Yield losses in wheat associated with different levels of resistance to speckled leaf blotch (mycosphaerella graminicola)

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Speckled leaf blotch, caused by *Mycosphaerella graminicola (Septoria tritici),* seriously limits wheat yields in the southern cropping areas of Australia. Disease severity is associated with early sowing and frequent spring rains in southern New South Wales (Murray, unpublished), conditions which also favour high potential yields. Breeders are currently developing resistant varieties to control this disease. The capacity for such resistance to augment yields is reported.

Methods

The trial comprised 64 *T.* aestivum and *T.* durum cultivars and lines with varying reactions to speckled leaf blotch from the New South Wales breeding programs. It included lines selected for resistance by R. Martin and J. Kuiper and was sown on 12-13 May, 1981 at Wagga Wagga as a square lattice design replicated four times. Lattice blocks were split with one half receiving fungicide treatment to control speckled leaf blotch. Plot size was 13 m . Heading date, plant height at maturity and plot yield were measured; disease was assessed in early spring using Rosielle's method (1). Yield loss was analysed as the difference in yield between sprayed and unsprayed plots.

Results and Discussion

Speckled leaf blotch established rapidly during winter, when rain periods were frequent, and continued to progress during September. However, the disease reached only moderate severity because of the generally dry spring. Plants became severely moisture-stressed by the end of October. Speckled leaf blotch was the only disease of significance.

Yield loss and disease score were highly correlated. Seventeen lines were rated as moderately resistant, 27 as moderately susceptible and 20 as susceptible; mean yield losses of the groups were 2.2, 5.3 and 10.6 respectively. Most of the loss resulted from reduced kernel mass. Yield when diseased (unsprayed) was modelled as a.function of disease rating and yield when disease-free (sprayed). The resulting family of three equations accounted for 86.7 percent of the variance of diseased yield, as follows:

for susceptible lines, $YU = 0.81YS + 0.26$

for moderately susceptible lines, $YU = 0.81YS + 0.44$

for moderately resistant lines, $YU = 0.81YS + 0.53$

where YU and YS are unsprayed and sprayed yields in tonnes per hectare.

Several high-yielding, disease-resistant wheats were found among lines from both northern and southern programs. Interestingly, Banks, which was selected in Queensland in the absence of the disease, had the lowest disease score of the cultivars. Its higher yield compared with Condor when diseased (3.40 versus 3.05 t ha^{-1}) probably resulted from resistance, because their yields when disease-free were equal (3.49 t ha^{-1}). Even in a moderate epidemic such as that of 1981 the yields of susceptible wheats can be increased significantly by disease control (e.g. 19% increase for Robin). In wetter seasons yield increases of more than 150% have been recorded for Robin (2). Thus high-yielding, disease-resistant lines should exploit favourable springs much more than current cultivars while having a similar yield potential in dry seasons.

1. Rosielle, A.A. 1972. Euphytica 21: 152-161.

2. Kuiper, J. 1978. p.14-1 in Close et al. (editors), Epidemiology and Crop Loss Assessment, Workshop Proceedings, Lincoln College.