Variety, Plant Population vs. Severity of Ascochyta Blight in Chickpea

Y. Gan[1], L. Li[2], and G. Ford[1]

[1]Agriculture and Agri-Food Canada, Swift Current, SK, S9H 3X2
[2] Dep. of Plant Sciences, Univ. of Saskatchewan, Saskatoon, SK, S7N 5A8

INTRODUCTION

Ascochyta blight, a fungal disease caused by *Ascochyta rabiei* (Pass.) Labrousse, is the major constraint for chickpea production in western Canada. The crop infected with *Ascochyta rabiei* reduces seed yield and quality significantly, and in some circumstances yield losses for susceptible cultivars are as high as 100%. The development of integrated disease management is the key for successful chickpea production. Choice of cultivars is one of the key components of integrated disease management practices. An optimum plant population density will minimize disease development and maximize seed yield. This study determined (i) the effect of cultivar types (i.e., cultivars with fern vs. unifoliate leaves; cultivars with branchy vs. erect growth habit, and desi vs. kabuli types) on the severity of ascochyta blight, and (ii) the response of ascochyta blight to plant population density for chickpea in the short-seasoned western Canada.

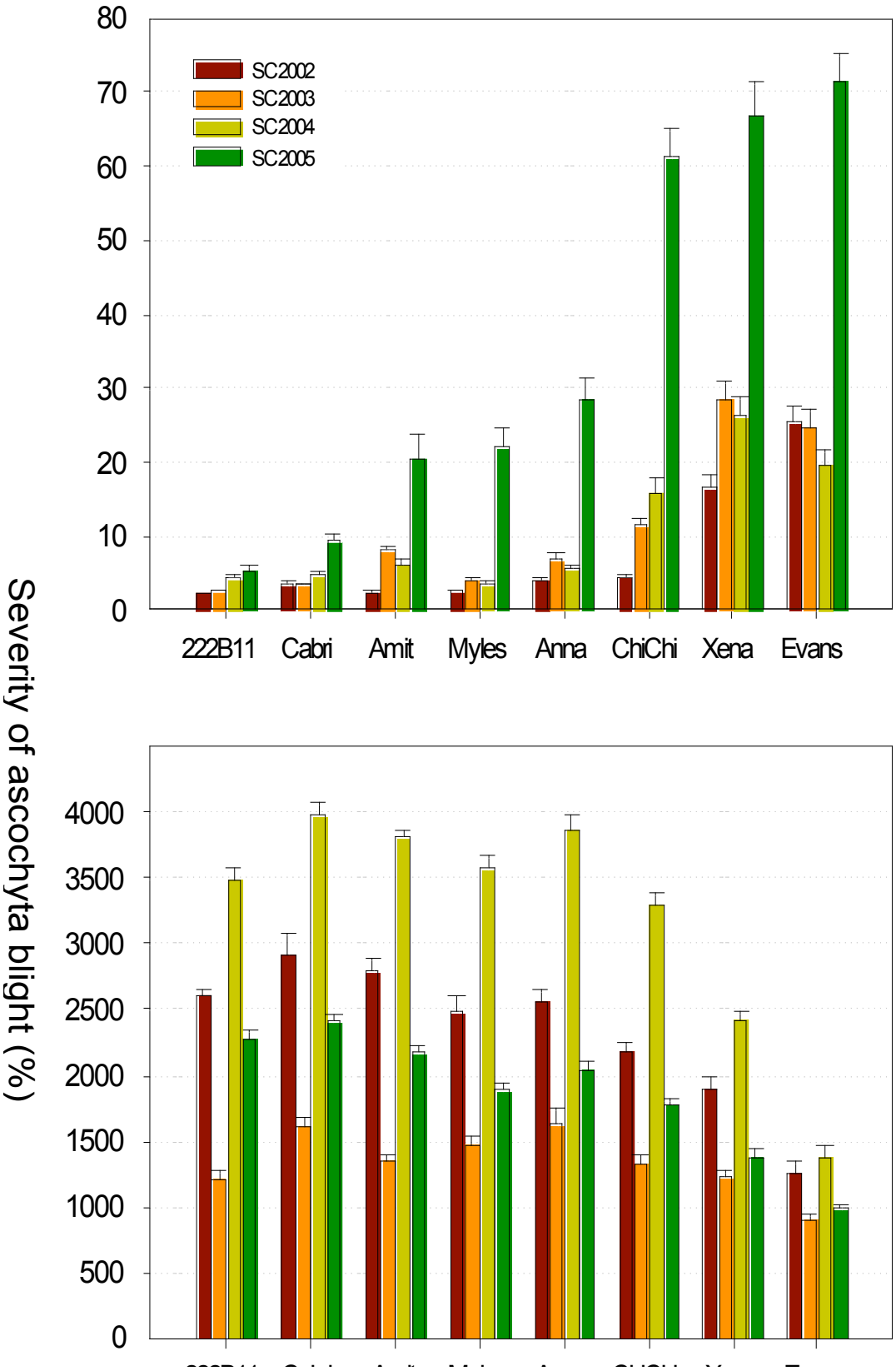
METHODOLOGY

Field experiments were conducted in Swift Current during 2002-2005. Eight genotypes were studied: 2 kabuli with fern leaf (Amit, CDC Chichi), 2 kabuli with unifoliate leaf (CDC Xena, Evens) and 4 desi type with fern leaf (CDC Anna, CDC Cabri, Myles, and Line 222B11). Each variety/line was grown under plant density of 20, 35, 50, 65, and 80 plants m^{-2}. Disease severity was assessed at seedling, early flowering, late-flowering, and late-podding stages using a 0 to 11 scale with 0 representing no symptoms and 11 representing the whole plant diseased. The ratings were then converted to percentage of severity with rating of 1 being converted to 2.3% and rating of 11 to 99%. Plots were harvested for seed yield and quality.

RESULTS AND DISCUSSION

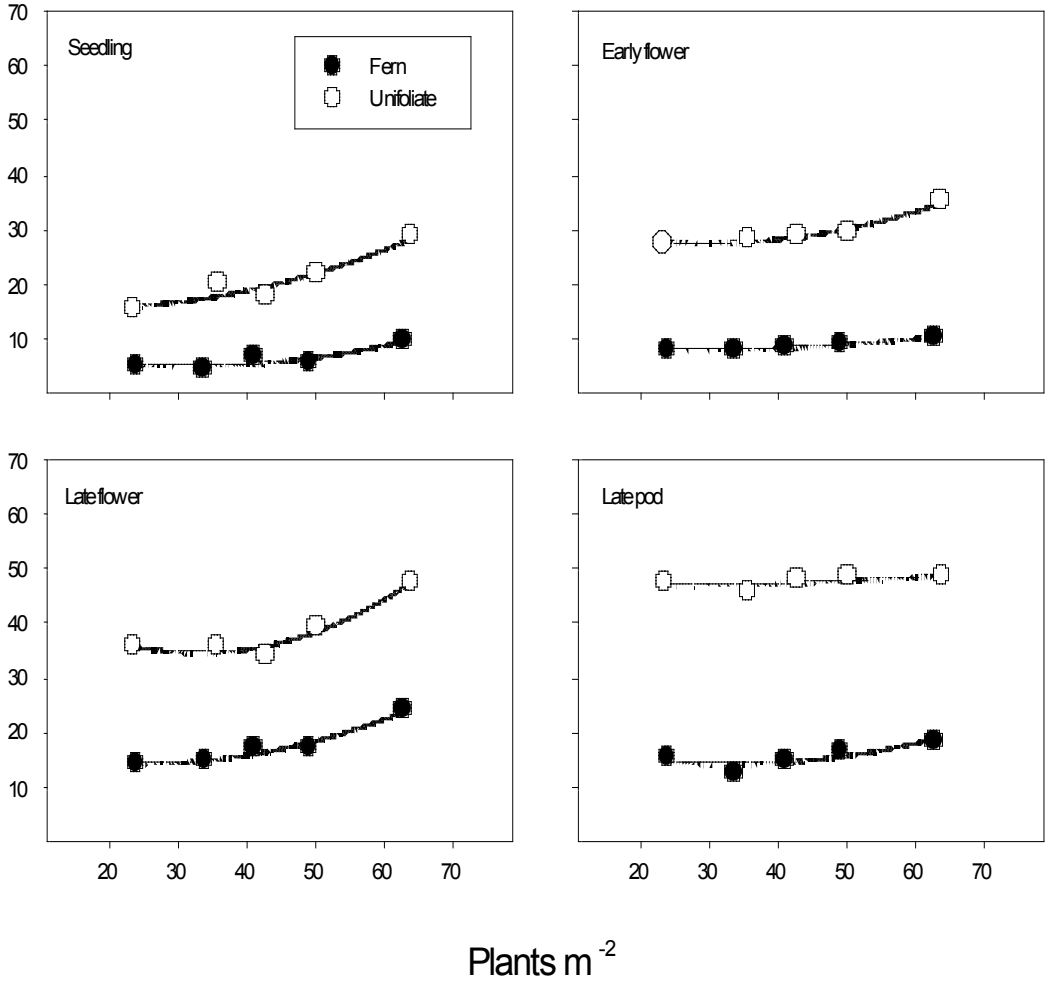
The severity of ascochyta blight was highest in 2005 (25% averaged across all varieties) and lowest (8%) in 2002 (Fig. 1). Excessive rains in July 2005 (123 mm) and ideal temperature (14.7C) might have shortened the time required to complete an infection cycle of the pathogen, thereby increased the number of cycles that occurred during the growing season.

