THE EFFECT OF PROPICONAZOLE ON LEAF SPOT INFECTION AND SEED YIELD OF VELVET GRASS

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SUMMARY

The pathogen *Ramulaspora holci-lanati* which caused leaf spot in a seed crop of velvet grass (*Holcus lanatus* L.) cv. Massey Basyn was controlled by the application of propiconazole (125 g ai/ha) either at ear emergence or just before anthesis. Fungicide application significantly reduced leaf spot lesions on the top three leaves of the plant, and green leaf area was prolonged. Seed yield was increased by 30-40% depending on time of fungicide application. A double fungicide application (at ear emergence plus anthesis) did not further increase seed yield over that of either single application.

Keywords: *Ramulaspora holci-lanati*, leaf spot, velvet grass, propiconazole, seed yield

INTRODUCTION

The pathogen *Ramulaspora holci-lanati* (Cavara) Lindau is commonly found on velvet grass (*Holcus lanatus* L. also known as "Yorkshire fog") in Europe and New Zealand (Latch 1964), producing reddish-brown rectangular to oval leaf lesions 3-8 mm in diameter surrounded by a yellow halo. Dingley (1969) considered that the disease was of little importance in New Zealand, but in the 1988/89 season, a seed crop of *H. lanatus* cv. Massey Basyn was observed to be heavily leaf spot infected by anthesis, and leaves had senesced before seed had reached physiological maturity. Hampton (1986) and Rolston *et al* (1989) have demonstrated that fungicide application prior to anthesis can significantly increase seed yields of *Lolium perenne* L., *Dactylis glomerata* L. and *Bromus willdenowii* Kunth, by controlling leaf pathogens and delaying senescence of photosynthetic tissue. In the 1989/90 season we investigated the effects of fungicide application on disease control, green leaf duration and seed yield of velvet grass.

MATERIALS AND METHODS

Plots, each 7 x 2 m, were pegged out in a second year crop of *H. lanatus* cv. Massey Basyn growing on the Frewen's Block, Massey University, Palmerston North (Tolentino 1990). The crop was closed for seed production on 24 August 1989 and received 90 kg N/ha (as urea) on 7 September. Prior to ear emergence (27 November) and anthesis (21 December), 25 tillers per control plot were selected at random and assessed for the percentage of leaf area infected with leaf spot lesions, and green leaf area (Tolentino 1990). Data were recorded for the flag leaf and the next two leaves in descending order (leaf 2 and leaf 3). The pathogen was identified by isolating from leaf lesions, initially on to tap water agar and then on to potato dextrose agar, and recording mycelial growth characteristics and spore shape and size (Latch 1964). The methodology has been more fully described by Tolentino (1990).

Propiconazole (Tilt 250EC) at 125 g in 200 litres water/ha was applied at ear emergence, or just prior to anthesis, or as a double application (ear emergence plus anthesis). Each treatment was replicated three times in a complete randomized block design. A further disease assessment was made for all treatments 13 days after the second fungicide application.

Plots were harvested on 10 January 1990 by hand cutting two 0.5 m² areas per plot. The cut material was bagged and ambient air dried for 10 days before being threshed

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using a bench brush thresher (Thrige-Titan a/s, Denmark) and cleaned through a bench model screen seed cleaner (Clipper Inc., Michigan, USA). Seed yields were corrected to 0% seed moisture, and thousand seed weight determined.

RESULTS

Leaf symptoms recorded were typical of *R. holci-lanati*, being eyespot type lesions, reddish brown with a yellow halo, rectangular to oval, and varying from 3 x 1.5 mm up to 7 x 2 mm. The isolates from these lesions were confirmed as *R. holci-lanati* (Tolentino 1990).

TABLE 1: Percentage of leaf area lesioned and percentage green leaf area on untreated velvet grass tillers assessed at ear emergence (E) and anthesis (A).

	% leaf area lesioned		% green leaf area	
	E	A	E	A
flag leaf	0	2	100	87
leaf 2	1	13	99	80
leaf 3	21	38	77	51

At ear emergence the pathogen had reached leaf two but not the flag leaf (Table 1), and green leaf area was still 100%. During the 4 weeks between ear emergence and anthesis, leaf two and the flag leaf area with lesions had increased from 2% to 52%, and flag green leaf area had declined from 87% to 23% (Tables 1 and 2).

Fungicide application reduced infection ($P < 0.05$) by the pathogen and prolonged green leaf area (Table 2). Data did not differ between fungicide application times or single and double applications. Seed yield was increased ($P < 0.05$) by fungicide application, the increases ranging from 49% for the double application to 33% for the ear emergence application (Table 3). Thousand seed weight did not differ between treatments.

TABLE 2: Percentage of leaf area with lesions, and percentage green leaf area for velvet grass tillers from plots treated with propiconazole at different growth stages. Assessments were made 13 days after anthesis.

Treatment	% leaf with lesions			% green leaf area		
	flag leaf	leaf 2	leaf 3	flag leaf	leaf 2	leaf 3
nil	52	78	83	23	11	6
propiconazole (ear emergence)	24	31	33	67	54	42
propiconazole (anthesis)	9	34	50	75	55	31
propiconazole (ear emergence plus anthesis)	5	12	22	78	70	54
LSD ($P < 0.05$)	22.3	35.4	32.9	18.8	31.6	24.5

TABLE 3: Velvet grass seed yield, and thousand seed weights (TSW), from plots treated with propiconazole at different growth stages.

Treatment	Seed yield (g/m ²)	TSW (g)
nil	40.9	0.288
propiconazole (ear emergence)	54.5	0.299
propiconazole (anthesis)	56.1	0.297
propiconazole (ear emergence plus anthesis)	61.0	0.295
LSD ($P < 0.05$)	13.3	0.018

DISCUSSION

The seed yield increases recorded were associated with control of the pathogen; in comparison with no fungicide, propiconazole application reduced leaf spot lesions on the top three leaves by over 60%, and as a consequence green leaf area was significantly prolonged. Grass seed yield increases have also been reported following propiconazole application in the absence of pathogens (Horeman 1989; Rolston *et al* 1989), the responses being associated directly with prolonging green leaf area. Whatever the mechanism of the responses, these results further emphasise the importance to grass seed yields of avoiding stress from anthesis until harvest, and the benefits of a fungicide application, whether it be to control a specific pathogen, or to delay senescence (Hampton 1986; Horeman 1989; Welty 1989). Apart from thousand seed weight, seed yield components were not recorded in this trial, but previous work in other grass seed crops (Hampton 1986; Rolston *et al* 1989) has demonstrated that fungicide application allows the retention of more seeds per spikelet.

At present propiconazole (as Tilt 250 EC) is registered for control of leaf and stem rusts in ryegrass seed crops, but not for use in other herbage species. The data add support to the suggestion that this product, and/or other triazole fungicides, could be usefully registered for *Bromus*, *Dactylis*, *Festuca* and *Holcus* seed crops.

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