

New barley varieties and management

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Key Messages

- Barley is the major winter crop after wheat in central NSW, and areas increased in 2005 with the late seasonal break and concerns about stripe rust in wheat.
- Barley is a valuable rotation crop as it is not susceptible to many wheat foliar diseases (yellow spot, stripe rust, septoria), suffers less yield loss from root diseases, and competes well with weeds.
- Schooner and Gairdner have been the preferred malting varieties in central NSW. Gairdner has proved to be the highest yielding malting variety, but is prone to high screenings under dry conditions, late sowing and excessive nitrogen or seeding rates.
- Buloke, a new potential malting variety for the mid-lower rainfall parts of the region performed well in 2005. Fitzroy, Baudin and Cowabbie yielded well in the mid-higher rainfall areas.
- Tilga and Tantangara are high yielding feed varieties with Tilga better suited to drier areas. Binalong, Mackay and Grout are new feed grain lines particularly suited to the northern half of the State.
- Seeding rates of 70-120 seeds/m² are likely to be a good compromise for yield and grain quality for barley; the higher rate should be used with late sowing and in wetter areas, but care is needed with Gairdner which is prone to high screenings.

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Barley in Central NSW

New barley varieties and management practices for NSW are being evaluated in a GRDC-supported project based at Condobolin, in co-operation with CWFS. This paper presents results from central NSW in 2006.

Barley is second only to wheat in area grown in the central west but is rarely given the attention it deserves. In recent years, both the malt and feed markets have given reasonable returns. New varieties with higher yield potential are being released and the colour standards for malting have been eased. Barley can be valuable as a rotation crop with wheat, particularly in no-till and stubble retention systems, as it is not a host for most wheat foliar diseases. Its vigorous early growth allows it to compete well with weeds, needing lower herbicide rates and restricting weed seed set.

In choosing a barley variety, growers need to consider which of the four major markets they are targeting. For malting barley, there are three markets:

1. Export barley grain, principally to China. The very price sensitive Chinese market continues to grow and demand for Schooner in China remains strong. However, there is increasing demand for varieties with higher enzyme levels.
2. Grain used by Australian maltsters to produce malt for domestic brewing customers. This market is relatively static. Schooner has been the preferred variety in this market, but Fitzroy may be a suitable replacement.
3. Grain used by domestic maltsters to supply malt to overseas brewing customers. These markets require varieties with higher enzyme levels, such as Gairdner, Buloke and Baudin.

Domestic **feed barley** is the fourth market and demand is likely to remain steady with high numbers of cattle on feed and the continued requirements of the dairy and intensive livestock industries.

Variety performance

Four variety trials were conducted by NSW DPI and CWFS in 2006 (Table 1). The feed variety Tilga was the highest yielding at all sites. Of the new malting varieties, Buloke yielded well particularly at the lower rainfall sites, as did Fitzroy at the more favourable sites, while both Baudin and Cowabbie gave good yields at some sites. These findings are broadly in line with the longer-term results, as presented in the 2006 Winter Crop Variety Sowing Guide.

Table 1. Grain yield (t/ha) for selected varieties at 4 sites in central NSW in 2005.

Variety	Rankins Springs	Wirrinya	Euabalong	Nyngan
Baudin	3.50	3.20	2.13	1.46
Binalong	3.48	3.15	2.03	1.16
Buloke	3.64	3.10	2.13	1.31
Cowabbie	3.59	3.22	2.42	1.07
Fitzroy	3.84	2.96	2.16	1.25
Flagship	3.30	2.63	2.08	1.42
Gairdner	3.51	2.88	2.18	1.33
Grout	3.40	3.30	2.16	1.50
Mackay	3.58	2.81	2.07	1.39
Schooner	3.40	2.76	2.18	1.49
Tantangara	3.66	3.26	1.74	1.39
Tilga	3.94	3.36	2.23	1.57
Yarra	3.58	2.98	2.17	1.32

Grain quality varied dramatically across sites (Table 2). At Rankin Springs, all varieties easily exceeded the 70% retention standard for malting, with Schooner, Baudin, and Grout having the highest values. At Wirrinya, Gairdner, fell below this level while at the drier sites Schooner was outstanding and Buloke intermediate. Buloke has excellent average kernel weight but has a narrow grain shape and so retention and screenings values usually fall between Gairdner and Schooner. Fitzroy met malting specifications at all sites. At Nyngan, late rain may have helped Fitzroy, as its plump grain values were higher than for Grout and Baudin which usually have plumper grain. The feed varieties generally met the feed barley specification, which is for less than 15% passing through a 2.2 mm screen.

