and North NSW will be actively sought as this barley is harvested earlier than Southern barley crops.

Table 4: Customer preferences for malting barley varieties in northern NSW and Queensland

Variety	Domestic maltsters		Export
	QLD	NSW	
Gairdner	✓✓	✓✓	✓✓
Commander	✓✓	✓✓	✓✓
Fitzroy	✓	✓	X
Grimmett	✓	✓	X
Navigator	X	✓	X
Hindmarsh	X	X	✓

✓✓ = Well accepted into market

✓ = Limited acceptance

X = Not accepted or not yet classified in the market

Check with your local Graincorp depot before delivering malt as not all depots have segregation for each malting barley variety.

Tips for producing malt:

- Plant as early as possible.
- Plant into good moisture conditions.
- Aim for a plant population of 100 – 120 plants/m².
- Use good quality treated planting seed.
- Soil test and fertilise to achieve protein of 10 – 11% (dry basis). Malting barley only requires approximately 40% of the nitrogen needed to grow prime hard wheat.
- Delay application of N and based rates on individual paddock yield potentials.
- Good levels of P are also important.
- Harvest as soon as possible.

After sowing there are 4 major environmental risks in producing malting quality:

1. Moisture stress pre-heading (i.e. August to September) – which can reduce yield.
2. Late spring frosts.
3. Moisture and/or heat stress post flowering will reduce yield, decrease grain size and increase protein.
4. Harvest rains and high humidity after ripening reduce quality and may cause pre-harvest sprouting.

Diseases of barley

Diseases occur when a susceptible host is exposed to a virulent pathogen under favourable environmental conditions. Control is best achieved by knowing the pathogens involved and manipulation of the interacting factors. Little can be done to modify the environment but growers can minimise the risk of diseases by sowing resistant varieties and adopting management practices to reduce inoculum.

Resistant varieties provide the easiest and most effective option; yet varieties possess adequate resistance to some major diseases. Alternative strategies are required to reduce risk. Rotate barley crops with non-hosts such as wheat (foliar pathogens), legumes or summer crops; avoid sowing barley on barley and maintain clean fallows. Sowing out of season favours disease development and can build up inoculum early in the season.

Leaf diseases

The main foliar diseases of barley are leaf spots, rusts and powdery mildew. Leaf spots and powdery mildew over-season on crop residues while rusts (and to a lesser extent powdery mildew) require living plants to carry them from one season to the next.

Growers should assess the disease risk of individual paddocks before sowing. Consider the recent history of a paddock, the incidence of diseases in recent barley crops and the amount of infected stubble in the target and neighbouring paddocks. Infective stubble can usually be recognised by the presence of small black “pimples” on the straw.

Powdery mildew

Powdery mildew (*Blumeria graminis hordei*) is often present in susceptible varieties, but generally causes only relatively small yield loss (usually less than 10%). Some seed treatments can give good early season control of powdery mildew but these may also

shorten coleoptile length and cause emergence problems. Resistant varieties are the best means of control. Some varieties may appear susceptible at the seedling stage but develop adult plant resistance. When this occurs lower leaves may take on a blotchy appearance after jointing. This can be confused with other blotches. When powdery mildew is responsible, fine mycelia are usually evident on the older leaves.

Leaf rust and stem rust

Leaf rust (*Puccinia hordei*) and stem rust (*Puccinia graminis tritici, secalis* and *tritici x secalis*) are traditionally the major air-borne diseases of barley in Queensland. They are more likely to occur in wetter years or in higher rainfall areas. Both can cause significant yield loss and quality downgrading. Grain yield can be reduced by over 50% by stem rust and in excess of 30% by leaf rust. As stem rust may infect barley and wheat, an epidemic could put both crops at risk. Planting disease resistant varieties and avoidance of very early or very late plantings are the best protection against rusts. Major epidemics of stem rust are unlikely in barley as long as resistance levels of all winter cereals (especially wheat) remain high. In emergencies, timely application of fungicides can be effective against leaf rust and stem rust.

