

Barley – planting and disease guide 2011

Queensland and NNSW

Barley - advantages

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

- Less susceptible to frost at flowering so can be planted earlier than wheat.
- Quicker in maturity so can be planted later than wheat.
- Vigorous plants and a high water use efficiency so makes barley an excellent choice for double cropping.
- Vigorous early growth means barley quickly establishes ground cover and is beneficial for both smothering weeds and producing early grazing feed in mixed farming operations.
- Produces more dry matter than wheat leaving very good stubble cover or valuable straw for fodder.
- A good choice for silage, hay or early grazing. If grazed before stem elongation, barley can regrow to produce a good grain crop provided there is sufficient moisture.
- Resistance to different foliar diseases from wheat so makes a good break crop.

Table 1: Variety comparisons (Pork CRC trials 2009, 8 trials planted across the region including Tullooona, Weemelah, Lundavra, Pittsworth, Dulacca, Burnett and Springsure). (HLW = Hecto Litre Weight) (Subscribe to Direct [see further information] to receive trial data updates)

	Yield t/ha	Protein (%)	HLW Kg/ha	Screenings < 2.2 mm	Retention >2.5 mm
Hindmarsh	3.63	14.3	67.7	10.8	50.1
Grout	3.46	13.2	66.0	11.2	51.2
Commander	3.41	14.3	64.8	15.9	49.9
Shepherd	3.31	14.4	66.5	9.1	55.0
Fitzroy	3.22	13.8	61.0	21.7	34.7
Fleet	3.05	14.2	62.6	7.6	66.2
Skiff	3.03	15.4	64.5	33.9	24.0
Gairdner	2.74	15.2	66.4	22.7	28.0



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 livestock and the malt industries require barley grain for energy, which it provides in the form of starch. The starch is utilised for live weight gain by the intensive livestock industry, and in the malt industry it 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 high screenings and low hectolitre weight as small light grain reduces energy content and the processing efficiency.

The malting and brewing industries base barley specifications on varietal traits. Gairdner, Fitzroy, Commander and Grimmatt are the preferred varieties for the domestic malting in NNSW and Queensland. Growers should note that malt accredited varieties may not have the best yield potential or disease resistance, but during 2011 malt premiums may be offered due to new malthouses at Pinkenba and Sydney. All varieties are acceptable to the feed market.

Choice of variety

Growing conditions in NSW and QLD are quite different from other barley growing regions of Australia. The crop is grown on moisture stored during the summer season with sporadic in-crop rainfall. In the southern part of the region, rainfall during the season is generally more regular.

The northern cropping zone also has a much shorter winter and harvest may start as early as October in some areas. Selecting a variety with proven performance in the region is important. If trying a new variety, it is important to compare it with a variety you have grown before. Factors to take into consideration 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. not high starting N levels for malting barley
- Marketing options - malt vs. feed
- Rotation (past crops and future planting intentions)
- Availability of seed

Malting varieties

***Fitzroy* ♂ (M)**

Fitzroy is a medium slow maturity variety with malting accreditation. It should be planted into good sub soil moisture or irrigated situations. The best planting time is early in the season. It has higher yield potential than Gairdner but low test weights are a problem. Fitzroy has good levels of net form net blotch resistance but is susceptible to leaf rust, powdery mildew and spot form net blotch. A systemic seed dressing is recommended to help with control of early powdery mildew infection. Not recommended for western areas. (Marketed by Seednet).

***Gairdner* ♂ (M)**

Good yield potential in high yielding situations. Susceptible to powdery mildew and a systemic seed treatment is recommended. It is susceptible to most foliar diseases. A good

selection to gain access to the malt market and maintain a high yield potential. Performs well on early plant or irrigated situations but be wary of western environments as this is a late/slow maturing variety.

***Grimmett* (M)**

A reliable malt variety for Queensland and northern NSW but has been superseded for yield and disease resistance in most areas. Good post ripe straw strength. Less preferred by end users as newer varieties have improved malt quality.

***Commander* ♂ (M)**

Commander has reliable yields across the environment except in 2010. Resistant to most foliar diseases except leaf rust. When planting into high yielding situations, weaker straw and lodging have been an issue. To avoid lodging plant into lower yielding sites, avoid planting early and do not push plant populations above 1.2 million plants per hectare. Growers targeting malt should evaluate Commander against current lines. (Marketed by Viterro).