Fig. 1. The disease severity and seed yield of chickpea cultivars grown at Swift Current 2002 (SC2002) through 2005.


Severity of ascochyta blight (%)
SC2002
SC2003
SC2004
SC2005
0
10
20
30
40
50
60
70
80
222B11
Cabri
Amit
Myles
Anna
ChiChi
Xena
Evans
0
500
1000
1500
2000
2500
3000
3500
4000

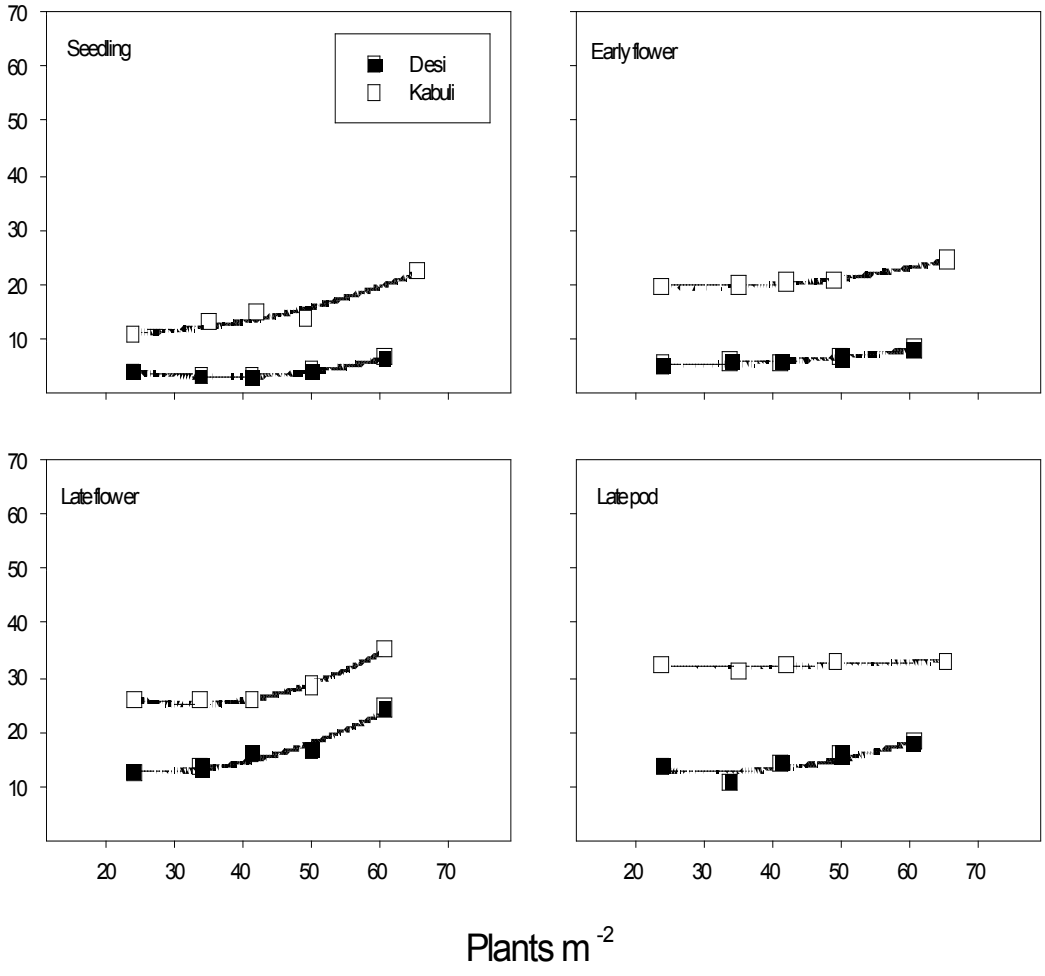
Varieties with fern leaves had consistently lower disease ratings at all growth stages measured during the growing season (Fig. 2). The severity of ascochyta blight increased as plant population density increased.