Net blotch

Net blotch (*Pyrenophora teres*) has become the most significant disease of barley in the region and is likely to be a problem in wetter years and in stubble-retained situations. The pathogen may also be seed-borne. It occurs in two forms – net form of net blotch (*P. teres* f. *teres*) and spot form of net blotch (*P. teres* f. *maculata*). The net form produces brown to black stripes on leaves and leaf sheaths of older plants and gives a characteristic netting pattern in juvenile leaves. The spot form of net blotch produces dark brown, round to elliptical spots on leaves and leaf sheaths that are often surrounded by yellowing. High levels of either disease will kill leaves prematurely and may cause yield losses in

excess of 30%. Growers are advised to avoid planting barley on barley because stubble borne spores are the main source of infection for the new crop. The net form of net blotch may be seed borne, and grain from heavily diseased crops should not be retained for planting.

Spot blotch

Spot blotch (*Cochliobolus sativus*) is favoured by warm wet conditions and is promoted by stubble retention. It can be seed borne. Leaf symptoms are almost identical to the spot form of net blotch, but spot blotch may also cause discolouration of grain. This disease is more likely to be a problem in sub-coastal areas where temperatures are warmer and relative humidity is higher. All commercial varieties are susceptible.

Barley grass stripe rust

Barley grass stripe rust (*Puccinia striiformis*) can attack at least one barley variety grown in Queensland. It is unlikely to be a production problem in the northern region in the near future.

Head and root diseases

Head blight

Head blight in barley may be caused by several species of the fungus: *Fusarium* species or *Botryosphaeria zeae*. Damage can range from death of single florets to loss of the whole head. The fungi responsible are stubble borne and infection is favoured by extended wet conditions at and shortly after head emergence. Conspicuous levels of head blight result in the presence of white grains in the harvested grain. This can lead to substantial downgrading of grain quality and price. High levels of blighted grains are rare in barley but when *Fusarium* is responsible toxins may be produced.

Covered smut

Covered smut (*Ustilago hordei*) is seed and soil borne and has a life cycle similar to

stinking bunt of wheat. Grain contaminated with covered smut is not accepted by end users and is heavily discounted. Smuts can be easily controlled with seed dressings; a smuticide should be applied to barley seed retained for sowing.

Crown rot

Crown rot (*Fusarium pseudograminearum*) is common in winter cereals in the northern region. It is soil and stubble borne and can be carried over from one season to the next on barley and/or wheat stubble. A barley variety with the same crown rot rating as a wheat variety will not suffer the same level of yield loss. However yield losses as high as 28% have been recorded. Rotation with chickpeas or summer crops is currently the best method of controlling crown rot as there are no varieties which possess adequate field resistance.

Common root rot

Common root rot (*Cochliobolus sativus*) is also soil borne root and crown disease. It is widespread in barley crops of the northern region and may cause yield losses of up to 15%. As there are no varieties resistant to this disease, rotation with summer crops or winter legumes is the best method of control.

Recommended planting times for varieties

		Planting Time Weeks															
		April				May				June				July			
		2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Western Downs																	
Miles	Fitzroy, Gairdner, Oxford		A	A	B	B	B	C	C	C	C	D					
	Commander, Grimmett, Mackay			A	A	B	B	B	C	C	C	C	D				
	Grout, Shepherd				A	A	B	B	C	C	C	C	C	C	D		
Dawson Callide																	
Biloela	Commander, Grimmett, Mackay		A	A	B	B	C	C	C	C	D						
	Grout, Hindmarsh, Shepherd			A	B	C	C	C	C	C	C	D					
Central Highlands																	
Emerald #	Commander, Grimmett, Mackay		A	A	B	B	C	C	C	C	D						
	Grout, Hindmarsh, Shepherd			A	A	B	C	C	C	C	C	D					

A = earliest recommended planting time and a high risk (20-50% chance) of a -4°C and up to 30% chance of a -5°C frost.

