CONTROL OF STEMPHYLIUM LEAF SPOT IN ASPARAGUS WITH DIFENOCONAZOLE

G. FOLLAS and H.M. BEETZ

Ciba-Geigy New Zealand Ltd, Hastings and Cambridge

SUMMARY

Trials were carried out in the Hawkes Bay in 1988 and 1989 to assess the efficacy of difenoconazole for the control of stemphylium leaf spot in asparagus fern. Difenoconazole at 100-125 g/ha gave good control of the disease and was comparable to either iprodione or captafol. Evaluation of 125 g/ha difenoconazole at spray intervals of 2, 3 or 4 weeks in 1990 showed that disease control at all spray intervals was equivalent to iprodione at 3 week intervals. Shorter spray intervals gave lower levels of disease, more green fern and less fern defoliation. Green fern and defoliation assessments may not be reliable for disease assessment in the later part of the season.

Keywords: stemphylium leaf spot, asparagus fern, difenoconazole

INTRODUCTION

Stemphylium leaf spot of asparagus, caused by *Stemphylium vesicarium* (Wallr.) Simmons, can be a major problem to asparagus fern after close-up especially in warmer areas with reasonable summer rainfall. The fungus can attack the fern at any time during the summer-autumn period causing defoliation, die-back and fern death. Purple spotting of spears the following spring can occur (Cheah and Hunt 1987), increasing the number of rejected spears and reducing spear yields (Menzies 1983) due to the loss of reserves in the crowns. Yield losses of up to 50% in the following season have been reported.

Stemphylium leaf spot was controlled by applications of captafol until this fungicide was removed from the market. One current control measure is the use of iprodione applied at the first appearance of spotting and at regular intervals thereafter. Tate *et al* (1989) demonstrated the effectiveness of several triazole fungicides including CGA 169374 (difenoconazole). This paper reports further work with difenoconazole. Details of chemical and physical properties, and biological activity of difenoconazole have been outlined by Ruess *et al* (1988).

METHODS

Two trials were carried out for the control of stemphylium leaf spot in asparagus in Hawkes Bay in the 1988 and 1989 seasons on the asparagus cultivar Mary Washington. The trial design was a randomised complete block with four replicates and 4 x 5 m plots. Applications of difenoconazole (Score 10WP), captafol (Difolatan 5FL) and iprodione (Rovral 250FL) were made in 500 litres water/ha with a precision CO₂ backpack sprayer using hollow cone nozzles and 270-340 kPa pressure. All treatments in 1989 were applied with a wetting agent. Applications were made on 22 February, 21 March and 19 April in 1988 and 13 January, 7 February, 27 February and 20 March in 1989. Assessments were carried out 13 and 25 days after the final applications in 1988 and 1989 respectively for percentage needle area infection, percentage green fern and percentage stem area infection. Ten plants per plot were assessed for percentage green fern and percentage stem area infected and 10 assessments per plant were made for a mean needle infection/plant to give percentage needle infection.

In 1990 two trials were carried out in the Waikato and Hawkes Bay to evaluate different spray intervals. Applications of difenoconazole were made at 2, 3 or 4 week intervals and compared with iprodione at 3 week intervals. The Waikato trial (cv. Mary

Proc. 44th N.Z. Weed and Pest Control Conf. 1991: 134-137

Washington) was commenced on 24 January and concluded on 19 April. The Hawkes Bay trial (cv. Limbras) commenced on 31 January and concluded on 26 April. A total of seven 2 week applications, five 3 week applications and four 4 week applications were made in both trials. The trial design was a randomised complete block with four replicates and plot sizes of 1.5 x 10 m in the Waikato and 4 x 10 m in the Hawkes Bay. The application method in the Waikato used hollow cone nozzles with 250 litres water/ha at 500 kPa. The Hawkes Bay application was as previously described. Assessments of disease levels and percentage green fern were made periodically throughout the spray programme and specifically at 8 days after the sixth fortnightly application. Percentage defoliation or green fern was determined 3-4 weeks after the completion of the spray programme. Statistical analysis was by analysis of variance with mean separation by Duncan's Multiple Range test ($P < 0.05$, $P < 0.01$), with arcsine transformations where appropriate.

RESULTS AND DISCUSSION

In 1988 there were no differences between the rates of difenoconazole, or difenoconazole and captafol for the control of stemphylium leaf spot (Table 1). All treatments reduced ($P < 0.01$) the level of disease on the needles and stems and increased ($P < 0.01$) the percentage green fern compared with the untreated controls.

In 1989 a similar trend was observed with no differences ($P > 0.05$) for needle area infected between the rates of difenoconazole or between the fungicides difenoconazole and iprodione. All treatments maintained high levels of green fern and reduced ($P < 0.01$) needle and stem infections (Table 1). The systemic activity of difenoconazole may have assisted the distribution of the chemical to the lower stems giving, at 125 g/ha, lower level of disease ($P < 0.05$) than iprodione.

TABLE 1: Mean stemphylium leaf spot disease assessments, and percentage green fern, for asparagus sprayed with different fungicide treatments in the Hawkes Bay (1988 and 1989).