Feed varieties

***Shepherd* ♂**

A medium quick maturity line which has very good yield potential. In comparison to Grout it has improved grain size and hectolitre weight and better post ripe straw strength. It has good levels of resistance to leaf rust and powdery mildew but is susceptible to spot form of net blotch. A good choice when chasing extra income from early grazing. In trials it often lodges less than other varieties. Shepherd performed well in agronomy trials in 2010, particularly in CQ and Central Downs, where leaf rust was a problem. (Marketed by Seednet).

***Hindmarsh* ♂ (food grade)**

Hindmarsh is a medium quick maturity line with very good yield and plump grain. A very short, erect plant Hindmarsh has good standability but poor post-ripe standability can be a problem. Hindmarsh is classified as food grade which means it is accepted into some export markets but it is not a premium malt variety. (Marketed by Seednet).

Grout (b)

A quick maturing feed variety with good grain size and excellent yield potential. Grout was a consistent performer until the 2010 leaf rust epidemic in the northern region. Best regions 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. Grout is a good selection for short fallows, double cropping, or limited moisture situations. Later maturing varieties should have a yield advantage in good sub soil moisture and early plant situations, but Grout has demonstrated ability to hold its own in these situations. Good levels of resistance to powdery mildew, net form of net blotch and crown rot tolerance similar to Grimmatt and Skiff. Grout is highly susceptible to leaf rust and should be monitored from early tillering. (Marketed by Seednet).

Oxford (b)

Oxford is a medium-late maturity feed barley of European origin. It has yielded well in NVT trials where the season is long and rainfall adequate. Not recommended for shorter seasons with potential for a hot or dry finish. Oxford is short with good lodging resistance. It has lower test weights and higher screenings under unfavourable conditions. It is resistant to powdery mildew and leaf rust. Oxford is in the second year of testing as a malt variety. Seed is available from Seedmark.

Fleet (b)

Quick maturing, large-grained variety with good disease resistance, a non-malting variety from South Australia. Performance in NVT and other trials indicates it has very good yield potential. Fleet is relatively tall and has demonstrated weaker straw than other varieties. Worth comparing with other quicks such as Grout or Kaputar. (Marketed by Viterro).

Mackay (b)

Mackay has vigorous vegetative growth with high yield potential and good levels of disease resistance. Medium maturity helps it to handle a tough finish and it is well suited to western and northern environments. Straw strength is good. Mackay is a taller plant with vigorous early growth, which can result in a lush crop and pre

flowering lodging particularly on an early plant in soft growing conditions. Mackay is a good option for growers concerned about leaf rust. (Marketed by Seedmark).

Skiff

An old favourite of many growers in NNSW and parts of SQ. Good reliable yield performance and good lodging resistance combine to make a reliable and consistent performer. It has been superseded for yield potential by newer varieties, but still seems to perform well on some soil types and in some regions.

(M) Varieties accredited for malting

(b) Variety protected by Plant Breeders Rights

Table 2: Variety yields 2007–2009*

Variety	Mean Yield (t/ha) 47 trials
Grout	3.57
Fleet	3.53
Commander	3.51
Hindmarsh	3.40
Shepherd	3.43
Mackay	3.26
Fitzroy	3.20
Skiff	3.12
Gairdner	2.94
Grimmett	2.93

* The 2010 data are not included due to effect of leaf rust on yields.

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 most 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 keep plant populations up.
- Recommended population for high yield potential is 100 plants/m² (1,000,000 plants/ha) or higher. To achieve this planting rates of 40 – 60 kg/ha are likely. Adjust rates depending on seed weights and germination percentage.
- For example if the seed count is 25,000 seeds per kg you need 40 kg to plant 1 million seeds. Taking into consideration establishment of 80% would require 50 kg to be planted.
- Plant populations of below 800,000 plants/ha are likely to have reduced yield potential and provide less weed competition.
- Seed dressings containing systemic insecticides such as imidacloprid have also been shown to have a net benefit for aphid control and yield improvement.
- Use adequate nitrogen fertiliser but do not over fertilise as this will encourage excessive vegetative growth and could result in lodging and higher grain protein levels.
- Phosphorus, zinc and sulphur levels are important as well as nitrogen. A starter fertilizer is recommended.
- Inspect crop regularly for infestation of insects or diseases and consult your agronomist about potential control methods.

