CONTROL OF POWDERY MILDEW IN GRAPES

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SUMMARY

Triadimefon as a wettable powder and emulsifiable concentrate formulation was evaluated for the control of powdery mildew (*Uncinula necator*) in grapes (*Vitis vinifera*). In field trials over several seasons a high level of control was obtained with triadimefon programmes (at 25 g/ha/application) compared to the standard sulphur programme. There was no adverse affect on foliage growth or crop yield even when triadimefon was applied at twice the recommended rate.

INTRODUCTION

Powdery mildew is an important disease of grapes in the wine grape growing areas of New Zealand. The fungus attacks all succulent tissue, leaves, shoots, berries and cluster stems, and is visible as a white, webbed mat of mycelium on the infected tissues. Infection at blossom or soon after, may cause fruit set failure and "shatter". Infection early in the season (before berry sizing) results in small berries, low sugar content, and the formation of scar tissue. As berries enlarge, these scars may crack open allowing secondary infection by rot organisms. Throughout the season the susceptibility of various plant parts to powdery mildew changes. Ripening grapes are immune to infection and established infections become inactive when the sugar content exceeds 15% (Sall and Teviotdale 1981). Leaf and stem tissues remain susceptible throughout the season.

Development of powdery mildew is favoured by mild weather. Spores can germinate at temperatures between 6° and 33°C but optimal germination and mycelial growth occurs from 21° to 30°C. Under these conditions the time from spore germination to spore production is 5 days. High temperatures reduce conidial production and can kill mildew colonies. The fungus develops more rapidly in shaded areas within the crop canopy.

Temperature is more important than humidity in the development of the fungus as normal growth can occur at the full range of relative humidities. The spores and mycelium are mildly hydrophobic but heavy rain or dew can affect spore germination and growth.

Traditionally sulphur (dusting and sprayable formulations) applied at high rates and close intervals has provided good control of powdery mildew. The effectiveness of sulphur is dependant upon coverage as sulphur is a protectant, there is no experimental evidence that sulphur can kill existing mildew colonies (Sall and Teviotdale 1981). If applied in high temperatures sulphur can cause serious burning of foliage. Sulphur residues can also lead to the development of off flavours in wine making which require special corrective measures (Knappstein pers comm).

Overseas reports show that triadimefon is very effective in controlling powdery mildew in grapes (Dorntlein and Rota 1978; Tromp and Marais 1981). This paper reports on the evaluation and development of triadimefon for powdery mildew control in grapes in New Zealand.

METHODS

The three replicated trials were conducted in the Hawkes Bay. Treatments were replicated four times and each plot consisted of six vines of the cultivar Muller Thurgau. Applications were made by using an experimental orchard sprayer. In Trial A the vines were sprayed to the point of run off. In Trials B and C sprays were applied by hand-gun

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operating at 2100 kPa and timed to deliver the equivalent of 400 litres/ha for the first spray; 600 litres/ha for the second spray and 1000 litres/ha for all subsequent sprays.

Details of the five block trials are included in Table 2. Standard programmes of fungicides and insecticides were applied to the trial areas as required.

The assessment method in all trials involved a visual estimation of the percentage of bunch surface area infected by powdery mildew. The number of bunches assessed varied with 25 per plot for Trial A; 50 per plot for Trials B and C; 75 - 100 per block for Trials D to H. The 0 to 5 classification scale used in all trials was as follows: 0 = no infection, 1 = 1-5%, 2 = 6-10%, 3 = 11-25%, 4 = 26-50%, 5 = > 50% bunch surface area infected. From this assessment data the degree of infestation according to the method of Kremer and Unterstenhofer (1967) was calculated. In Trials A to C this data was used to determine the percent effectiveness by the method described by Abbot (1925).

Yields were obtained from the replicated trials by stripping the bunches from a number of vines per plot and weighing. This data along with the percentage effectiveness figures were analysed by the standard analysis of variance and means were separated by Duncan's New Multiple Range Test.

RESULTS AND DISCUSSION

Results of the replicated and field trials are given in Table 1 and 2. In the replicated trials powdery mildew infection occurred late in the season and had no effect on yield. There was no leaf infection in any of the trials.

