

Barley variety response to seed rate and ryegrass

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Key findings

- Annual ryegrass did not affect crop establishment but did reduce grain yield.
- Seed rate did not influence grain yield or levels of annual ryegrass populations.
- Annual ryegrass populations were found to be significantly lower in Flagship and Maritime plots.

Why do the trial?

The aim of this trial was to determine varietal performances under various seeding rates and the ability of barley varieties to compete with annual ryegrass.

How was it done?

The trial contained 4 barley varieties; Maritime, Fleet, Hindmarsh and Flagship. All varieties differ in growth rates and final growth height. The varieties were compared over three seeding rates 80, 150 and 220 seeds per square metre. These treatments were compared against two weed densities, Annual ryegrass planted at 25kg/ha and an un-treated control.

Seeding rates were adjusted according to grain weight and germination to produce target plant populations specified in the trial design. The trial was sown on the 5th June using chisel points and presswheels.

Plot size 1.5m x 10m **Fertiliser rate** DAP @ 70kg/ha

Barley plant and Annual ryegrass counts were carried out four weeks after sowing to determine crop establishment. The trial was harvested on the 12th of November and scores for straw strength, plant height and grain yield measurements were recorded. Grain quality was assessed for retention (%) with a 2.5mm screen, protein (% dry basis), screenings with a 2.2mm screen and test weight (kg/hectolitre).

Results

Table 1 displays the impact that seeding rate has on grain yield and the establishment of annual ryegrass. Increasing the seed rate from 80 to 150 or 220 seeds per square metre had no significant grain yield impact. However, the seeding rate of 80 seeds per square metre had the highest grain yield of 1.18t/ha. Comparing the establishment of annual ryegrass across the three seeding rates showed no significant difference, indicating that seeding rate had no impact on annual ryegrass populations.

Table 1. Seed rate influence on grain yield and annual ryegrass (ARG) populations at Hart in 2008.

| Barley density (plants/m²) | Grain yield (t/ha) | | Ryegrass density (plants/m²) | |
|--------------------------------------------------|-------------------------------|---|----------------------------------------------------|---|
| 80 | 1.18 | a | 132 | a |
| 150 | 0.89 | a | 117 | a |
| 220 | 0.94 | a | 109 | a |
| LSD (5%) | ns | | ns | |

Barley variety grain yield differences were detected, as seen in Table 2. Hindmarsh and Fleet recorded the highest grain yield, which were both significantly higher than varieties Flagship and Maritime. A difference was seen in annual ryegrass establishments across barley varieties. Populations in Fleet and Hindmarsh were significantly higher compared to levels in Flagship and Maritime.

Table 2. Barley variety grain yield, barley establishment and annual ryegrass (ARG) establishment at Hart in 2008.

| Variety | Grain yield (t/ha) | | Ryegrass density (plants/m²) | |
|----------------|-------------------------------|---|----------------------------------------------------|---|
| Flagship | 0.82 | b | 99 | b |
| Fleet | 1.14 | a | 139 | a |
| Hindmarsh | 1.22 | a | 137 | a |
| Maritime | 0.84 | b | 103 | b |
| LSD (5%) | 0.12 | | 28 | |

The presence of annual ryegrass had a negative impact on grain yield reducing 1.05t/ha to 0.96t/ha, Table 3. Annual ryegrass had no impact on barley crop establishment as there was no difference in plant numbers whether the weed was present or not. The annual ryegrass plant count displays the difference in populations per square meter with the sown annual ryegrass plots having significantly higher populations compared to those without.

Table 3. Presence of annual ryegrass impact on grain yield, barley establishment and annual ryegrass (ARG) populations at Hart in 2008.

| | Grain yield (t/ha) | | Barley density (plants/m²) | | Ryegrass density (plants/m²) | |
|----------|-------------------------------|---|--------------------------------------------------|---|----------------------------------------------------|---|
| No ARG | 1.05 | a | 166 | a | 2 | a |
| ARG sown | 0.96 | b | 164 | a | 237 | b |
| LSD (5%) | 0.1 | | ns | | 22.9 | |

Table 4 shows the mean grain quality characteristics for seeding rate. Seed rate had no impact on grain protein, retention and test weight, although increasing the seed rate above 80 seeds per square meter significantly increased screenings despite all seed rates having screenings above 60%. All seed rates had a receival grade of Feed 4.

