Faba bean fungicide efficacy trials – Breeza 2016

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Key findings

- In a year of high disease pressure, most fungicides did not provide a yield and seed size benefit when used at low frequency.
- A high frequency fungicide strategy provided yield benefit using a number of products.

Introduction

In wet years, foliar disease can cause large economic loss in faba bean and there is limited knowledge of the comparative efficacy of different products and different application strategies. This study aimed to compare fungicides for their effectiveness to control diseases as well as improve yield and seed size in faba bean. Experiment one used a low frequency (LF) program, while experiment two involved a high frequency (HF) fungicide program.

Site details

Location	Liverpool Plains Field Research Station, Breeza
Co-operator	Scott Goodworth
Soil type	Black vertosol
Rainfall	A total of 495 mm rainfall was recorded at the experimental site between sowing and harvest, which encouraged development of foliar disease.
Experimental design	Split plot design with fungicide as the main plot and varieties as sub-plots; three replications.
Sowing date	27 April
Fertiliser	Nil
Plant population	Target 20 plants/m^2
Weed management	Post-sowing/pre-emergent Terbyne® 1 kg/ha (terbuthylazine 750 g/kg) applied on 27 April.
Insect management	Insect pressure was low and no insecticides were used.
Harvest date	21 November

Treatments

Varieties (3)	PBA Warda⦸, PBA Nasma⦸ and Fiord
Fungicides (5)	See Table 1 for fungicide treatments.
Fungicides programs	Fungicides were applied before rain on: • LF: application of fungicides (Table 1) on 16 June and 18 August • HF: application of fungicides (Table 1) on 16 June, 1 August, 18 August, 9 September

Table 1. Fungicides and rates used in both fungicide experiments at Breeza 2016.

Active ingredient[1]	Active ingredient (g/L or kg product)	Rate product used (L or kg/ha)
Procymidone	500 g/L	0.50
Carbendazim	500 g/L	0.50
Chlorothalonil	720 g/L	1.50
Mancozeb	750 g/kg	1.00
Tebuconazole	430 g/L[2]	0.35

[1] NSW DPI research is covered under a permit to use off-label crop protection products and application rates on experimental plots (PER7250).

[2] Applied rate was higher than the 145 mL/ha permit rate for tebuconazole on faba bean.

Results

Early disease development

The experiments were located next to a faba bean rust (*Uromyces viciae-fabae*) screening experiment where a high disease level was initiated by sowing rust-susceptible spreader plots, distributing pots with greenhouse-grown rust-infected plants and repeated inoculations with rust spore suspension. The resulting high disease pressure provided a continuous load of rust inoculum to the fungicide experiments. Rust was noted in the disease management experiments soon after plant emergence and developed rapidly in non-fungicide-treated plots. Towards the end of July a high incidence of Stemphylium blight (*Stemphylium* spp) symptoms was noted. On 10 August, plots were scored (% leaf coverage) for both rust and Stemphylium blight.

Impact of early fungicide application on disease symptoms

On 10 August both the LF and HF experiments showed a significant (P<0.05) reduction of rust infection levels for the tebuconazole and mancozeb treatments (Tables 2 and 3) compared with the carbendazim, procimidone and unsprayed control. No difference for Stemphylium blight was noted in the LF experiment on 10 August, but the extra tebuconazole application in the HF experiment on 1 August resulted in a significant (P<0.05) difference from the control, with procymidone and carbendazim treatments both showing a non-significant trend to greater incidences of Stemphylium blight (Table 3). No interactions were found between fungicide treatment and variety for rust or Stemphylium blight scores.

Varietal differences in disease

Averaged over treatments, Fiord had significantly (P<0.05) more rusted leaf area in August than PBA Nasma⦻ or PBA Warda⦻ (data not shown). For Stemphylium blight, the genotype effect in both experiments was highly significant (P<0.001) with PBA Warda⦻ showing a very high level of susceptibility and PBA Nasma⦻ significantly less affected than Fiord (data not shown).

Late disease development

Chocolate spot (*Botrytis fabae*) became noticeable in late August and progressed very fast after a number of high intensity, long duration rainfall events. Rust and chocolate spot severities were recorded on 27 September. On 30 September, plots were scored for leaf retention using a 1–5 scale (1 = no leaves dropped; 3 = 50% of the leaves dropped; 5 = > 90 % of the leaves dropped). Stemphylium blight appeared not to progress further after August. On 27 September only minor Stemphylium blight symptoms were noted on the top leaves, but both rust and chocolate spot reached high incidences.

Impact of late fungicide application on disease symptoms

Fungicide treatments were less successful in reducing rust and chocolate spot symptoms later in the season. There was little difference amongst treatments for rust on leaves, while rust severity of the procymidone treatments was significantly (P<0.05) higher than the control in both LF and HF application (Tables 2 and 3), and carbendazim was higher (P<0.05) in the HF application. There was no difference in chocolate spot severity between treatments in the LF experiment. In the HF experiment chlorothalonil gave a significantly better (P<0.05) result than carbendazim and tebuconazole, but was no different from mancozeb and procymidone.

The poor performance of carbendazim and procymidone for chocolate spot control was surprising, given that both are considered to be the fungicides of choice for chocolate spot control.