Fig. 2. The severity of ascochyta blight of fern versus unifoliate chickpea varieties measured at seedling, early flower, late-flowering, and late-pod growth stages.



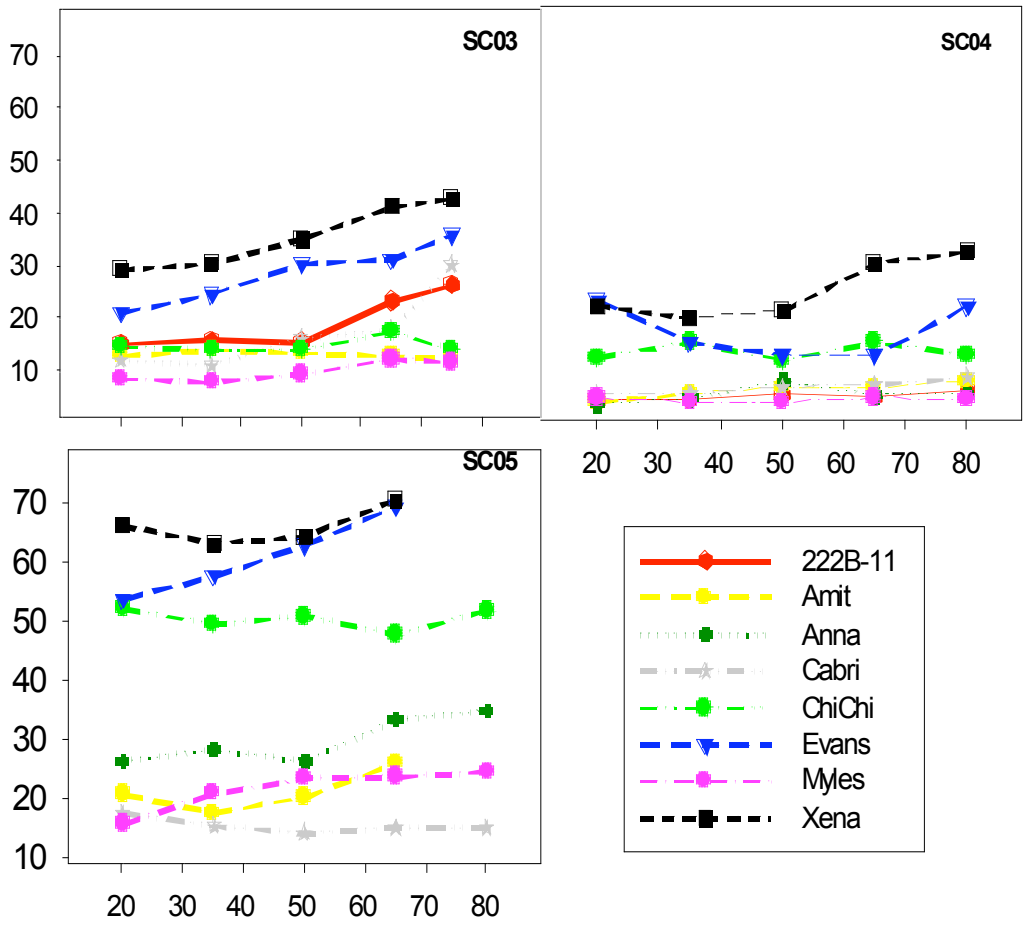
On average, desi varieties consistently had lower severity of ascochyta blight than kabuli chickpea under the same growing conditions (Fig. 3). Varieties with erect growth habit had slightly lower disease severity than those with prostrate growth habit, but the results were inconsistent across years (data not shown).

Fig. 3. The severity of ascochyta blight of desi versus kabuli chickpea varieties measured at seedling, early flower, late-flowering, and late-pod growth stages.



