Project title:	The chemical control of *Rhododendron* powdery mildew
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Objectives and background

Erysiphe sp. causing Rhododendron powdery mildew is now the most serious disease of *Rhododendron* in Britain. Many nurseries are affected and have applied intensive spray programmes to achieve control. Unfortunately, coherent evaluation of agrochemicals for this purpose is lacking and use is based solely on efficiency with other crops. In the majority of nurseries bupirimate & triforine (Nimrod T) is primarily used and some growers must spray fortnightly for adequate control.

Previous trials of bupirimate & triforine showed this product performed poorly compared with the majority of other fungicides and did not stop the disease even at the highest doses. Studies using a number disease isolates collected from commercial and botanical sites showed that fungicide tolerance had developed further reducing efficacy.

Work funded by the HDC investigated the efficacy of 5 fungicides at 2 rates on *Rhododendron* cv Elizabeth for control of powdery mildew.

Summary of Results

Knowledge of the disease epidemiology highlights the importance of protecting young tissue produced in the spring. This tissue is very susceptible to leaf scorch resulting from the use of certain chemicals. Hence an initial screen of possible fungicides assessed phytotoxicity. Nine fungicides Bayfidan, Dorado, Epic, Glint, Radar, Sportak Delta, Sprint, Tern and Topas were applied at ½ and full field rates, with or without an additive (Codacide oil). Two applications were made, the first shortly after bud break and the second once the new leaves had expanded fully. Damage was recorded 4 weeks after the second application. Results allowed Bayfidan, Glint, Radar, Sportak Delta and Sprint to be removed from further trials. The three remaining fungicides Dorado and Nimrod T were carried forward for efficacy studies of disease control in the field.

All treatments were applied with codacide oil and at ½ and full field rates, at the same intervals as before. Disease was assessed 12 weeks after the second chemical application. All full rate treatments reduced disease compared with unsprayed controls. Epic (epoxiconazole) is the most effective chemical for the control of Rhododendron powdery mildew when applied at either ½ (2.5 ml/litre) or full (5 ml/litre) rates. Tern (fenpropidin), Topas (penconazole) and Dorado (pyrifenox) treatments produced substantial control at full application rates but performed significantly less effectively than Epic. Nimrod T (bupirimate & triforine) was less effective than any of the other full rate treatments and did not significantly reduce disease, despite being currently recommended for the control of this disease.

Action points for growers

1. Crops should be protected as soon after the leaves unfurl as possible, protecting new growth and inhibiting sporulation of infections on older leaves.

2. A second application 2/3 weeks after the first delays disease establishment early in the growing season.

3. Epic provides significantly greater control than the currently recommended products bupirimate & triforine.

In the final 3 weeks of the trial disease began to be seen on the Epic, Tern and Topas treatments suggesting that a 3rd application in mid-season is required to prevent disease development in late season.

Caution: All trials solely used cv Elizabeth. Test spraying must be made on other cultivars and hybrids since suseptibility to phytotoxic damage may occur.

INTRODUCTION

Rhododendron powdery mildew has spread recently amongst commercial crops, causing substantial losses and is now being rated as the most important foliar disease of *Rhododendron*. Most *Rhododendron* nurseries in Britain are affected and growers are applying intensive spray programmes in attempts to achieve control. Unfortunately there has been no coherent assessment of agrochemicals for this purpose and use is based on efficacy with other crops.

The gardening public is now well aware of this pathogen and its effects causing disfigurement and death to expensive plants consequently, unless the Nursery Industry responds by producing plants free from disease a lucrative market is likely to be severely damaged. Alarm in the retail sector is indicated by surveys undertaken by the Consumers Association which they have published showing that in England and Wales 18 of 60 nurseries stocked diseased - plants.

Rhododendron powdery mildew has been the subject of research at the Royal Botanic Garden Edinburgh, for the past twenty years; largely aiming at a better understanding of the taxonomy of the pathogen and the manner by which fungal populations have evolved.

A collaborative project between RBGE/SAC/University of Strathclyde began in 1991 funded by the Ministry of Agriculture, Fisheries and Food. This has studied pathogen morphology, epidemiology and host resistance/susceptibility. Part of this research provided a dual in *vitro* culture method by which the pathogen is grown on the host in controlled environmental conditions (Kenyon, Dixon & Helfer 1995). Using this method several fungicides have been screened for activity against *Rhododendron* powdery mildew. These preliminary tests showed that agrochemical products available for control powdery mildew in cereals have high levels of efficacy against the *Rhododendron* pathogen (Kenyon, Dixon & Helfer, in press). Of the 11 formulations screened, 8 showed higher levels of control than Nimrod T, currently the most commonly used product for *Rhododendron* powdery mildew.

MATERIALS and METHODS

Phytotoxicity Trial 1995

Knowledge of the disease epidemiology highlights the importance of protecting young tissue produced in the spring. This tissue is very susceptible to leaf scorch resulting from the use of certain chemicals. Hence an initial screen of possible fungicides assessed phytotoxicity. Nine fungicides Bayfidan, Dorado, Epic, Glint, Radar, Sportak Delta, Sprint, Tern and Topas were applied at ½ and full field rates, with or without an additive (Codacide oil). Two applications were made, the first shortly after bud break and the second once the new leaves had expanded fully. Damage was recorded 4 weeks after the second application. Phytotoxicity was assessed in two ways firstly the percentage of leaves showing damage and, secondly 5 randomly selected leaves were scored for the extent of phytotoxic damage using the scale :-

0 = No Damage
1 = Slight Damage (<10%)
2 = Moderate Damage 10-50%)
3 = High Damage (50-90%)
4 = Extreme Damage (90-100%)

When ranking the products in terms of phytotoxicity a greater emphasis was placed on the percentage of leaves showing damage rather than the damage scores.

