A petal survey for Sclerotinia in canola across NSW and northern Victoria

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Key findings

- Sites in the Riverina, Cootamundra, Cowra and Grenfell developed high levels of Sclerotinia-infested petals during the flowering period in 2015.
- No correlation was found between individual districts and petal infestation levels.
- The amount of rainfall during flowering was positively correlated to the level of inoculum.
- Rainfall during flowering is not the only factor that determines the level of petal infestation. Other factors such as initial inoculum level (from sclerotia), crop height, crop-canopy density and paddock history play a significant role.

Introduction

Petal testing, used as one of the Sclerotinia disease forecasting tools, can provide information on the presence and levels of Sclerotinia inoculum, which can lead to the stem rot developing in canola. Ascospores are released from apothecia (the fruiting structures of the Sclerotinia fungus) in winter and early spring and colonise canola petals when conditions are favourable. The infected canola petals fall into the canola crop canopy and can become lodged against a stem (main stem or branch). If environmental conditions are favourable, a stem lesion and stem rot can subsequently develop, causing yield loss.

Some districts in NSW and Victoria are known to frequently develop Sclerotinia stem rot. The purpose of conducting the petal survey was to identify if there are significant differences in the level of petal infestation between districts where the disease develops frequently, compared with those districts where the disease develops once every few years. This information will indicate what influences disease development, background inoculum levels or environmental conditions, or both.

Site details

Weekly petal samples were collected from commercial crops. Locations in NSW were divided into three meteorological districts: Riverina; South West Slopes; and Central West Slopes and Plains. Sites within the Riverina included Lockhart, Alma Park, Morven and Howlong. Sites within the South West Slopes included Mirrool, Pucawan, Coolamon, Junee, Harden and Cootamundra. Sites within the Central West Slopes and Plains included Condobolin, Forbes, Parkes, Manildra, Cowra and Grenfell. All petal samples from Victoria were collected from four commercial crops located at Dookie. Details on the paddock, time of sowing, time of fungicide application, date of sample collection, bloom stage, variety, nearest town location, the presence of apothecia and stem lesions (weekly) were recorded.

Sample collection and analysis

Flower heads were collected weekly from each site during the flowering period and were sampled from areas within the crop where no foliar fungicide had been applied. Collected samples were then sent to NSW DPI at Wagga Wagga for analysis. Random petals from the flower heads were plated onto agar plates and analysed after seven days. Counts were then taken for the number of Sclerotinia colonies present on a plate. Daily rainfall from Bureau of Meteorology (BOM) weather stations nearest to each site or location was used.

There are limitations with the testing procedure. The test cannot differentiate whether the Sclerotinia colony grew from an ungerminated resting Sclerotinia ascospore, or from an infected and colonised petal. However the result does give an indication of inoculum potential. Hence the term 'infested' is used rather than 'infected' to describe the level of inoculum present.

Results and discussion

The overall petal test survey showed that all sites in the Riverina had high levels of infestation throughout most of the flowering period (Table 1). Pucawan and Cootamundra had the highest levels of petal infestation in the South West Slopes compared with other sites within the district, which had moderate levels of petal infestation (Table 2). Only two sites in the Central West Slopes and Plains, Cowra and Grenfell, had high levels of petal infestation, while other sites within the district had low to moderate levels of infestation (Table 3). Two paddocks in Dookie had high levels of petal infestation while the other two sites showed moderate levels of infestation (Table 4).

Out of all the sites tested, only sites within the Riverina were shown to have the same pattern of infestation levels throughout the flowering period. The rest of the NSW and Victorian sites did not congregate according to their meteorological districts ($P > 0.05$). This is most likely due to the different amounts of rainfall and other factors that contribute to the level of inoculum released in the individual site within a district.