Treatment	Rate g ai/ha	Assessment date					
		2 May 1988			14 April 1989		
		% area infected needle	% area infected stem	% green fern	% area infected needle	% area infected stem	% green fern
difenoconazole	100	7.5 B*	6.0 B	42 B	20.5 B	9.1 bcB	61 B
difenoconazole	125	15.0 B	5.0 B	50 B	18.8 B	6.2 cB	58 B
captafol	1250	7.5 B	5.8 B	55 B	—	—	—
iprodione	625	—	—	—	18.5 B	13.6 bB	73 B
untreated	—	57.5 A	58.8 A	6 A	72.3 A	28.7 aA	27 A

*Means in each column followed by the same letter are not different ($P < 0.05$ in lower case, $P < 0.01$ in capitals)

The three methods of assessment used were useful for a relative comparison of fungicides. Care must be taken in using green fern percentages as this can be affected by weather conditions and plant physiological factors which can be independent of the stemphylium disease. Bansal *et al* (1989) reported that the assessment of disease as a percentage of the cladode tissue infected provided the most effective method of screening for resistance to *S. vesicarium*.

In 1990 stemphylium leaf spot did not appear in either district until March, which was halfway through the spray programme. It did not reach reasonable levels in untreated plots until late March or early April just prior to the application of the last two fortnightly treatments. Disease levels assessed in April after six fortnightly sprays showed that all treatments reduced stemphylium leaf spot on the needles (Hawkes Bay) and the stems (Waikato) compared with the untreated controls (Table 2). There was no difference ($P > 0.05$) between difenoconazole or iprodione at the 3 and 4 week spray

TABLE 2: Mean stemphylium leaf spot disease assessments, and percentage green fern and defoliation, for asparagus sprayed with different fungicide treatments (1990).

Treatment	Rate (g ai/ha)	Spray interval (wks)	Hawkes Bay			Waikato		
			% nai ¹ 20 Apr	% green fern 20 Apr	% defol ² 15 May	% sai ³ 12 Apr	% green fern 12 Apr	% green fern 16 May
difenoconazole	125	2	2.0 cC*	60 aA	20 dCD	1.5 B	98 aA	63 aA
difenoconazole	125	3	7.1 bBC	50 aAB	44 cBC	1.1 B	95 aA	35 aAB
difenoconazole	125	4	12.4 bB	45 aAB	65 bB	1.7 B	93 aA	49 aA
iprodione	500	3	6.7 bBC	65 aA	17 dD	1.8 B	84 abA	45 aA
untreated	—	—	34.1 aA	20 bB	98 aA	6.7 A	62 bA	6 bB

¹ needle area infected² defoliation³ stem area infected* Means in each column followed by the same letter are not different ($P < 0.05$ lower case, $P < 0.01$ capitals)

interval. A 2 week spray interval of difenoconazole (125 g/ha) was more effective than 3 week ($P < 0.05$) or 4 week ($P < 0.01$) applications for needle infection. The 2 week difenoconazole applications had less disease ($P < 0.05$) on the needles in Hawkes Bay than iprodione applied at 3 week intervals. All spray intervals and fungicides gave rise to more green fern than untreated, with no difference ($P > 0.05$) between the two fungicides or the spray intervals.

The May assessments for percentage green fern in the Waikato showed that all treatments had maintained green fern with no difference ($P > 0.05$) between spray intervals or treatments. In the Hawkes Bay defoliation levels were assessed and all spray intervals and fungicides gave reduced ($P < 0.01$) defoliation. For each week longer in the difenoconazole spray interval there was a higher ($P < 0.05$) level of defoliation. Only at the 2 week interval was difenoconazole equivalent to iprodione. Defoliation may have been exacerbated by factors other than stemphylium leaf spot due to the later time of this assessment compared with 1988 and 1989. This could account for the variations in results of direct disease assessments and plant growth parameters. Iprodione may also be more effective than difenoconazole on the senescing plant due to a possible lack of uptake of the systemic material by the plant in this physiological state.

There was no phytotoxic effect from any treatment in any year. In 1989 spears were taken from the early harvests (169-193 days after treatment) for residue analysis. No detectable residues were found and no spear damage was observed following multiple applications of 100 and 125 g/ha difenoconazole to mature fern.

CONCLUSIONS

Multiple applications of the systemic fungicide difenoconazole gave effective control of stemphylium leaf spot of asparagus and was comparable to the previous standard captafol. The rate of 125 g/ha difenoconazole with a spray interval of 3 weeks appeared to give the optimum level of disease control and maintained an adequate level of green fern. It was comparable to the protectant fungicide iprodione applied at 3 week intervals.

ACKNOWLEDGEMENTS

The authors thank the growers on whose properties these trials were carried out.

REFERENCES

- Bansal, R.K., Menzies, S.A. and Broadhurst, P.G., 1989. Improvements in methods of screening asparagus for resistance to stemphylium leaf spot. *Proc. 7th Australasian Plant Pathology Society Conf.*: 128.

- Cheah, L.H. and Hunt, A.W., 1987. Stemphylium purple spot of asparagus. *Proc. 40th N.Z. Weed and Pest Control Conf.*: 78-79.
- Menzies, S.A., 1983. Control of stemphylium leaf spot of asparagus. *Proc. 4th International Congress Plant Pathology*: Abstract 76.
- Ruess, W., Riebli, P., Herzog, J., Speich, J., and James, J.R., 1988. CGA 169374, a new systemic fungicide with a novel broad-spectrum activity against disease complexes in a wide range of crops. *Brighton Crop Protection Conf. — Pests and Diseases*: 543-550.
- Tate, K.G., Cheah, L.H., Hunt, A.W. and Dick, H., 1989. Fungicidal control of stemphylium leaf spot of asparagus. *Proc. 42nd N.Z. Weed and Pest Control Conf.*: 243-246.