Chocolate Spot management in faba beans

Stacey Power, Research Scientist, Department of Primary Industries and Regional Development Western Australia

Key Messages

Background

Research conducted by SARDI in South Australia shows that the causal agent of chocolate spot, *Botrytis fabae,* needs temperatures between 15-25° and humidity >75% for spores to be released and infection of new plants successful. Based on this information, South Australian Research and Development Institute (SARDI) are developing a warning system based on canopy temperature and humidity. When these conditions are met for a period of 12 consecutive hours, a 'red alert' is sent, and there is a 48-hour window to get a foliar fungicide on the crop to prevent infection from occurring. This could give farmers the information that they need to make informed spray decisions, including the confidence to leave a crop unsprayed.

Current recommended practice in WA is for farmers to monitor their crop for signs of chocolate spot with a view to begin spraying fungicide as the canopy closes and flowering begins through to early pod fill. In eastern states, it is common practice for farmers to spray faba bean crops with at least four foliar fungicides, from mid-winter onwards. The early sprays are often done to control diseases other than chocolate spot, such as ascochyta. Although ascochyta is less common in WA than other states, some farmers here have duplicated this practice, at times resulting in unnecessary fungicide applications.

We aim to compare the current recommended WA fungicide spray strategy with the more regular fungicide applications common in other states, and with a spray timing based on canopy humidity and temperature to determine if this could be a useful decision support tool by West Australian growers.

Trial Details

Trial Location	Frankland-Cranbrook Road, Frankland River
Soil type	Sandy loam gravel
Sowing date	29 April
Sowing rate	194kg/ha PBA Bendoc
Fertiliser	At seeding: 220kg/ha Single Superphosphate (0N, 9.1P, 0K, 20Ca, 10.5s)
Herbicides & Insecticides	Pre-seeding: 700g/ha terbuthylazine (875g/kg) + 700g/ha simazine (900g/kg) + 700g/ha diuron (900g/kg) At seeding: 1.1kg/ha carbetamide (900g/kg) + + 180g/ha flumioxazin (500g/kg) + 80mL/ha bifenthrin (250g/L) + 2.5L/ha glyphosate (570g/L) 25 May: 750mL/ha imazamox (33g/L) & imazapyr (15g/L) 18 June: 330mL/ha clethodim (360g/L) + 100g/ha butroxydim (250g/kg) + 1% MSO + 100mL/ha haloxyfop (520g/L) 14 Sep: 100mL/ha sulfoxaflor (500g/kg) + 80mL/ha alpha cypermethrin (100g/L) 27 Nov: 2L/ha diquat (200g/L) + 0.2% BS1000
Harvest Date	20 Dec

Table 1: Soil Composition

Depth (cm)	pH ($CaCl_2$)	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	N (NO_3) (mg/kg)	N (NH_4) (mg/kg)	EC (ds/m)	OC (%)
0-10	5.3	86	198	11.8	61	7	0.146	5.63
10-20	5.4	38	146	9.2	12	<1	0.063	3.14
20-30	5.3	19	102	6.4	6	<1	0.0.32	1.53

Table 2: 2021 monthly rainfall (mm) from DPIRD Frankland site (FR), Average rainfall from BOM Frankland site (009635).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr-Nov	Annual
2021	2	62	26	99	92	88	136	105	86	87	62	6	693	851
Average	15	14	23	42	72	87	94	80	64	80	28	20	547	619

Table 3: Trial treatments

1	Nil fungicides
2	Recommended procedure: 2 x sprays, flowering onwards
3	Regular spray: 4 x sprays, early July onwards
4	Alert: 1 x spray based off humidity/temperature sensor

Foliar fungicide details

Date	Treatments sprayed	Rate mL/ha	Active ingredients
2-Jul	Regular spray plots	500	procymidone (500g/L)
22-Jul	Regular spray plots	600	prothioconazole (1250g/L) + bixafen (75g/L)
12-Aug	Regular spray plots & recommended procedure plots	500	carbendazim (500g/L)
25-Aug	Alert plots	500	carbendazim (500g/L)
3-Sep	Regular spray plots & recommended procedure plots	1000	fludioxonil (150g/L) + pydiflumetofen (100g/L)

Table 4: Chocolate spot rating scale that was used to assess plots at Frankland River in 2021.