Positive correlation was detected between the level of petal infestation and the amount of total rainfall during flowering ($P < 0.05$). This was particularly apparent in the South West Slopes and the Central West Slopes and Plains, where an increase in rainfall during the flowering period coincided with an increase in the level of petal infestation. This pattern is clearly observed at Condobolin (Figure 1), where the percentage of infestation peaked in late August and early September, due to the increasing amount of rainfall. However, at some high rainfall sites only moderate levels of petal infestation were recorded. In this instance, paddock history is significant in determining the level of inoculum. The results from the four crops sampled at Dookie highlight the sporadic nature of Sclerotinia development, despite being located in close proximity. Factors such as variety, crop height, growth stage, canopy density and paddock history can all have an effect.

Table 1. Percentage of Sclerotinia infested petals and total rainfall during flowering at the Riverina sites.

Date	Week	% Petal infestation – Riverina				
		Lockhart	Alma Park 1	Alma Park 2	Howlong	Morven
27/07/15–02/08/15	1		100			100
03/08/15–09/08/15	2		100	94		100
10/08/15–16/08/15	3		100	98		100
17/08/15–23/08/15	4	100	100	100		100
24/08/15–30/08/15	5	100	100	100	100	90
31/08/15–06/09/15	6	96	100	100	100	100
07/09/15–13/09/15	7	98	98	100	100	100
14/09/15–20/09/15	8	100	100	100	100	100
21/09/15–27/09/15	9	100	100	100	96	98
28/09/15–04/10/15	10	94	96	100	100	100
05/10/15–11/10/15	11	18	23	33	64	28
12/10/15–18/10/15	12					
Total rainfall during flowering (mm)		99	111	111	107	131

Table 2. Percentage of Sclerotinia infested petals and total rainfall during flowering at the South West Slopes sites.

Date	Week	% Petal infestation – South West Slopes						
		Mirrool	Pucawan	Coolamon	Junee	Cootamundra 1	Cootamundra 2	Harden
27/07/15–02/08/15	1							
03/08/15–09/08/15	2					100	100	
10/08/15–16/08/15	3			36		100	100	
17/08/15–23/08/15	4			60		100	100	
24/08/15–30/08/15	5		62	40		94	96	46
31/08/15–06/09/15	6	46	94	54	96	100	100	80
07/09/15–13/09/15	7	76	98		88	90	100	36
14/09/15–20/09/15	8	50	82	68	58	100	100	48
21/09/15–27/09/15	9	38	96					58
28/09/15–04/10/15	10	48		42	78	100	100	78
05/10/15–11/10/15	11				12	30	18	10
12/10/15–18/10/15	12						8	
Total rainfall during flowering (mm)		90	90	131	92	112	112	97

Table 3. Percentage of Sclerotinia infested petals and total rainfall during flowering at the Central West Slopes and Plains sites.

Date	Week	% Petal infestation – Central West Slopes and Plains							
		Condobolin 1	Condobolin 2	Forbes	Parkes 1	Parkes 2	Manildra	Cowra	Grenfell
27/07/15–02/08/15	1								
03/08/15–09/08/15	2	4							
10/08/15–16/08/15	3	4			90				
17/08/15–23/08/15	4	6			82	58	50	100	
24/08/15–30/08/15	5	15				30	68	100	
31/08/15–06/09/15	6	20	20	22	48		62	96	92
07/09/15–13/09/15	7		14	46		18	64		94
14/09/15–20/09/15	8	4	8	62	58		30	76	100
21/09/15–27/09/15	9	10	22	18	10		20	94	94
28/09/15–04/10/15	10		26	4	8	6			4
05/10/15–11/10/15	11								
12/10/15–18/10/15	12								
Total rainfall during flowering (mm)		54	54	57	83	83	51	127	219

Table 4. Percentage of Sclerotinia infested petals and total rainfall during flowering at the Dookie sites.

