Chickpea, Disease Management, MRZ Wimmera (Horsham), Victoria

Aim

To evaluate chickpea varieties and breeding lines against ascochyta blight and their response to foliar fungicide application.

Treatments

Varieties: Refer to Table 2.

Fungicide Treatments: Refer to Table 1 for treatments and application rates.

Strategic sprays were applied before rainfall events, at key growth stages, to maximise foliage protection, which were 4th node and late vegetative/early flowering stage. Due to late rainfall, all treatments had a podding Chlorothalonil fungicide applied to protect the pods and seed quality.

The trial was inoculated with infected stubble on 18th July 2018.

Table 1. Fungicide treatments and the number of sprays applied for each fungicide spray to assess the control of Ascochyta Blight in chickpea at Horsham during 2018.

Seed Treatment	Rate (g/kg)	In Season Fungicide	Rate (gai/ha)	Timing	Number of Sprays
Nil		Nil			0
Thiram Thiabendazole	0.72 0.4	Chlorothalonil	1080	Strategically	3
Thiram Thiabendazole	0.72 0.4	Bixafen Prothioconazole	45 90	Strategically	2+1[A]
Thiram Thiabendazole	0.72 0.4	Chlorothalonil	1080	Fortnightly	7

[A] This was a final podding spray of Chlorothalonil (1080 gai/ha) due to a late rainfall event

Other Site Details

Sowing Date	22 May
Stubble (height cm)	Standing (20)
Row Spacing (cm)	36
Fertiliser (kg/ha)[1]	80
Plant density (plants/m^2)	35

1. MAP (9.2, 20.2, 0, 2.7) + Zn (2.5)

Results and Interpretation

- **Key Messages:** Despite a dry year with low grain yields, ascochyta blight was observed in all varieties, with stem breakages visible. There was a significant interaction between variety and fungicide treatment. This showed some newer breeding lines including CICA1352, CICA1454, CICA1156 ranked equal or better than Almaz and Genesis 090 (Table 2).
- Grain yields varied significantly, with a significant variety and treatment affect observed. Grain yield losses up to 36% were observed in the untreated (nil) plots (Table 3). This also highlighted CICA1156, CICA1552, 'C1', and CICA1652 which ranked higher for yield than the highest named variety Almaz. In a pairwise analysis only CICA1652 was significantly higher than Almaz.

- **Establishment and Plant Growth:** Plant growth and establishment was late with reduced rainfall throughout the season. Numerous small rainfall events were observed but equated to little plant growth with the soil drying quickly. Warmer than average temperatures and decreased rainfall limited yield at the site.

- **Plant Disease:** Ascochyta blight infection started well at the site post inoculation, with symptoms progressing well. Despite fog throughout August, with frequent small rainfall events, the warmer conditions and lack of significant rainfall meant that it was drier and these conditions limited disease progress. Multiple assessments were undertaken but the disease did not progress further than the

results presented in Table 2. This meant that the most susceptible variety Howzat had only 66% plot area affected during 2018, compared to complete plot death in previous years. Late rainfall events meant that a late Chlorothalonil was sprayed over all treatments except the nil. This resulted in low levels of pod infection but due to the low levels it could not be assessed visually.

- **Grain Yield and Profitability:** There was a significant difference detected in grain yield between varieties, despite the significant differences in ascochyta blight infection. This may be due to the low grain yields with the lowest grain yield reported to be 0.25 and highest 0.72 t/ha. The analysis of variance also showed a significant fungicide treatment affect. The pairwise analysis of this highlighted significant differences between all 4 treatments, with 36% loss in the nil, 15% in the bixafen + prothioconazole strategically, and 8% in the Chlorothalonil strategically fungicide treatments when compared to the Chlorothalonil fortnightly treatment.