Rating	Description
0	No infection
10	Very small specks
30	Few small discrete lesions
50	Some coalesced lesion with some defoliation
70	Large coalesced, sporulating lesions, 50% defoliation and some dead plant
90	Extensive lesions on leaves, stems and pods, severe defoliation, heavy sporulation, stem girdling, blackening and death of more than 80% of plants

Results

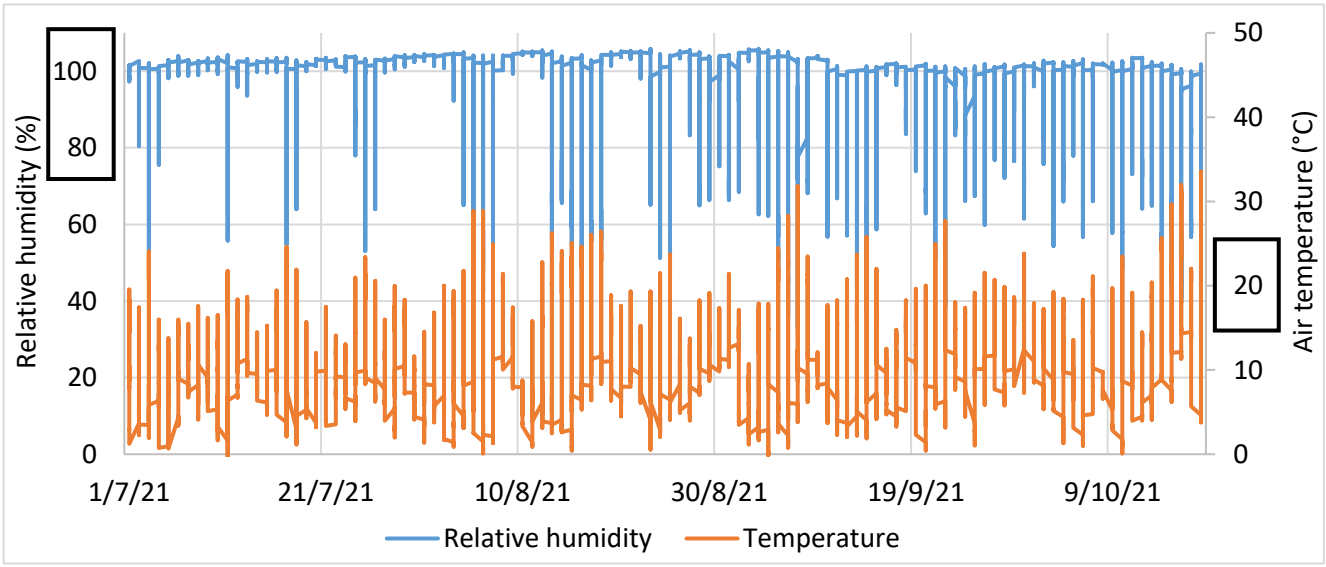

Figure One: Relative humidity (%) and air temperature (°C) as measured at canopy height in Frankland River from 1 July through to 15 September, the period when foliar fungicide sprays were active on various treatments in this trial. The highlighted ranges on either axis represent the conditions that must be met to trigger an alert.