B = medium risk (10-20% chance) of -4°C frost.

C = low risk (less than 10%) of a -4°C frost.

D = latest recommended planting date.

Planting too early on the Central Highlands may result in the crop running quickly to head.

Barley variety comparisons for 2013

	Commander	Fitzroy	Gairdner	Grange	Grimmett	Grout	Henley	Hindmarsh	Mackay	Navigator	Oxford	Shepherd	Westminster
Height	Medium - tall	Short	Medium - tall	Medium-tall	Medium - tall	Medium - tall	Short - medium	Short	Medium - tall	Short	Medium	Medium - tall	Medium
Standability	Medium - poor	Good	Medium	Good	Medium - poor	Medium	Good	Medium	Medium	Good	Good	Medium - good	Good
Post-ripe straw strength	Medium - poor	Medium - poor	Good	Good	Very good	Medium	Good	Medium - poor	Medium	Medium	Medium	Good	Medium
Maturity (Days to flower)	Medium	Medium - late	Late	Late	Medium - late	Early	Medium - late	Early - medium	Medium	Late	Late	Early - medium	Late
Net blotch (net form)	MS/S*	MR	MR	MRMS/S	S-VS	MR/S	SVS/MR	MRMS	MRMS/S	MRMS/S	MS	MR/S	SVS/MR
Net blotch (spot form)	MSS	S	S-VS	S	S	S	S	VS	S-VS	MRMS	S	S-VS	S-VS
Leaf rust	S	S	S	MRR	S	VS	MR	S	MRMS	S	MR	MR	R
Stem rust	S	S	S	S	S	S	S	S	MS-S	S	S	S	S
Spot blotch	S	S	S-VS	VS	S-VS	S	S-VS	S-VS	MS-S	VS	VS	S	VS
Powdery mildew	MRMS	S	S	R	S	R/MS	R	MR	MR	R/MS	R	R/MS	R
Crown rot	MSS	MS-S	S		MS	MS		MRMS	S			MR-MS	

Foliar diseases - Management options

R - MR =: Very little to no disease found. Fungicide application not warranted.

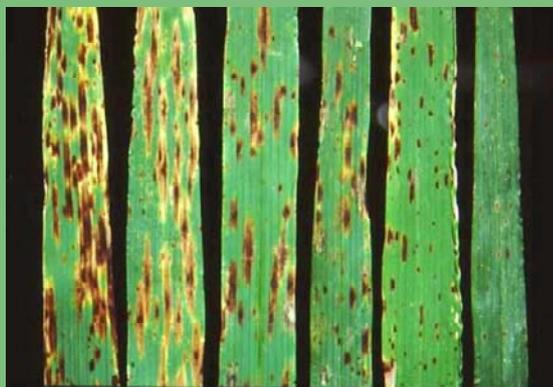
MR-MS Monitor crops for disease development. Under high inoculum pressure fungicide application can be economic. Late occurrence of the disease may not require any action.

S-VS Fungicide application will be required to reduce yield loss in favourable seasons.

*Ratings separated by "/" indicate response to different strains in the disease population. First value indicates response to the most common strains.

(Foliar diseases have a wide range of pathotypes. Disease resistance ratings are based on current knowledge of pathogen populations in the northern region).

Barley disease images



Spot form of Net blotch



Net form of Net blotch



Black pseudothecia of Net blotch on stubble



Covered smut



Crown rot



Leaf rust



Powdery mildew

Further information

Contact DAFFQ, Phone: 13 25 23 (cost of a local call within Queensland) or 07 3404 6999.

Contact John Sturgess at 07 4660 3614 or 0427 468 531.

DAFFQ Website www.daff.qld.gov.au under agriculture. This web site contains the best and most up-to-date information about growing grain in Australia's northern grain zone. You can bookmark it.

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