Table 4. Seed rate influence on grain quality characteristics at Hart in 2008.

| Sowing rate (seeds/m²) | Protein (%) | | Screenings (%) | | Retention (%) | | Test weight (kg/hL) | | Receival grade |
|----------------------------------------------|--------------------|---|---------------------------|---|--------------------------|---|--------------------------------|---|---------------------------|
| 80 | 18.0 | a | 60.4 | a | 7.8 | a | 61.5 | a | Feed 4 |
| 150 | 18.4 | a | 75.7 | b | 4.4 | a | 59.7 | a | Feed 4 |
| 22 | 18.2 | a | 77.6 | b | 4.1 | a | 59.7 | a | Feed 4 |
| LSD (5%) | ns | | 13.0 | | ns | | ns | | |

Maritime showed the best grain quality characteristics of all varieties, with protein and screening levels significantly lower than all other varieties (Table 5). Flagship showed significantly higher protein compared to all varieties and, along with Hindmarsh, the highest screenings. Maritime had the highest retention, however all varieties were very low. All varieties, except Maritime, achieved a receival grade of Feed 4.

Table 5. Barley variety grain quality characteristics at Hart in 2008.

| Variety | Protein (%) | | Screenings (%) | | Retention (%) | | Test weight (kg/hL) | | Receival grade |
|----------------|--------------------|---|---------------------------|---|--------------------------|---|--------------------------------|---|---------------------------|
| Flagship | 19.1 | c | 86.8 | c | 2.1 | c | 62.1 | a | Feed 4 |
| Fleet | 17.7 | b | 63.4 | b | 5.7 | b | 59.4 | c | Feed 4 |
| Hindmarsh | 17.9 | b | 86.7 | c | 2.8 | c | 58.9 | c | Feed 4 |
| Maritime | 18.2 | a | 48.1 | a | 11.1 | a | 60.8 | b | Feed 3 |
| LSD (5%) | 0.2 | | 4.5 | | 2.1 | | 0.5 | | |

The addition of annual ryegrass had no impact on screenings, retention, test weight and overall receival grade (Table 6). The presence of annual ryegrass did significantly reduce grain protein although protein levels were extremely high.

Table 6. Annual ryegrass (ARG) impact on grain quality characteristics at Hart in 2008.

| Weeds | Protein (%) | | Screenings (%) | | Retention (%) | | Test weight (kg/hL) | | Receival grade |
|--------------|--------------------|---|---------------------------|---|--------------------------|---|--------------------------------|---|---------------------------|
| No ARG | 18.2 | a | 70.9 | a | 5.7 | a | 60.3 | a | Feed 4 |
| ARG sown | 18.1 | b | 71.6 | a | 5.2 | a | 60.3 | a | Feed 4 |
| LSD (5%) | 0.1 | | ns | | ns | | ns | | |

Discussion

Early rainfall allowed good crop establishment at Hart. Rains throughout winter meant high biomass production with crops setting a high grain yield potential. These beneficial conditions were followed with a very dry spring imposing severe drought effects on the crop. As a consequence grain yield and grain quality was very poor.

Although the season finished harshly seed rate had no impact on grain yield. Seed rate also failed to influence annual ryegrass populations in this season at Hart. This may be due to the good start to the season with ample soil moisture allowing the ARG populations to establish not allowing the influence of competition. ARG populations were found to be significantly lower in Flagship and Maritime plots. Flagship has excellent early vigor compared to other varieties and is quick to get established. This trait allows Flagship to compete well with ARG as indicated by reducing ARG populations compared to Hindmarsh and Fleet, as seen in this trial. Maritime also had ARG populations at the same level as Flagship indicating that this variety too has the ability to impose good early competition on ARG. Despite the difference in weed populations all ARG in this trial died due to the extreme conditions endured at the end of the growing season.

Seed rate had no impact on receival quality of the barley. However, a seed rate of 80 seeds per square meter did have significantly lower screenings compared to the higher seed rates. This can be explained due to the competition for moisture through September and October. Maritime displayed the best grain quality of all varieties in this trial. Maritime has inherent plump grains and this trait allowed it to achieve Feed 3 classification.

Trials will continue in 2009 to validate 2007 and 2008 results with different seasonal conditions.

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