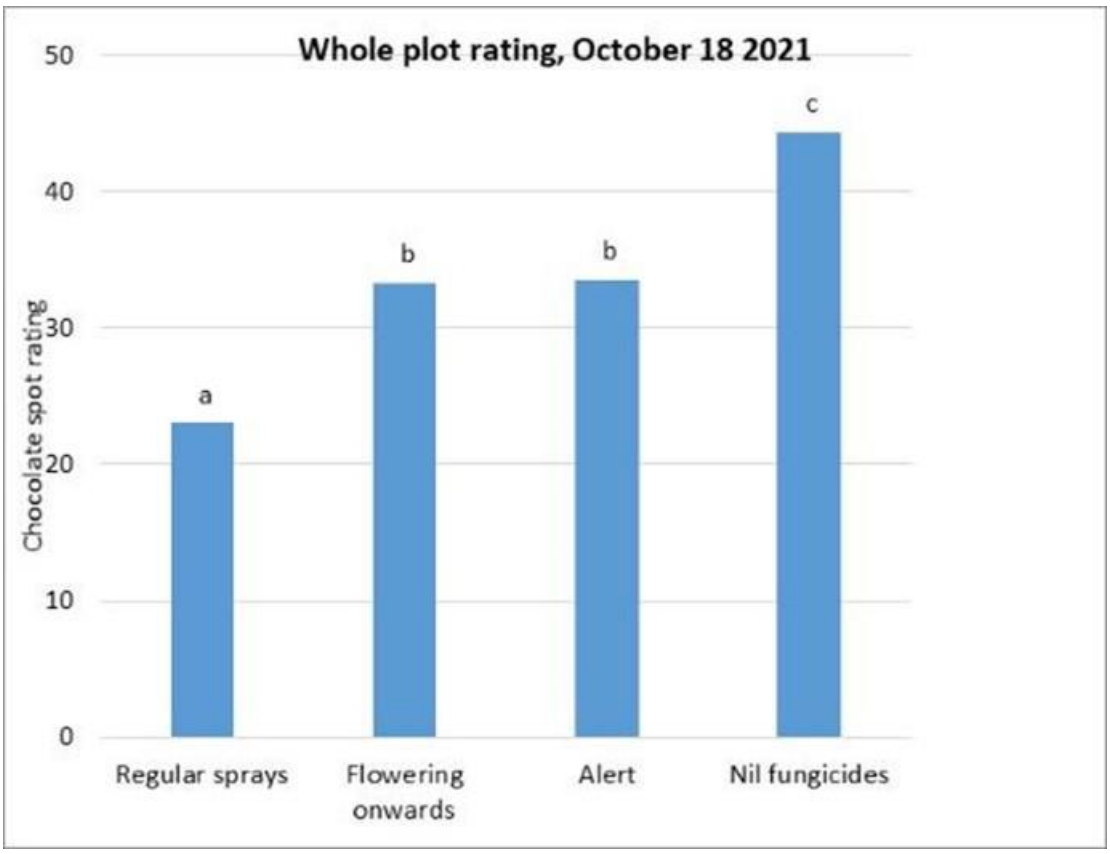

Figure Two: Chocolate spot ratings at Frankland River from 18 October 2021. Treatments with a common letter are not significantly different from each other. *p = 0.01*.

Chocolate spot in this trial was rated repeatedly throughout the 2021 season using the scale in Table 4, with the final rating, taken on 18 October following all fungicide applications, presented in Figure Two. The first signs of disease in the trial were seen in in mid-July, by which time the regular spray plots had been sprayed once. Disease levels were very low at that time, with small specks seen on some leaves. By mid-late August, the regular spray plots had received two foliar fungicides, the flowering onwards plots had one application and the other treatments had no fungicide applied. At this time discrete lesions were seen on the leaves of plots that had received no foliar fungicide applications, whilst the regular spray plots had specks of disease on leaves and the flowering onwards plots were in between. By the time the final rating was done, regular spray plots had significantly less disease than all other treatments. The regular spray plots showed discrete lesions on leaves, whilst other treatments had larger lesions and defoliation of some plants. There was no difference in the disease level seen in the flowering onwards, alert or nil plots.

No 'red alerts' based off the consecutive 12 hours system were received throughout the season. From mid-July through until the end of August long periods of relative humidity higher than 100% within the crop canopy were measured (Figure One). These conditions continued for regular periods of up to 170 consecutive hours. When the crop experiences such high humidity, the *Botrytis* fungus can release spores, when temperature is 8-15°, although it will occur more slowly than it would at warmer temperatures. Given extremely high humidity was measured in the crop regularly from July through to September, with above average rainfall falling in July, August, and September (Table One), weather conditions in 2021 were ideal for the development of chocolate spot even without reaching the 15-25° temperature range for long enough to trigger the alert system. This explains why disease levels in the alert plots were not different than the nil plots. It also explains why the WA recommended practice of spraying from flowering onwards was insufficient at controlling disease in this trial, given the wetter than average conditions began in early July before flowering had started, and when temperatures were still cooler than required for chocolate spot to progress with normal humidity levels. The alert system is still being developed and appropriate parameters refined. Based on our results in WA in 2021 and from other states where very high humidity over long periods of time has led to high disease levels at lower temperatures than expected, modifications to the alert system will be made by SARDI. We are confident that these modifications will enable alerts to successfully guide spray decisions even in unusual seasons of high rainfall and humidity such as 2021.