Table 3: Barley delivery quality specifications. Guide only. Please check specifications before delivery as they may change.

	Feed	Malt
Barley variety	Any variety	Fitzroy, Gairdner, Grimmett, Commander
Grain test weight (min)	62.5 kg/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

Determining planting time

At flowering barley can tolerate a 1°C lower frost than wheat. A frost of -4°C at head height during flowering can cause between 5-30% yield loss. A frost of -5°C or lower at head height can cause 100% yield loss.

- Early planted barley generally has higher yield potential, but also more frost risk occurs.
- Planting too early can result in the crop running quickly to head if conditions are warm during late autumn and early winter.
- Hot 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.
- Later planting and later flowering generally result in declining yield potential due to foliar diseases and higher temperatures during grain fill.

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 mainly to Asian markets. The quality characteristics required by international markets are somewhat different from that required by domestic brewers, therefore not all varieties are acceptable to the international market. 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 Northern NSW will be actively sought as this barley is harvested earlier than southern barley crops. Growers are encouraged to grow malt varieties in low nitrogen paddocks.

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

	Domestic Maltsters		Export
	QLD	NSW	
Gairdner	✓✓	✓✓	✓✓
Fitzroy	✓✓	✓✓	X
Grimmett	✓	✓	X
Commander	✓	✓	X

✓✓ = Well accepted into market

✓ = Limited acceptance

X = Not accepted or not yet marketed into market

Check with your local Graincorp depot before delivering malt as not all depots have segregation for malt or segregation for all malting varieties.

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 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.
- Good levels of P are also important.
- Harvest as soon as possible.

After sowing there are 5 major environmental risks in producing malting quality:

1. Moisture stress pre-heading (that is August to September) – which can reduce yield.
2. Late spring frosts.
3. Moisture or heat stress post flowering will reduce yield, decrease grain size and increase protein.
4. Foliar diseases reduce grain size and yield.
5. Harvest rains, which will 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 knowledge of 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 practices to reduce inoculum.

Resistant varieties provide the easiest and most effective option; yet current varieties do not possess adequate resistance to all major diseases. Alternative strategies are therefore 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. Where this occurs lower leaves of infected plants may take on a blotchy appearance after jointing. This can be confused with other blotches. Where 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 and are more likely to occur in wetter years or higher rainfall areas. Both can cause significant yield loss and quality downgrading. In recent years leaf rust has

caused more losses than stem rust. 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. The best protection from either disease is to plant resistant varieties and avoid planting very early or very late in the season. Barley occupies approximately 25% of the winter cereal area; therefore as long as resistance levels of all winter cereals (especially wheat) remain high it is not expected that major epidemics of stem rust will occur in barley. In emergencies timely application of fungicides can be effective.

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 and are often surrounded by yellowing. High levels of either disease will kill leaves prematurely which may cause yield losses in excess of 30%. Growers are advised to avoid planting barley on barley where stubble is retained, as 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 yet spot blotch may also cause discolouration of grains. This disease is more likely to be a problem in sub tropical-coastal areas. All commercial varieties are susceptible.

Barley grass stripe rust

Barley grass stripe rust (*Puccinia striiformis*) can attack at least one variety grown in Queensland

but it is unlikely to be a 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* or by *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. High levels of blighted grains are rare in barley but where *Fusarium* is responsible, toxins may be produced by the fungus.

Covered smut

Covered smut (*Ustilago hordei*) is seed and soil borne and has a life cycle similar to bunt of wheat. Grain contaminated with covered smut is not accepted by end users, unless heavily discounted. Smuts can be easily controlled with a seed dressing, which should be applied to barley seed retained for sowing. Commander, Fleet and Shepherd are resistant.

Crown rot

Crown rot (*Fusarium psuedograminearum*) is common in winter cereals. 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 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. It is widespread in barley crops 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.