Product Trial 1996

Based on results from the phytotoxicity trial caused Bayfidan, Glint, Radar, Sportak Delta and Sprint to be discarded. Four remaining fungicides [Epic (epoxiconazole), Tern (fenpropidin), Topas (penconazole) and Dorado (pyrifenox)] and Nimrod T were carried forward for efficacy studies on disease control in the field.

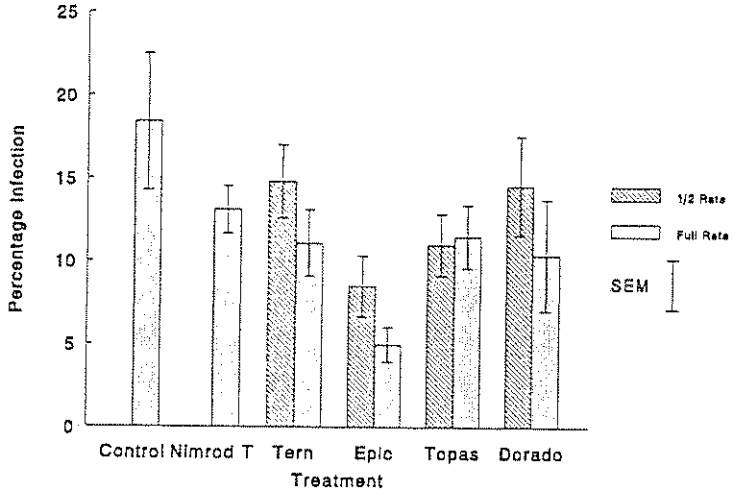
All treatments were applied with codacide oil and at ½ and full field rates, at the same intervals as before. Plants were laid out in a three block structure each with a randomised design. Disease was assessed 12 weeks after the second chemical application, recording the percentage of leaves infected.

RESULTS

Table 1. The phytotoxic damage resulting from the application of 9 fungicides at 2 rates with / without Codacide Oil.

Treatment	Percentage of leaves showing damage	Damage Score
control	6	0.28
control + oil	47	1.28
bayfidan + oil 1/2	29.6	1.32
bayfidan + oil full	22.4	1.12
bayfidan 1/2	8	0.36
bayfidan full	21.6	0.64
dorado + oil 1/2	11.2	0.48
dorado + oil full	6.8	0.4
dorado 1/2	16.4	0.96
dorado full	19.4	0.64
epic + oil 1/2	14	1.72
epic + oil full	25.6	0.64
epic 1/2	14.4	0.52
epic full	26.2	1.6
glint + oil 1/2	23.4	0.64
glint + oil full	30	0.84
glint 1/2	19.2	0.8
glint full	15.8	0.6
radar + oil 1/2	17.6	0.92
radar + oil full	39.8	0.88
radar 1/2	1.8	0.3
radar full	24.4	0.48
sportak delta 1/2 + Oil	67.4	2.2
sportak delta + oil full	80.2	1.92
sportak delta 1/2	56.4	1.08
sportak delta full	40.2	1.12
sprint + oil 1/2	21	0.52
sprint + oil full	32.4	1
sprint 1/2	7.6	0.2
sprint full	36.2	1
tern + oil 1/2	29.6	1.28
tern + oil full	7.6	0.32
tern 1/2	24	0.92
tern full	9.8	0.44
topas + oil 1/2	32.4	1.56
topas + oil full	9.8	0.24
topas 1/2	16	0.8
topas full	28	1.08

Figure 1. Control of *Rhododendron* powdery mildew, comparison of fungicides.



DISCUSSION

The phytotoxity trial in 1995 showed that Rhododendron cv Elizabeth is sensitive to phytotoxic effects during leaf emergence. The severity of symptoms was undoubtedly increased by the very hot dry season experienced in 1995. These conditions were also responsible for the very low disease incidence in this trial, with the development of Rhododendron powdery mildew being inhibited at temperatures greater than 20°C (Kenyon *et al.* 1995 & in press). In spite of the climatic conditions the application of 4 fungicides [Epic (epoxiconazole), Tern (fenpropidin), Topas (penconazole) and Dorado (pyrifenox)] resulted in only minimal leaf damage.

In the 1996 trial all full rate treatments reduced disease compared with unsprayed controls. Epic (epoxiconazole) is the most effective chemical for the control of Rhododendron powdery mildew when applied at either ½ (2.5 ml/litre) or full (5 ml/litre) rates. Tern (fenpropidin), Topas (penconazole) and Dorado (pyrifenox) treatments produced substantial control at full application rates but performed significantly less effectively than Epic. Nimrod T (bupirimate & triforine) was less effective than any of the other full rate treatments and did not significantly reduce disease, despite being currently recommended for the control of this disease.

APPENDIX 1

METEOROLOGICAL RECORDS - MONTHLY AVERAGES 1995

	Temperature (°C)		Rainfall (mm)
	Maximum	Minimum	
May	13.9	6.6	50.2
June	18.1	9	21.4
July	20.4	11.9	3.0
August	21.3	12.0	0.8
September	16.9	9.4	2.5
October	14.9	9.2	203.4

APPENDIX 2

METEOROLOGICAL RECORDS - MONTHLY AVERAGES 1996

	Temperature (°C)		Rainfall (mm)
	Maximum	Minimum	
May	12.4	4.0	42.0
June	16.5	8.9	58.2
July	17.3	10.5	49.4
August	18.7	11.6	48.1
September	17.1	9.0	27.8
October	13.7	8.3	146.7

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