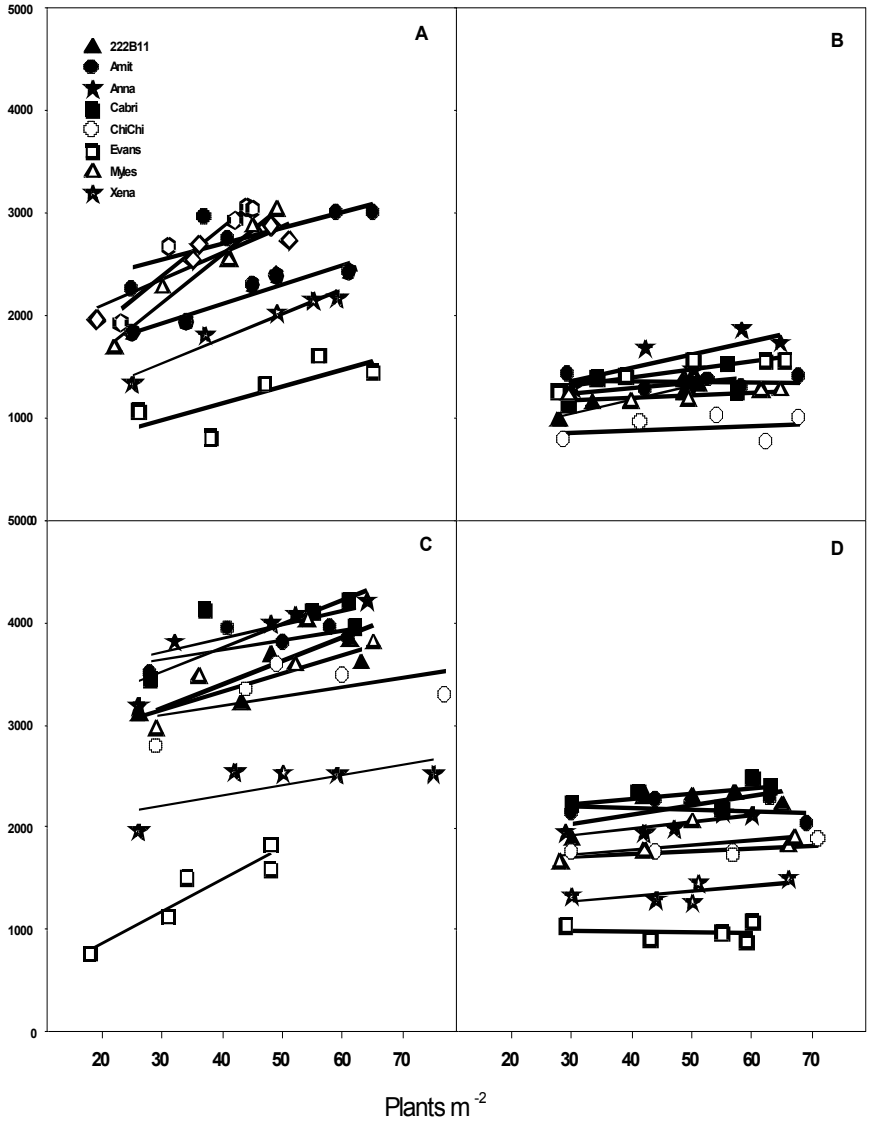
There was significant interaction between variety and plant population density in influencing the ratings of disease severity (Fig. 4). The disease severity increased as plant density increased from 20 to 80 plants m^{-2} for some varieties, but this trend did not show in other varieties tested. Overall, trial site and year had greatest impacts on disease severity, followed by choice of cultivar types, and the influence by plant density had lowest influence on the severity of ascochyta blight in chickpea. Once ascochyta blight occurred in a field, all plants tended to be infected regardless of plant density.

Fig. 4. Interactive effects of test site-year, variety and plant density on the severity of ascochyta blight in chickpea grown at Swift Current 2003 (SC03) to 2005.



Seed yield per a unit area increased as plant population increased due to more seeds produced per the unit area (Fig. 5), despite more disease on the basis of individual plants (Fig. 3). Seed yield on a single plant basis decreased as plant population density increased; this was largely due to stronger plant-to-plant competition for growth resources such as water and nutrients, and it was also due to increased blight severity for some cultivars.

Fig. 5. Seed yield of chickpea varieties in response to plant density at Swift Current in (A) 2002, (B) 2003, (C) 2004, and (D) 2005.



CONCLUSION

Growing season environmental conditions had greatest influence on ascochyta blight in chickpea; in wet years this disease will develop aggressively regardless of plant population or cultivar. However, under the same growing conditions, fern leaf varieties always produce less disease than unifoliate leaf varieties, and desi has less disease than kabuli varieties. Plant population density will play a marginal role in influence of the magnitude of ascochyta blight in chickpea.