- **Grain Quality:** The grain weight, seed size index, percentage of grains less than 6mm in size and percentage of grains 6-7mm in size are presented in Tables 4-7. There was a significant interaction between variety and fungicide treatment for one hundred grain weight and percentage of grains less than 6mm in size (Table 4 and 6). However, overall it appeared a higher grain weight was observed in the fortnightly Chlorothalonil treatment (Table 4). There was a significant variety and fungicide treatment affect for seed size index and the percentage of grains in the 6-7 mm size category (Tables 5 and 7). There was significantly higher seed size index in the Chlorothalonil Fortnightly and Chlorothalonil Strategically treatments compared to the Bixafen + Prothioconazole Strategically and Nil fungicide treatments (Table 5). There were approximately 1% more grains in the 6-7mm category in the Bixafen + Prothioconazole Strategically and Nil fungicide treatments compared to the Chlorothalonil Fortnightly and Chlorothalonil Strategically treatments (Table 7). There were significant ($P<0.05$) variety affects but not treatment affects for the seed size categories between 7mm and 11mm.

Table 2. Percentage (%) of plot affected by ascochyta blight in 15 chickpea varieties at Horsham assessed on the 24th September 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
CICA1352	0	0	0	8	2
CICA1454	0	1	0	6	2
CICA1652	0	[A]	[A]	18	3
CICA1156	0	3	1	16	5
Almaz	0	4	1	21	6
CICA1552	0	0	1	28	7
'C1'	1	3	2	24	7
Genesis090	0	3	0	33	9
Kalkee	0	0	1	35	9
CICA1551	0	4	4	43	13
PBA Slasher	1	6	15	45	17
PBA Monarch	0	14	5	58	19
CICA1521	0	9	7	63	20
Howzat	0	14	4	66	21
CICA1841	0	25	21	44	23
Mean	0	5	4	34	
	P	**LSD**			
Variety	**<0.001**	**6.8**			
Treatment	**<0.001**	**3.5**			
Variety x Treatment	**<0.001**	**13.6**			

[A] These plots were not sown due to a lack of seed

Table 3. Grain yield (t/ha) of 15 chickpea varieties inoculated with ascochyta blight and undergoing 4 different treatment methods to control the disease conducted at Horsham during 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
CICA1841	0.44	0.25	0.26	0.31	0.32 a[B]
PBA Monarch	0.58	0.37	0.58	0.28	0.45 b
Howzat	0.55	0.50	0.58	0.33	0.49 bc
Kalkee	0.57	0.51	0.51	0.38	0.49 bcd
CICA1352	0.62	0.45	0.55	0.41	0.51 bcde
CICA1551	0.58	0.54	0.53	0.40	0.51 bcde
Genesis090	0.57	0.51	0.56	0.43	0.52 bcde
PBA Slasher	0.66	0.54	0.52	0.36	0.52 bcdef
CICA1454	0.52	0.54	0.55	0.50	0.53 cdef
CICA1521	0.65	0.54	0.61	0.35	0.54 cdef
Almaz	0.61	0.53	0.60	0.43	0.54 cdef
CICA1156	0.72	0.58	0.57	0.39	0.56 def
'C1'	0.65	0.63	0.66	0.38	0.58 ef
CICA1552	0.65	0.62	0.69	0.43	0.59 fg
CICA1652	0.81	[A]	[A]	0.47	0.66 g
Mean	0.61 a	0.52 b	0.56 c	0.39 d	
	P	**LSD**			
Variety	**<0.001**	**0.073**			
Treatment	**<0.001**	**0.038**			
Variety x Treatment	**0.26**	***n.s.***			

[A] These plots were not sown due to a lack of seed

[B] Different letters indicate a significant pairwise difference between average grain yields (P<0.05)

Table 4. Grain weight (g/100seed) of 15 chickpea varieties inoculated with ascochyta blight and undergoing 4 different treatment methods to control the disease conducted at Horsham during 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
PBA Slasher	21.7	21.5	21.4	20.9	21.4
'C1'	23.0	23.0	22.9	22.9	22.9
CICA1521	23.2	23.0	22.4	23.3	23.0
Howzat	25.2	25.3	25.1	24.4	25.0
CICA1841	29.1	27.4	28.3	28.2	28.2
Almaz	30.3	29.0	29.9	30.1	29.8
Genesis090	32.5	30.2	32.3	31.7	31.7
CICA1454	32.4	32.5	32.7	32.7	32.6
CICA1156	33.9	32.7	33.2	32.5	33.1
CICA1652	39.4	[A]	[A]	38.1	34.1
Kalkee	34.6	34.8	35.3	34.3	34.8
CICA1552	35.3	36.0	35.2	33.7	35.0
PBA Monarch	38.7	36.9	37.7	35.0	37.1
CICA1551	38.3	38.0	37.3	35.8	37.3
CICA1352	49.9	48.0	49.6	47.6	48.8
Mean	32.5	31.2	31.5	31.4	
	P	**LSD**			
Variety	**<0.001**	**0.91**			
Treatment	**<0.001**	**0.47**			
Variety x Treatment	**<0.001**	**1.81**			

