Influence of Plant Age on Resistance to *Ascochyta rabiei* in Chickpea Cultivars

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Introduction

Ascochyta blight of chickpea, which is caused by the fungal pathogen *Ascochyta rabiei*, can cause severe losses in yield and seed quality. When environmental conditions favour blight development, even resistant cultivars may become heavily infected (Nene and Reddy 1987). Plant age has no impact on disease reaction in susceptible cultivars (Trapero-Casas and Kaiser 1992). However, two previous studies of the reaction of resistant cultivars as the plants mature had conflicting results, with resistance increasing in one study and declining in the other (Hafiz 1952, Sattar 1933). The objective of this study was to investigate the impact of plant age on ascochyta blight severity in partially resistant and susceptible chickpea cultivars adapted for western Canada.

Materials and Methods

The susceptible chickpea cultivar UC 27, and the partially-resistant cvs. Sanford, Myles and B90 were used to study the influence of plant age (2-3, 4-5, 6-7, 8-9 wk after seeding) on resistance in a growth chamber study and a field trial. These dates correspond to seedling, vegetative, early flowering and podding stages, respectively. In both tests, seeding of the individual cultivars was staggered slightly to synchronize the time to first flower for all four lines. This allowed us to inoculate all of the cultivars at the same growth stage. Both trials were arranged in a randomized complete block design with 4 replicates In the growth chamber trial, seeds were planted in plastic pots at 20/16^{o}C (day/night) temperature and 16 h photoperiod. In the field trial, plots were 1x3 m.

Two aggressive isolates of *A. rabiei* were used (separately) to inoculate plants in both trials. A suspension of 2 x 10^5 conidia mL^{-1} was used in the growth chamber, and infected rye seed was used in the field.. Blight severity was rated using the Horsfall-Barratt scale (0-11) at 2 wk after inoculation in the growth chamber trial and four times (2-wk intervals) after inoculation in the field. The number of lesions on the main stem and leaves of representative plants was also assessed.

Results and Discussion

In UC27 (susceptible), the number of lesions on the main stem and disease severity were not affected by plant age. In the partially-resistant cultivars, the number of lesions and disease severity increased dramatically in both trials as plants matured (Table 1, Fig. 1 & 2). Ascochyta blight severity in the resistant cultivars was lower on leaves than stems (Table 1). There were no substantial differences in infection between the two isolates (data not shown).

The cultivars used in this study represent all of the cultivars registered for commercial production in western Canada at this time. Growers know that they need to use the best resistance available to reduce their risk of loss from ascochyta blight. However, our study shows that blight resistance declines rapidly between 5 - 9 weeks after seeding in these partially-resistant cultivars. This rapid decline coincides with flowering and seed set, which are critical to yield; serious yield losses can occur even in resistant lines.

Ascochyta blight in chickpea should be managed by using an integrated approach incorporating resistant cultivars, crop rotation and disease-free seed. Fungicide application at late flowering is required to provide effective disease management on resistant lines in years when conditions are particularly favourable for disease increase (Chongo et al. 2000). Strategies relying exclusively on cultivar resistance are unlikely to provide adequate disease control in the long term.

Fig. 1. Ascochyta blight increases with increasing plant age (from left to right at 3, 5, 7 and 9 weeks after seeding) in partially resistant chickpea plants of cv. Sanford infected with *Ascohyta rabiei*.

Table 1. Effect of plant age on infection of chickpea cultivars by *Ascochyta rabiei* (isolate Jan9702) in a growth chamber trial.

Plant age (wk after seeding)	Disease severity (%)			Lesions/stem	Cultivar
	Leaves	Stems	Mean		
2	80	80	80	8	**UC27**
4	78	85	82	12	(susceptible)
6	69	85	77	18	
8	84	91	88	25	
3	2	4	3	2	**Sanford**
5	2	5	4	4	(resistant)
7	24	59	42	13	
9	57	77	69	19	
2	12	20	16	3	**Myles**
4	12	24	19	5	(resistant)
6	29	45	37	9	
8	36	67	52	16	
3	2	3	3	1	**B90**
5	5	7	6	3	(resistant)
7	8	30	19	7	
9	23	51	37	12	
† **$LSD_{0.05}$**	13	13	11	4	

Data combined from two repetitions of a 4-replicates test.

† For comparing any treatment means within columns.