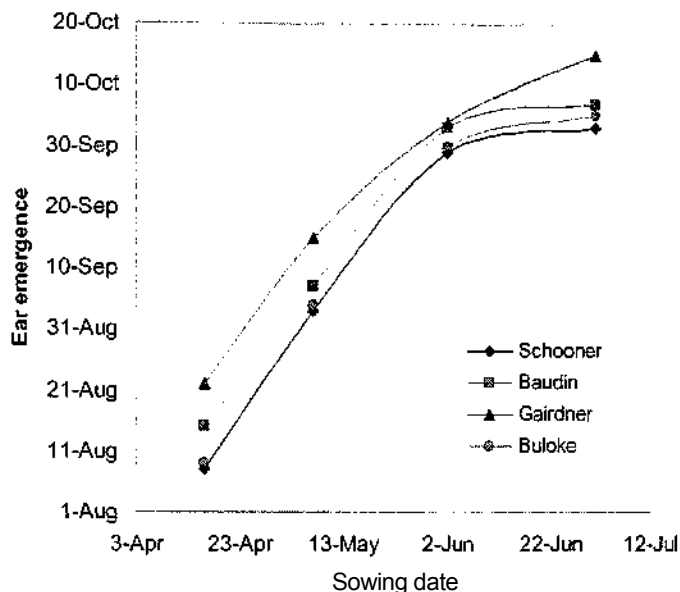
Table 2. Grain retention values (% grain retained on a 2.5 mm screen) for selected varieties at 4 sites in central NSW in 2005.

Variety	Rankins Springs	Wirrinya	Euabalong	Nyngan
Baudin	97.7	78.2	86.4	55.9
Binalong	90.1	57.4	60.9	76.0
Buloke	95.6	75.7	81.4	60.4
Grout	96.9	80.4	84.8	49.4
Cowabbie	90.2	73.9	72.7	58.4
Fitzroy	94.7	75.4	81.4	76.3
Flagship	89.8	70.3	81.8	64.3
Gairdner	94.3	65.6	63.2	66.1
Mackay	91.0	74.0	53.9	79.2
Schooner	97.7	91.0	85.8	81.1
Tantangara	85.5	60.3	67.6	54.4
Tilga	85.8	49.4	61.3	62.2
Yarra	91.3	76.7	73.3	80.3

Management of new varieties Sowing time

Flowering date is the most important factor in adapting a crop to an environment. Many barley varieties respond to daylength as well as to temperature, and so their maturity rankings can change with latitude. Development pattern also has a strong influence on grain number per ear in two-row barleys. Figure 1 shows ear emergence dates for four barley varieties sown on four dates in central NSW.

Figure 1. Ear emergence dates for four barley varieties sown at four sowing dates



Schooner was the quickest to flower at all sowing dates, closely followed by Buloke. Baudin was next quickest and Gairdner was the slowest. The ideal ear emergence date will vary with season, being a balance between achieving sufficient biomass (but not excessive water use) by flowering and the risk of frost. These results emphasise the need to sow Gairdner earlier than other malting varieties. Buloke appears to perform similarly to Schooner although with very late sowings Schooner is more likely to achieve plump grain. Of the semi-dwarf varieties, Baudin performs well from mid-season sowings as its daylength response leads to acceptable flowering times.

Seeding rate

Higher seeding rates have been advocated in wheat as a way of reducing the number of higher order tillers and hence maintaining grain size and reducing screenings. This can be dangerous in barley and particularly in the newer varieties which have smaller grain than Schooner. Yield results from three seeding rate trials at CWFS sites in 2005 are shown in Figure 2, with the values averaged over all varieties at each site. At Tottenham, about 120 seeds/m² gave the highest yield while at the other sites 120-160 seeds/m² were required, probably because of the late sowing.