[A] These plots were not sown due to a lack of seed

Table 5. Seed size index of 10 kabuli chickpea varieties inoculated with ascochyta blight and undergoing 4 different treatment methods to control the disease conducted at Horsham during 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
Almaz	7.30	7.25	7.28	7.34	7.29 a[B]
Genesis090	7.41	7.32	7.41	7.38	7.38 b
CICA1454	7.54	7.49	7.53	7.50	7.52 c
CICA1156	7.69	7.66	7.64	7.62	7.65 d
CICA1552	7.74	7.84	7.77	7.66	7.75 e
Kalkee	7.77	7.76	7.82	7.77	7.78 e
PBA Monarch	7.95	7.91	7.92	7.81	7.90 f
CICA1551	7.95	7.93	7.93	7.85	7.92 fg
CICA1652	7.98	[A]	[A]	7.94	7.97 g
CICA1352	8.62	8.56	8.61	8.55	8.58 h
	7.79 a	7.77 ab	7.79 a	7.74 b	
	P	**LSD**			
Variety	**<0.001**	**0.059**			
Treatment	**0.022**	**0.037**			
Variety x Treatment	**0.630**	***n.s.***			

[A] These plots were not sown due to a lack of seed

[B] Different letters indicate a significant pairwise difference between average grain yields (P<0.05)

Table 6. Percentage of grains less than 6mm in size of 10 kabuli chickpea varieties inoculated with ascochyta blight and undergoing 4 different treatment methods to control the disease conducted at Horsham during 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
CICA1352	0.9	1.2	1.0	1.0	1.0
CICA1652	1.3	[A]	[A]	1.2	1.3
CICA1552	1.5	1.2	1.3	1.5	1.4
CICA1551	1.6	1.5	1.2	1.1	1.4
CICA1454	1.4	1.7	1.6	1.4	1.5
Kalkee	1.1	2.0	1.6	2.3	1.7
CICA1156	1.4	1.4	2.1	2.2	1.8
PBA Monarch	2.0	1.7	1.9	1.5	1.8
Almaz	2.1	3.0	1.9	2.2	2.3
Genesis090	2.3	3.4	2.0	1.7	2.3
	1.6	1.9	1.6	1.6	
	P	**LSD**			
Variety	**<0.001**	**0.38**			
Treatment	**0.069**	***n.s.***			
Variety x Treatment	**0.006**	**0.77**			

[A] These plots were not sown due to a lack of seed

Table 7. Percentage of grains 6 to 7 mm in size of 10 kabuli chickpea varieties inoculated with ascochyta blight and undergoing 4 different treatment methods to control the disease conducted at Horsham during 2018.

Variety	Chlorothalonil Fortnightly	Bixafen + Prothioconazole Strategically	Chlorothalonil Strategically	Nil	Mean
CICA1352	2.6	2.7	2.1	2.9	2.6 a[B]
CICA1652	2.8	[A]	[A]	3.3	3.0 a
CICA1551	4.2	3.8	4.3	5.4	4.4 b
CICA1552	5.7	4.5	5.1	6.3	5.4 c
PBA Monarch	5.0	5.6	5.0	6.2	5.4 c
Kalkee	6.5	6.9	5.3	6.7	6.3 d
CICA1454	6.4	6.5	6.1	7.3	6.6 d
CICA1156	6.4	8.7	6.7	7.1	7.2 d
Genesis090	7.4	10.0	7.1	9.0	8.4 e
Almaz	10.8	13.4	11.8	11.0	11.8 f
	5.8 a	6.5 b	5.6 a	6.5 b	
	P	**LSD**			
Variety	**<0.001**	**0.90**			
Treatment	**<0.001**	**0.57**			
Variety x Treatment	**0.214**	***n.s.***			

[A] These plots were not sown due to a lack of seed

[B] Different letters indicate a significant pairwise difference between average grain yields (P<0.05)