Date	Week	% Petal infestation – Dookie			
		Dookie 1	Dookie 2	Dookie 3	Dookie 4
27/07/15–02/08/15	1				
03/08/15–09/08/15	2	60	48		
10/08/15–16/08/15	3	58	96		
17/08/15–23/08/15	4	96	100	54	98
24/08/15–30/08/15	5	98	100	42	92
31/08/15–06/09/15	6	72	98	84	100
07/09/15–13/09/15	7	26	30	28	78
14/09/15–20/09/15	8	46	92	26	88
21/09/15–27/09/15	9				
28/09/15–04/10/15	10	4		34	4
05/10/15–11/10/15	11				
12/10/15–18/10/15	12				
Total rainfall during flowering (mm)		47	50	56	57

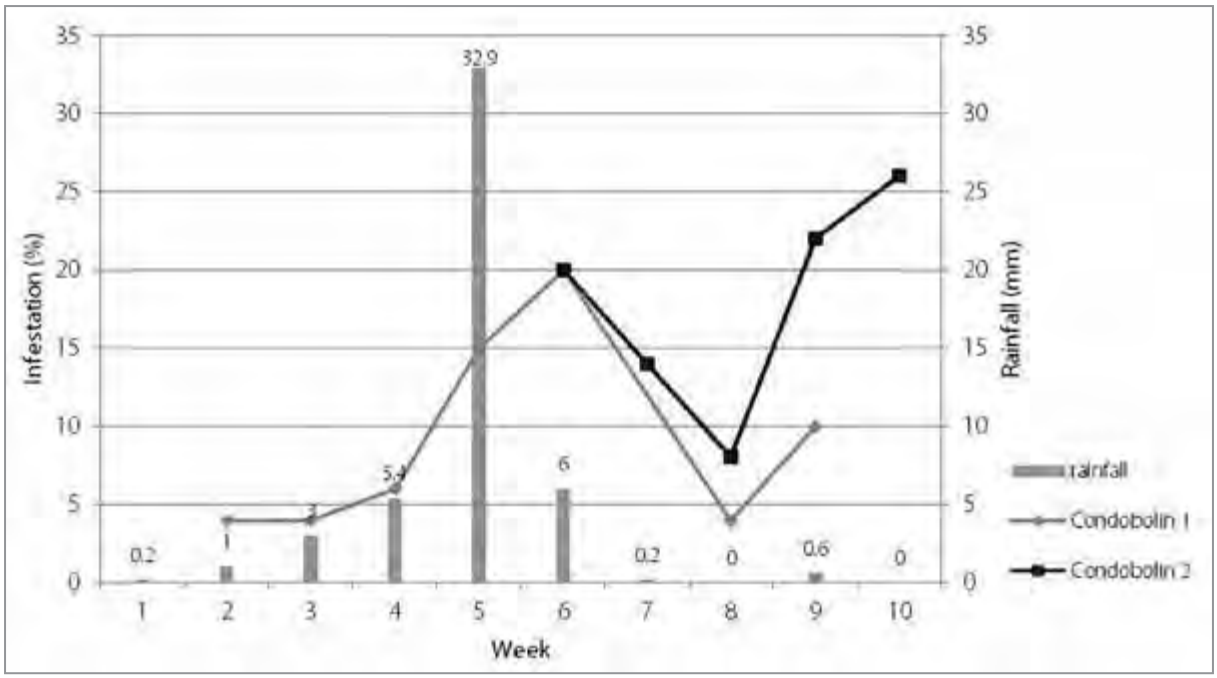

Figure 1. Percentage of petal infestation and weekly rainfall events at Condobolin 1 and Condobolin 2 during the flowering period.

Summary

All sites in this study were found to have varying levels of infestation. The level of petal infestation within each site did not cluster according to the meteorological districts, but it was positively correlated to the total amount of rainfall at an individual site during the flowering period.

High rainfall sites, for example at Cowra, Grenfell, Cootamundra and five of the Riverina sites, were found to have high levels of petal infestation from early until late bloom. At some of these sites such as Alma Park, large numbers of apothecia were seen developing within the crop before stem elongation. This shows that the level of inoculum is not a limiting factor and there is a high disease potential for these sites to develop a significant level of stem rot if the environmental conditions permit. It should be noted that the incidence of stem rot depends not only on the initial level of inoculum, but the frequency and amount of rainfall as well. Other factors such as crop-canopy density, variety and paddock history should be considered as these will have a major impact in creating a favourable micro-environmental climate for the apothecia to grow and produce ascospores leading to a high disease incidence.

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