Figure 2. Effects of seeding rate on grain yield at three sites in 2005. Values are the mean of six varieties at each site.

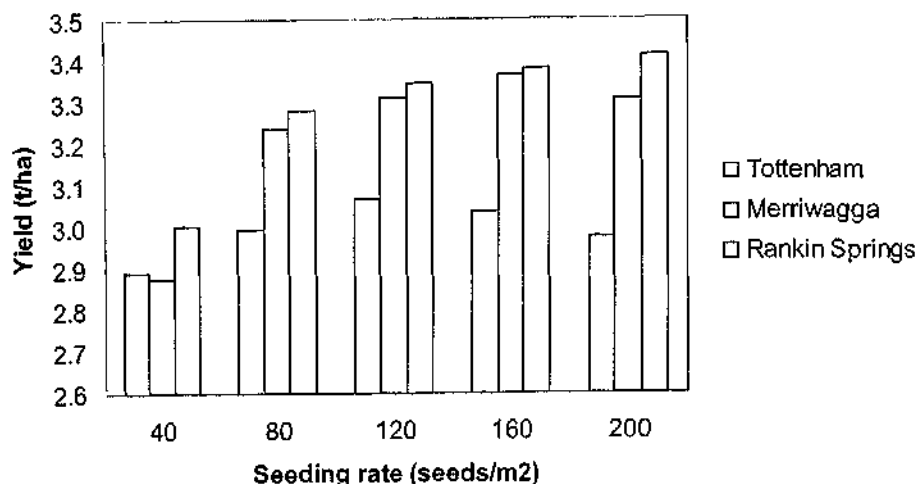
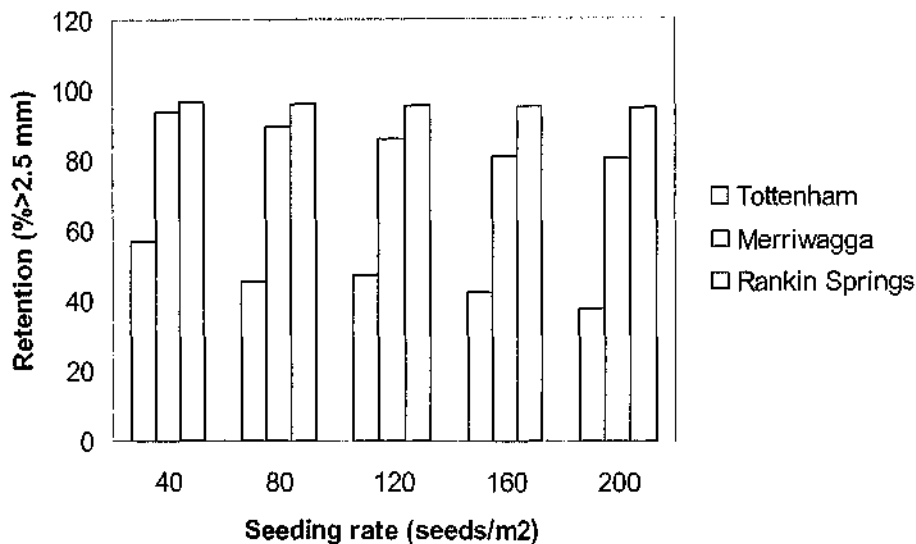


