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THE IMPACT OF ANNUAL GRASSES AND GRASS REMOVAL WITH HERBICIDES ON CARRY-OVER OF TAKE-ALL (*GAEUMANNOMYCES GRAMINIS* var. *TRITICI*)

By

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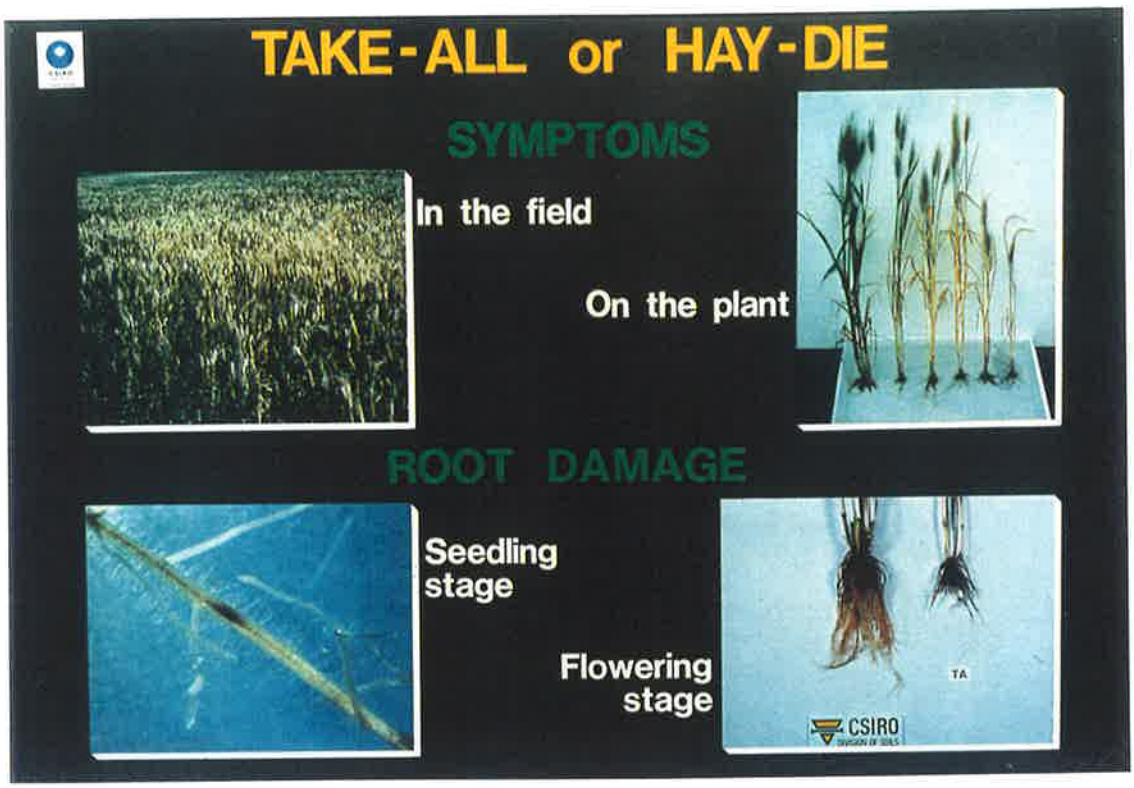

Plate 1.1 The "take-all" story (photo compiled by Dr A. D. Rovira)

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ABSTRACT

This thesis reports on research data from seven field experiments, two pot trials and two surveys. This work was aimed at providing information on control measures against *Gaeumannomyces graminis* var. *tritici* (abbreviated to Ggt) in annual pastures across southern Australia. Most data presented in this thesis comes from research using conditions and materials as close to field situations as possible (natural Ggt inoculum, mixed swards of grass genera and field based trials).

Four field experiments assessed the impact of timing of herbicides applied to naturally regenerating annual pastures for the ability to reduce Ggt carry-over and to reduce the incidence of take-all on wheat sown the following season. I found that the impact of timing of herbicide application depended on a distinction between "lower rainfall" (<350 mm annual rainfall) and "higher rainfall" (>450 mm annual rainfall) districts. Ggt carry-over would normally be reduced in 'lower rainfall" districts if herbicides are applied by the end of June, but in "higher rainfall" districts herbicide applications could occur as late as mid July to control Ggt. The impact of variation in timing of rainfall patterns, as well as herbicide application on the control of Ggt are also discussed.

Additional experiments examined the ability of grass genera to host and carry over Ggt. Three field experiments (using either natural or artificial Ggt inoculum) showed that Ggt infection on wheat roots was most severe when sown in soil which previously supported *Hordeum* spp., with *Bromus* and *Vulpia* spp. being moderate carriers and *Lolium rigidum* least able to carry Ggt. This was confirmed by two surveys of pasture sites across Victoria and South Australia.

However, in two pot experiments, significant variation between *Lolium rigidum* genotypes in ability to carry over Ggt was found, with the variation ranging in Experiment 1 from 12.5% to 70.6% seminal root infection on following wheat, and 8.5% to 37.8% in Experiment 2.

The following recommendations have arisen from my research.

1. Farmers should remove grasses early in the growing season; late June in "lower-rainfall environments" (<350 mm annual rainfall), and mid July in "higher-rainfall" environments (>450 mm annual rainfall). In addition, the success of grass removal for the control of Ggt will vary from season to season. Farmers should approach each season mindful of the possibility that in some seasons grass removal may not be required or may not have the desired effect of reducing Ggt, due to a season that does not allow the build-up of Ggt, due to reduced rainfall, or a late break season that significantly reduces the time available for break-down of Ggt infected material.

2. Farmers should consider their choice of herbicides in terms of the speed with which herbicides kill grasses, as this can affect the length of time that remains for microbial activity to break down any Ggt-infected material, therefore reducing control of Ggt.

3. Farmers should pay particular attention to the removal of *Hordeum* spp., but also to *Bromus* and *Vulpia* spp.. More than 165 *Hordeum* spp. plants per m^2 will result in significantly increased levels of Ggt carry-over. *Lolium rigidum* is essentially a "low host" genus, but farmers should be aware that there are genotypes of *Lolium rigidum* that are very effective hosts of Ggt and able to cause significant levels of Ggt infection on subsequently sown wheat.

DECLARATION

I HEREBY DECLARE that the work presented in this thesis has been carried out by myself and does not incorporate any material previously submitted for another degree in any University. To the best of my knowledge it does not include any material previously written or published by another person, except where due reference is made in the text.

I am willing to make this thesis available for photocopy and loan for the purposes of study and further research.

Richard J Inwood

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