Comparison of canola varieties for sclerotinia stem rot development in southern NSW – 2016

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Key findings

- Some early flowering varieties developed significantly higher levels of sclerotinia stem rot infection.
- Variety response to infection and yield could be relative to other factors such as infection timing and plant biomass.

Introduction

To date, there are no Australian canola varieties with known resistance to sclerotinia stem rot. Anecdotally, variation has been observed in levels of Sclerotinia development between canola varieties, either in commercial crops or at experimental sites. Often the major factor driving susceptibility to Sclerotinia infection is when flowering starts. Once flowering starts, the susceptibility to infection increases significantly, as canola petals capture fungal ascospores and spread the pathogen into the crop canopy, which can then develop into stem lesions. Varieties that start flowering early in the growing season have a greater chance of developing stem infection due to prolonged exposure to infested senescent petals. This chance is even higher when it coincides with the ascospore release in early winter, and exposure to prolonged periods of cool, wet weather that favour disease development. Early main stem Sclerotinia infection is known to cause more yield loss compared with late main stem or branch infection.

The aim of this study was to determine what effect the start of flowering had on Sclerotinia development. Two canola experiments using a range of varieties with different flowering times were conducted in southern NSW.

Site details

Two experiments were conducted at the Wagga Wagga Agricultural Institute and at Alma Park. These sites represent the medium–high rainfall cropping region of southern NSW with intensive canola production and frequent Sclerotinia development.

Treatments

Varieties

Six commonly grown canola varieties with a range of maturity timing were used (Table 1). Seed was treated with Jockey® and sown with Impact In-Furrow®-treated fertiliser. Each experiment was in a randomised block design with four replications. No artificial pathogen inoculation or foliar fungicide was applied to the experiments during the growing season. Sowing date for the experiments was 28 and 29 April 2016 for Alma Park and Wagga Wagga, respectively.

Table 1. Canola varieties included in the 2016 Sclerotinia experiments.

Variety	Maturity*	Type	Date of 30% bloom	
			Wagga Wagga	Alma Park
Nuseed Diamond	Early maturing	Conventional hybrid	18 August 2016	17 August 2016
ATR Stringray$^{\Phi}$	Early maturing	Open pollinated	28 August 2016	24 August 2016
ATR Gem$^{\Phi}$	Early–mid maturing	Open pollinated	30 August 2016	1 September 2016
ATR Wahoo$^{\Phi}$	Mid–late maturing	Open pollinated	5 September 2016	10 September 2016
Hyola® 650TT	Mid–late maturing	Hybrid	28 September 2016	1 September 2016
Archer	Mid–late maturing	Hybrid	5 September 2016	7 September 2016

* Variety maturity varies depending on the location and the time of sowing. This relative maturity timeline is adopted from the NSW DPI *Winter crop variety sowing guide 2016*.

Assessment

Commencement of flowering and bloom stages were recorded for each variety by counting the numbers of open flowers and pods on the main stem. The guide to assess bloom stages was adapted from the Canola Council of Canada Bloom assessment guide (http://www.canolacouncil.org/canola-encyclopedia/diseases/sclerotinia-stem-rot/).

Sclerotinia was assessed at the end of the growing season by counting the number of infected plants at two central locations within each plot. Different types of infection were recorded: main stem (MS), lateral branch (LB) and basal (B). The total number of healthy and infected plants was recorded to calculate the percentage of plant infection. Experiments were later harvested for yield.

Results and discussion

Both experiments showed a significant difference in the level of Sclerotinia development between some varieties and when flowering started (Table 2). Nuseed Diamond was the first variety to start flowering (tables 3 and 4) and showed a significantly higher level of Sclerotinia development compared with other varieties. Varieties that matured later, such as Archer and ATR Wahoo(ϕ), had significantly lower infection levels. Although ATR Stingray(ϕ) is an early-maturing variety, the infection level was relatively low and did not differ from ATR Wahoo(ϕ) or Archer.

This study also showed that Hyola® 650TT had the second highest infection level at both sites, most likely due to the variety developing its full bloom earlier than the other early–mid maturing varieties, ATR Gem(ϕ) and ATR Stingray(ϕ). Archer, which is a mid–late maturing hybrid, developed full bloom at a slower rate compared with Hyola® 650TT (tables 3 and 4), which could explain the lower infection rate at both experiment sites.

Yield was different for each variety at Wagga Wagga, but not at Alma Park (Table 2). There was no correlation between infection levels and yield.

The results demonstrated that variety choice and hence, timing of commencement of flowering could be a useful tool for growers to reduce the risk of Sclerotinia development.

Table 2. Effect of Sclerotinia on yield (t/ha) and plant infection (%) of six canola varieties at Wagga Wagga and Alma Park in 2016.

Variety	Yield (t/ha)		Plant infection (%)	
	Wagga Wagga	Alma Park	Wagga Wagga	Alma Park
Archer	2.46	2.07	9.28	3.63
Nuseed Diamond	2.01	2.08	39.23	57.95
ATR Gem	1.83	2.04	10.52	12.38
Hyola 650TT	2.43	1.98	27.13	25.56
ATR Stingray	1.90	1.91	4.13	18.65
ATR Wahoo	2.23	2.07	3.92	1.14
l.s.d. ($P = 0.05$)	0.17	2.03	0.87	0.85

Table 3. Bloom stage (%) development at Wagga Wagga in 2016.

Variety	11 August	18 August	25 August	7 September	16 September
Archer	<5%	<5%	<5%	30 %	>60%
Nuseed Diamond	10 %	30 %	50%	>60%	>60%
ATR Gem	<5%	<5%	10%	40%	60%
Hyola 650TT	<5%	<5%	10%	60%	>60%
ATR Stingray	5%	10%	20%	40%	>60%
ATR Wahoo	<5%	<5%	<5%	30%	60%

Table 4. Bloom stage (%) development at Alma Park in 2016.

Variety	10 August	17 August	24 August	30 August	7 September	12 September	20 September
Archer	<5%	<5%	<5%	5%	30%	50%	>60%
Nuseed Diamond	10%	20%	50%	50%	>60%	>60%	>60%
ATR Gem	<5%	<5%	10%	20%	40%	50%	>60%
Hyola 650TT	<5%	<5%	5%	20%	50%	>60%	>60%
ATR Stingray	5%	10%	30%	30%	50%	50%	60%
ATR Wahoo	<5%	<5%	<5%	5%	20%	40%	60%

Summary

These two experiments showed that some early-maturing varieties could develop a higher level of Sclerotinia compared with later-maturing varieties due to the earlier start of flowering. However, it also indicated that the interaction between the Sclerotinia infection level and yield loss is complex. Low levels of infection might not necessarily translate to higher yield and vice versa. This could be due to several factors such as infection timing, the amount of rainfall received at the site as well as the canopy architecture and characteristics of the variety. The differential response of each variety to Sclerotinia loss has implications for growers when choosing the right variety for different sowing times and growing regions.

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