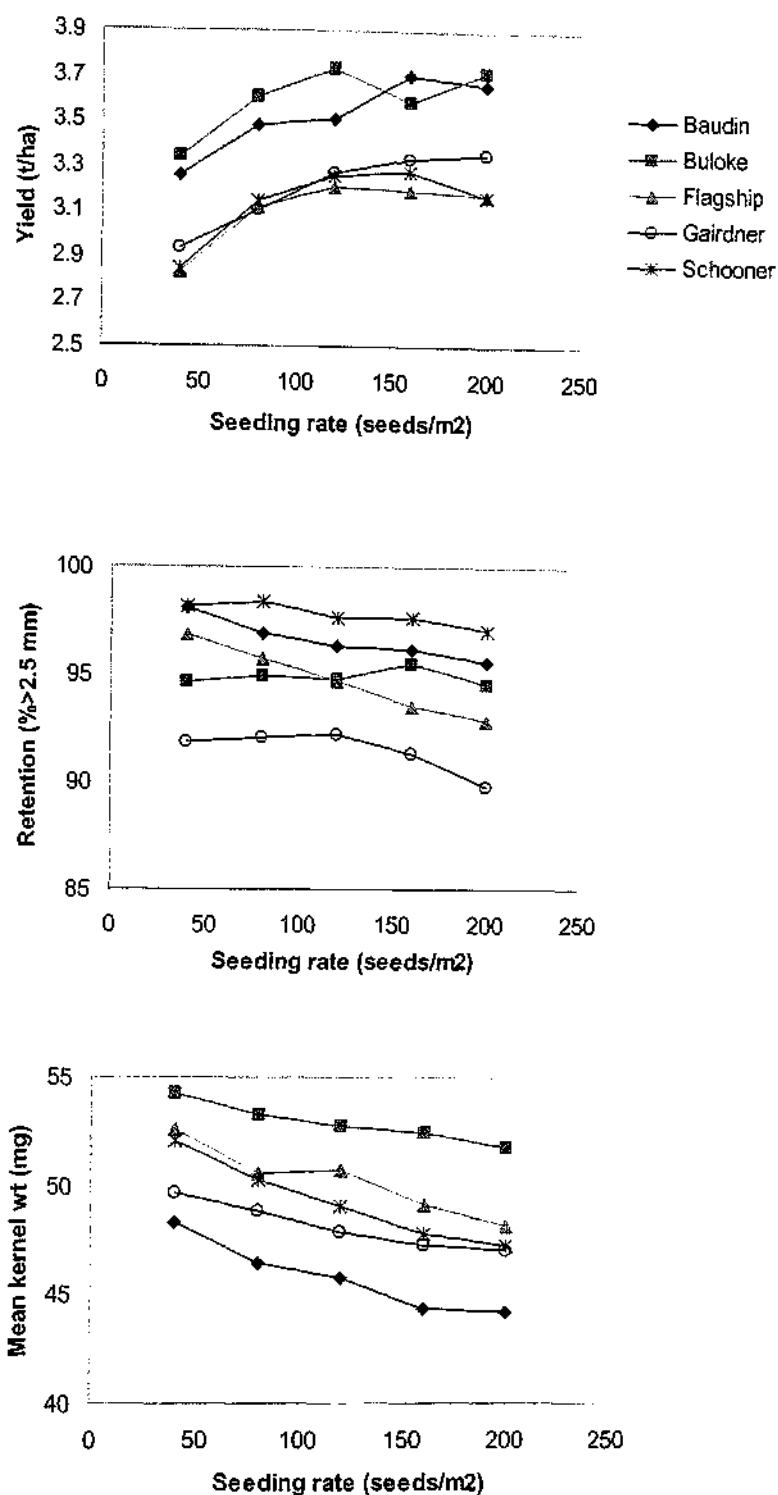
Figure 3. Effects of seeding rate on grain plumpness (retention) at three sites in 2005. Values are the mean of six varieties at each site.



Grain plumpness varied greatly among sites, being much poorer at Tottenham than at Merriwagga and Rankins Springs (Figure 3). Retention values decreased with seeding rate at all sites, although the decline at Rankins Springs was small. Based on results over a number of years, populations of 70-120 plants/m² are likely to be a good compromise for yield and grain quality for crops sown on time.

Varieties differed in their response to seeding rate at some sites such as Rankins Springs (Figure 4). Yield increased up to about 120 plants/m² in most varieties while kernel weight decreased with each increase in plant density for all varieties. Plump grain (retention) also decreased with increases in plant density in all but Buloke although the decline was only minor in Schooner. The effect of grain shape is evident. Buloke had the heaviest grains but was intermediate for retention whereas Baudin had high retention values and the lowest kernel weights. High seeding rates should be avoided in Gairdner.

Figure 4. Grain yield, mean kernel weight and retention responses to seeding rate for five varieties at Rankins Springs in 2005.