The tebuconazole-treated plots showed a significantly higher level of leaf retention than all other treatments in the HF experiment (Table 3).

Table 2. Fungicide efficacy experiment – LF, summary of treatment averages for disease scores (% coverage) and leaf retention (1–5), Liverpool Plains Field Station, 2016.

Treatment	Rust (leaf) August	Stemphylium (leaf) August	Rust (leaf) September	Rust (stem) September	Chocolate spot September	Leaf retention September
Control	8.2 ^{b}	7.1	13.8^{ab}	17.8^{ab}	23.9	4.1
Procymidone	9.7 ^{b}	5.9	25.3^{c}	28.9^{c}	25.8	3.8
Carbendazim	7.3 ^{b}	5.1	18.7^{abc}	21.3^{abc}	21.9	3.8
Chlorothalonil	5.9 ^{ab}	5.4	13.9^{ab}	16.9^{ab}	21.1	3.8
Mancozeb	2.3^{a}	5.1	8.0^{a}	8.1^{a}	25.0	3.9
Tebuconazole	2.1 ^{a}	4.4	11.0^{ab}	14.5^{ab}	22.9	3.5
Average	5.9	5.5	15.1	17.9	23.4	3.8
l.s.d. (5%)	4.6	ns	8.8	8.1	ns	ns

*Numbers followed by the same letters are not significantly different (P = 0.05)

*ns = not significant

Table 3. Fungicide efficacy experiment – HF, summary of treatment averages for disease scores (% coverage) and leaf retention (1–5), Liverpool Plains Field Station, 2016.

Treatment	Rust August	Stemphylium August	Rust (leaf) September	Rust (stem) September	Chocolate spot September	Leaf retention September
Control	11.0^{bc}	5.9^{bc}	14.6^{a}	14.5^{b}	21.7^{c}	4.3^{d}
Procymidone	12.1^{c}	7.3^{c}	32.8^{b}	35.0^{c}	17.9^{abc}	3.7^{c}
Carbendazim	10.2^{bc}	7.0^{bc}	25.9^{b}	20.8^{b}	19.0^{bc}	3.3^{b}
Chlorothalonil	6.4^{ab}	5.3^{ab}	13.8^{a}	17.6^{b}	12.4^{a}	3.2^{b}
Mancozeb	4.4^{a}	4.9^{ab}	7.8^{a}	5.6^{a}	13.8^{ab}	3.4^{bc}
Tebuconazole	2.0^{a}	3.8^{a}	5.8^{a}	14.8^{b}	20.1^{c}	2.6^{a}
Average	7.7	5.7	16.8	18.0	17.5	3.4
l.s.d. (5%)	4.9	2.1	10.0	8.2	5.9	0.3

* Numbers followed by the same letters are not significantly different(P = 0.05)

Grain yield

Under severe rust pressure, tebuconazole was clearly the best treatment with a 20% and 68% increase in grain yield compared with the unsprayed control in the LF and HF experiments respectively (Tables 4 and 5). Fungicide treatments had a significant (P<0.05) effect on seed weight in the HF experiment where tebuconazole clearly provided a more positive effect than other treatments.

Comparing the effect of the different fungicides on the three diseases present, it is likely that most of the yield gains in these experiments resulted from controlling rust, but not chocolate spot or Stemphylium blight. It should be noted that the rust inoculum pressure in the experiments was far higher than would normally be present under commercial conditions.

Table 4. Fungicide efficacy experiment – LF, summary of treatment averages for yield components, Liverpool Plains Field Station, 2016.

Treatment	Yield (t/ha)	100 seed weight (g)
Control	2.4[ab]	56.6[b]
Procymidone	2.3[a]	53.2[a]
Carbendazim	2.6[ab]	52.0[a]
Chlorothalonil	2.6[ab]	54.0[ab]
Mancozeb	2.6[bc]	56.7[b]
Tebuconazole	2.9[c]	54.7[ab]
Average	2.6	54.5
l.s.d. (5%)	0.3	2.8

*Numbers followed by the same letters are not significantly different ($P = 0.05$)

Table 5. Fungicide efficacy experiment – HF, summary of treatment averages for yield components, Liverpool Plains Field Station, 2016.

Treatment	Yield (t/ha)	100 seed weight (g)
Control	2.2[a]	54.4[bc]
Procymidone	2.5[a]	50.9[a]
Carbendazim	3.0[b]	52.2[ab]
Chlorothalonil	3.1[b]	53.5[ab]
Mancozeb	3.2[b]	56.1[c]
Tebuconazole	3.7[c]	59.1[d]
Average	3.0	54.4
l.s.d. (5%)	0.4	2.6

*Numbers followed by the same letters are not significantly different ($P = 0.05$)

Conclusions

The high rust pressure and frequent rainfall towards the end of the season was likely responsible for the poor fungicide response in the LF experiment in terms of reducing symptoms and improving yield and seed size. In the HF experiment, mancozeb and tebuconozole were most effective overall in reducing symptoms and improving yield and seed size.

Four of the five fungicides were effective in increasing yield in the HF experiment compared with only one in the LF experiment, indicating the need for repeated sprays when disease pressure is high.

Note that the permit for tebuconazole allows for only three applications of 145 mL/ha in commercial crops.

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