Physiological responses of wheat to speckled leaf blotch

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Speckled leaf blotch (Mycosphaerella graminicola) is a major foliar disease of wheat in southern and western Australia. Our overall objective is to model disease development and its effects on plant growth and yield, as a basis for resistance breeding and agronomic management of the disease. As the disease affects leaf area and hence light interception and water use, we are developing a standard crop growth/water use model with a function estimating the development of necrotic leaf area. However, there is some evidence that the fungus produces a toxin, and this toxin may have a specific effect on root growth or function.

A pot experiment was designed to separate the effect of localised leaf necrosis on transpiration from the effect of translocated toxins on root growth and function.

Methods

The growth and water relations of inoculated plants were compared with uninoculated control plants when lesions appeared on the leaves, twenty one days after inoculation.

Results and Discussion

Transpiration, leaf water potential and the reduction of green leaf area (GLA) from speckled leaf blotch (SLB) are shown in Table 1.

Table 1. Effects of SLB on GLA and the water relations of wheat

	GLA	TRANSPIRATION			LEAF ψ
		Total	Hourly	Per unit GLA	
	(cm^2 pot^{-1})	(cm^3 pot^{-1})	(cm^3 hr^{-1} pot^{-1})	(cm^3 hr^{-1} cm^{-2})	(- MPa)
No SLB	884	216	6.8	0.010	0.92
SLB	657	182	7.1	0.011	0.98
Difference	227	34	1.7		

SLB reduced GLA by 26%. The difference in transpiration of 1.3 cm hr coupled with qe small total transpiration difference of 34 cm ("- one day at 1.7 cm hr) indicates that transpiration was probably reduced only after leaf necrosis started.

Hourly transpiration was a function of GLA, providing no evidence for an effect of a toxin on water use other than through leaf necrosis.

Water potential in healthy leaves of plants with or without SLB were similar, indicating that there is no effect of toxins on the water status of the green leaves on diseased plants.

Confirmatory data are required from studies with pure toxin, but the circumstantial evidence is that no toxins are translocated to roots which have any significant effect on growth (data not presented) or water uptake. This means the effects of SLB on plant growth and water use can be modelled simply with a function to reduce GLA according to disease severity.