Sowing times for managing frost risk

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
Darling Downs																
Dalby	Fitzroy Gairdner		A	A	B	B	B	C	C	C	D					
	Commander, Grimmatt, Mackay, Skiff					A	B	B	B	C	C	C	D			
	Grout, Hindmarsh, Shepherd					A	A	B	B	B	C	C	C	D		
Warwick	Fitzroy, Gairdner					A	A	B	B	C	C	C	C	D		
	Grimmett, Mackay						A	A	B	B	C	C	C	C	D	
	Grout, Hindmarsh, Shepherd							A	B	B	C	C	C	C	C	D
Pittsworth	Fitzroy, Gairdner					A	A	B	B	C	C	C	C	D		
	Commander, Grimmatt, Mackay						A	A	B	B	C	C	C	C	D	
	Grout, Hindmarsh, Shepherd							A	B	B	C	C	C	C	C	D
South West Downs and Maranoa																
Goondiwindi / Roma	Fitzroy, Gairdner		A	A	B	B	C	C	C	D						
	Grimmett, Mackay, Skiff			A	B	B	C	C	C	C	C	D				
	Fleet, Grout, Hindmarsh, Shepherd				A	B	B	C	C	C	C	C	C	D		

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,		A	A	B	B	B	C	C	C	C	D				
	Commander, Grimmett, Mackay, Skiff			A	A	B	B	B	C	C	C	C	D			
	Fleet, Grout, Hindmarsh, 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					
	Fleet, 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 2011

	Commander	Hindmarsh	Fitzroy	Fleet	Gairdner	Grimmett	Grout	Mackay	Oxford	Shepherd	Skiff	Tallon
Height	Tall	Short	Short	Tall	Medium -tall	Medium -tall	Medium-tall	Medium - tall	Short	Tall	Medium	Medium -tall
Standability	Medium - poor	Good	Good	Poor	Medium - good	Medium - poor	Medium	Medium	Good	Medium	Medium	Medium
Post-ripe straw strength	Medium - poor	Medium - poor	Medium - poor	Medium	Good	Very good	Medium	Good	NA	Good	Medium	Good
Maturity (Days to flower)	Medium	Early – Medium	Medium - late	Early – medium	Late	Medium – Late	Early	Medium	Medium-late	Early medium	Medium	Medium -late
Net blotch (net form)	MS-S	MR-MS	MR	MR	MR	S-VS	R-MR	MS	MS	MR-MS	S-VS	S-VS
Net blotch (spot form)	MS-S	S-VS	S	MR	S-VS	S	S	S-VS	S	S-VS	S	S
Leaf rust	S	MS-S	S	MR-MS	S	S	VS	MR	MR	MR	S	S
Stem rust	S	S	S	S	S	S	S	S	S	S	S-VS	S
Spot blotch	S	S	S	S	S	S-VS	S	S	S	MS-S	VS	S-VS
Powdery mildew	MR-MS	MR	S	MR-MS	S	S	R	MR	R	R	VS	MR-R

Foliar disease

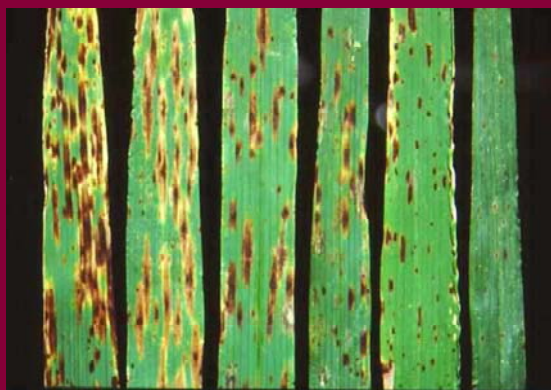
R & MR = Management option: Very little to no disease found. No economic management decisions required.

MR-MS Monitor crops for disease development. In the presence of inoculum and in seasons conducive to disease, an economic management decision may be appropriate (eg preventable spray)
Later occurrence of the disease may not require any action.

S-VS Management decisions will be required to reduce yield loss and will most probably be economic to do so.

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

DEEDI Website www.deedi.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.

To subscribe for regular online field crop updates: www.deedi.qld.gov.au, click on Agriculture click on 'services' and subscribe to *Direct*.

The Northern Barley Improvement Project is a collaborative project between Department of Employment, Economic Development and Innovation, NSW Department of Industry and Investment and the Grains Research and Development Corporation.



Industry & Investment



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