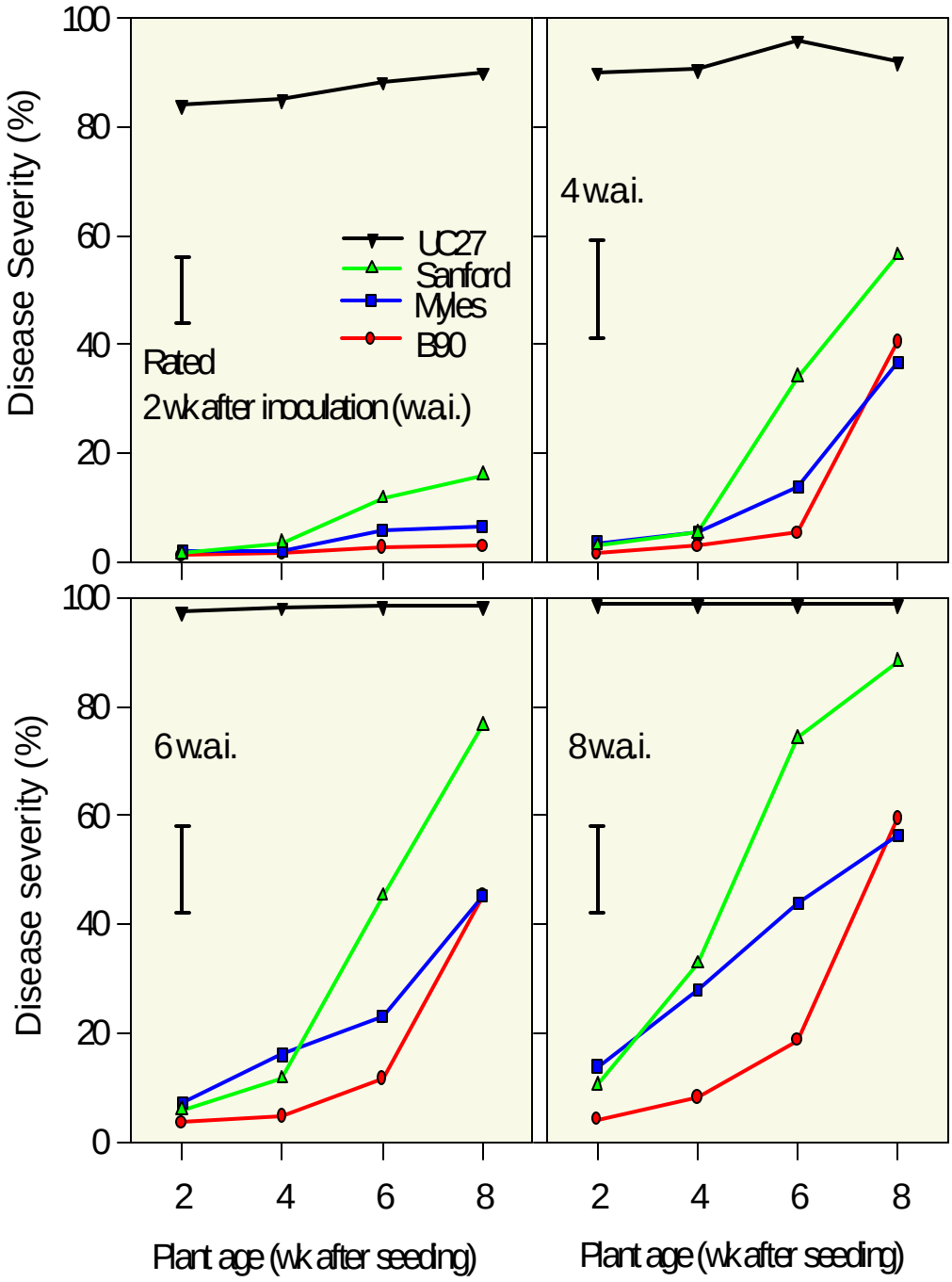

Fig. 2. Disease severity in four chickpea cultivars seeded at 2-wk intervals and inoculated on the same day with isolates Jan9702 of *Ascochyta rabiei* in a field trial at Saskatoon in 1999. Bar = $LSD_{0.05}$.

Literature cited.

Chongo, G., Gossen, B.D., and Buchwaldt, L. 2000. Pg. 275-276, Report #99 *In*: 1999 Pestic. Manage. Res. Rep., AAFC, Ottawa, ON. (published on diskette).

Hafiz, A. 1952. Phytopathology **42**:422-424.

Nene, Y.L., and Reddy, M.V. 1987. Pg. 233-270 *In*: Saxena, M.C., and Singh, K.B. *(eds.)* C.A.B. International, Oxfordshire, UK.

Sattar, A. 1933. Ann. Appl. Biol. **20**:612-632.

Trapero-Casas, A., and Kaiser, W.J. 1992. Phytopathology **82**:589-596.

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