TABLE 1: Treatment programmes and powdery mildew control in replicated trials.

Trial Treatment	Rate* g/ha	A		B		C	
		No.appli- cations	% Control	No.appli- cations	% Control	No. appli- cations	% Control
untreated			0(76)**		0(68)		0(22.9)
sulphur	2700	4	98	2	89 bB	2	79 b
	5400	5		4		5	
sulphur/ triadimefon	2700					2	
	25					5	95 a
triadimefon	12.5	4	100	2	100 aA	2	99 a
	25	5		4		5	
triadimefon	25					2	
	50					5	99 a
triadimefon	25			5	100 aA	3	97 a
triadimefon†	25			5	100 aA	3	91 a
triadimefon	25	2	47				
triadimefon	50	2	54				
triadimefon	100	2	46				
fenarimol	24			5	100 aA	4	94 a
CV %					2.5		8.3
Harvest Date		23.3.78		5.3.80		5.3.81	

* Where two figures are given per treatment the lower rate was used pre-blossom and the higher rate in subsequent sprays.

** Figure in bracket is degree of infection.

† 10% emulsifiable concentrate formulation, all other triadimefon treatments were the 5% WP. Fenarimol was used as the 12% EC formulation.

Trial A: Full season programme of sulphur or triadimefon gave a high level of disease control. Triadimefon at 12.5, 25.0 and 50 g/ha applied as an eradicant gave approximately 50% reduction of the level of infection. Application of these treatments was made when infection was established. The eradicant effect of these treatments was readily evident from the blackened dead mycelium present on exposed berry surfaces, although infection was still present in the bunch centres. Considering the eradicant effect demonstrated on exposed surfaces by these triadimefon treatments it is suggested that the failure to control this bunch centre infection was a function of coverage rather than of the chemical. As noted above the first eradicant application was not made until the rise of sugars, by which time spray penetration into the bunches was impossible.

Trials B and C: All fungicide treatments gave significantly higher disease control than sulphur. Under low infection pressure (Trial C) a programme of three sprays of triadimefon at 25.0 g/ha commencing at 5% capfall and repeated at 21 day intervals resulted in similar disease control to a full programme of seven sprays of triadimefon at 14 day intervals.

Trials D to H: Under commercial conditions triadimefon gave a very high level of powdery mildew control.

There were no symptoms of phytotoxicity from programmes of triadimefon even when applied at twice the recommended rate. In the replicated trials there were no significant differences in yield between any of the treatments.

TABLE 2: Details and results of block evaluation trials.

Trial-Localities Season Cultivar*	D-Poverty Bay		E-Poverty Bay		F-Poverty Bay		G-Hawkes Bay		H-Auckland	
	78/79	M.T.	78/79	M.T.	79/80	M.T.	79/80	M.T.	80/81	P
Applicator type	Airblast		Hydraulic		Airblast		Airblast		Air assisted	
Water rate litres/ha	500-1000		2400		800-1500		700-900		1000	
Treatment and Formulation	Rate* kg/ha	% Infection	Rate kg/ha	% Infection	Rate kg/ha	% Infection	Rate kg/ha	% Infection	Rate g/ha	% Infection
sulphur WP	28.8(7)	7.6	75.2(10)	8.8	30.0(9)	2.8 +	29.8(8)	4.6		
triadimefon WP	0.137(7)	0	0.225(9)	0.4	0.162(9)	0	0.137(8)	0	112.5(5)	9.0
triadimefon WP			0.175(9)	0						
triadimefon EC					0.162(9)	0	0.137(8)	0	82.5(4)	1.2
fenarimol EC									96.0(4)	6.0

* M.T. = Muller Thurgau; P = Palomino

** Rate refers to amount used over season, figures in parenthesis = No. applications

+ In this sulphur treatment there was also 1 triadimefon application at 25 g/ha.

CONCLUSIONS

When applied as a protectant programme triadimefon gave excellent control of powdery mildew in grapes. Both the wettable powder and emulsifiable concentrate formulations showed good crop tolerance.

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