Seed yields of PBA Bendoc at Frankland River in 2021 following application of fungicides from flowering onwards (DPIRD current recommendation) and a more rigorous Regular spray regime were similar (Table 5). Seed yield closely followed our final disease rating (Figure 3).

Table 5: **Yield (t/ha), REML spatial**

Treatment	Mean	Sig
Nil fungicides	3.0	a
Flowering onwards	4.1	b
Regular Sprays	4.6	b
Humidity/temp sensor	3.5	a

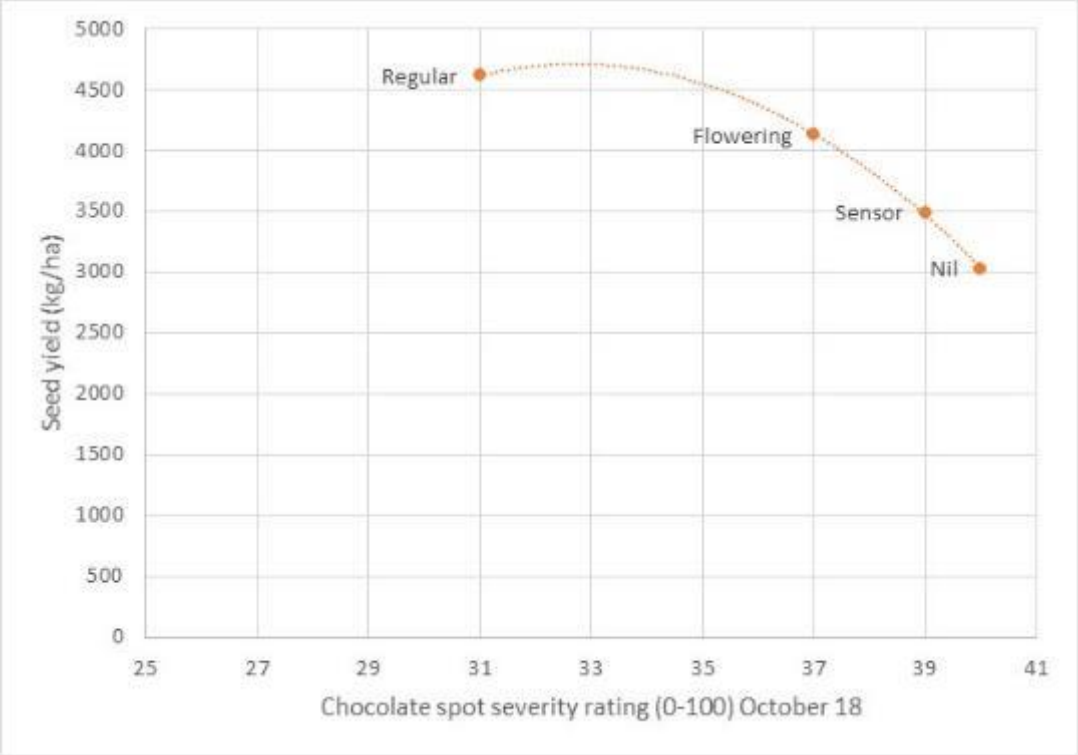

Figure Three: **Relationship between chocolate spot ratings (18 October 2021) and seed yield (kg/ha) of faba bean at Frankland River from. $R^2 = 0.99$.**

Comments

DPIRD's current recommendations of the first spray at flowering and a follow up spray produced similar yields to regular spray treatment which had four fungicide applications. The SARDI alert system was set to Red Alert if temperate was above 15°C and 70% humidity for 12 consecutive hours - which appeared to put too much emphasis on temperature. Whereas if we had used humidity alone the alerts may have occurred much earlier in the year in early August and most likely closely tracked the 'regular spray' treatment.

Acknowledgements

This trial is part of the DPIRD/GRDC co-investment "DAW1903-004RTX: High Value Pulses - Raising awareness, optimising yield and expanding the area of lentil, chickpea and faba bean in Western Australia". Thanks to Michelle Sampson for excellent technical assistance, TrialCo for trial management, and Simon Hilder for the trial site and ongoing interest in faba beans.

Contact: Stacey Power, Stacey.power@dpird.wa.gov.au, 0472 847 815