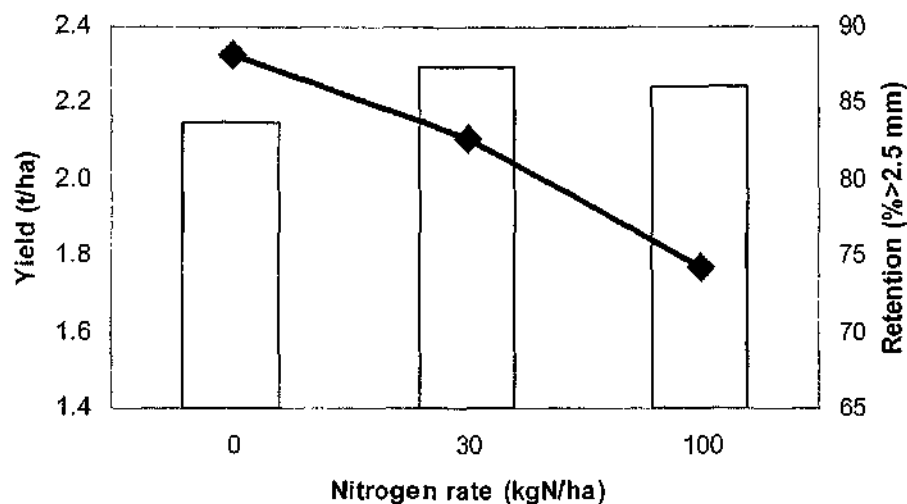
Nitrogen nutrition

Protein content is a major determinant of malting quality. High protein concentrations reduce malt extract. In lower rainfall areas, keeping below the 12% upper limit can be difficult, as the nitrogen levels required to obtain maximum yield result in grain proteins of about 11%. At low to moderate yield levels, only a small amount of additional nitrogen

will rapidly increase grain protein and screenings. Figure 5 shows the effect of nitrogen fertiliser on yield and grain plumpness averaged over six varieties at Merriwagga in 2005. A high nitrogen rate was included to test the ability of varieties to maintain grain quality under adverse conditions.

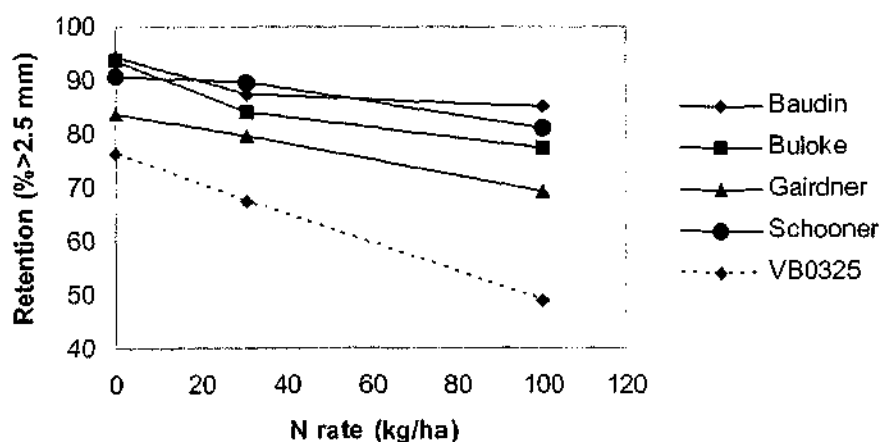
There was a small yield response to 30 kgN/ha but no further response to 100 kg/ha. However, grain plumpness declined with each addition of nitrogen, retention values dropping from 89 to 74% over the nitrogen range. This emphasises the need for careful nitrogen management in barley.

Figure 5. Grain yield (vertical bars) and plumpness (line) responses to nitrogen fertiliser at Merriwagga in 2006. Values are the mean of six varieties.



There were also varietal differences in sensitivity to high nitrogen as shown in Figure 6. Baudin and Schooner were better able to maintain grain size at high nitrogen levels whereas Gairdner and the breeding line VB0325 were poor under high nitrogen. These results emphasise the need to test potential varieties under a range of agronomic conditions.

Figure 6. Plump grain (retention) for five varieties at three nitrogen levels at Merriwagga in 2006.



Conclusions

The outlook for the barley industry appears bright with the release of varieties that are higher yielding than Schooner and suited to either the domestic or export markets. However, the new varieties have smaller or less stable grain size, requiring careful management.