CONTROL OF BLACK CURRANT LEAF SPOT

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SUMMARY

A trial conducted from bud-burst to post-harvest in black currants (*Ribes nigrum*) showed that the leaf spot (*Mycosphaerella ribis*) can cause severe crop damage. High levels of disease control and subsequent crop yield response, cane growth increment and a delay in post-harvest defoliation were achieved with fungicide treatments of triforine, folpet and prochloraz. However, the prochloraz formulation caused an unacceptable fruit taint when applied to fruiting bushes.

INTRODUCTION

The fungal disease black currant leaf spot (*Mycosphaerella ribis* con.stat. *Septoria ribis*) is widespread throughout the South Island and has become a problem of importance in the wetter climate of Southland (J. Hedley pers comm). Several authors including O'Riordain (1973) have reported effective control of black currant leaf spot (*Pseudopeziza ribis*) with triforine in Britain, but there is little documented data under local conditions on the control of *Mycosphaerella ribis* and its effect on black currant yields. This trial on 3rd year bushes cv Magnus ascertained the effect of leaf spot on black currant yields and evaluated control programmes based on triforine and a new broad spectrum fungicide, prochloraz, (Ballard and McLaughlan 1982). The trial was at Edendale, Southland, alongside a concurrent research project in which the Plant Diseases Division, DSIR, monitored the over-wintering and primary inoculum levels of *Mycosphaerella ribis* (R. Beresford unpublished).

METHODS

One length of row, flanked by untreated buffer rows, was divided into 8 m long plots of approximately 32 bushes each with the treatments randomized within four replicated blocks. Treatments were applied with a motorized pump and hand-gun in a spray volume ranging from 1500 - 2300 litres/ha depending on the amount of leaves on the bushes. A post-harvest trial in 1981 evaluated benomyl, two rates of triforine and an emulsifiable concentrate formulation of prochloraz. Treatments were applied on 9 Jan and 21 Feb 1981. On 21 Feb and 13 March, the leaf area infected by leaf spot on five canes/plot was assessed visually to ascertain the protection provided to new growth near the top of the bush.

The design of the main trial, over a full season of programmed applications during 1981-82, was determined by the acceptability of products for export crops and was therefore divided into three spray periods: bud-burst to end of flowering; fruit-set to harvest and post-harvest. Copper oxychloride at 250 g/100 litres plus oil and copper oxychloride at 150 g/100 litres were applied to all plots including untreated on 27 Aug and 15 Sept 1981 respectively. Leaf spot treatment programmes for full season's evaluation (Table 1) used the formulations previously mentioned and commenced at the grape-bud stage on 1 Oct 1981.

Insecticides and miticides were applied by the grower with a "Smallford" cross-flow straddle sprayer when required. Leaf spot infection was visually assessed immediately prior to fungicide application on a sample of 25 leaves per plot picked systematically from the top, middle and bottom of the bushes.

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TABLE 1: Fungicide treatment programmes 1981-82 spray dates and crop stages.

Tmt No.	TREATMENTS g/100 litres									
1	Untreated									
(MAF export programme)										
2	thiram 160	iprodione 38		folpet 75				thiram 160		
3	triforine 19			folpet 75				triforine 19		
4	triforine 38			folpet 75				triforine 38		
5	prochloraz 40			folpet 75				prochloraz 40		
6	triforine 19				rain prevented application	triforine 19				
7	triforine 38					triforine 38				
8	prochloraz 40		triforine 38	triforine 38		prochloraz 40				
	1 Oct	20 Oct	4 Nov	23 Nov	1 Dec	16 Dec	31 Dec	15 Jan	25 Feb	
	grape-bud → early fruit-set			100% fruit-set → 3 days pre-harvest				post-harvest		

Plots were harvested on 3 Jan 1982 with a "Smallford" double sided harvester. Premature fruit drop on untreated plots was collected prior to harvest while the fruit loss due to mechanical harvesting was measured on 1 m of row over one replicate. Measurement of the new season's cane growth was made on 10 canes/plot on 19 March 1982. A final visual assessment of percent leaves retained on the bushes was made on 22 April 1982.

RESULTS AND DISCUSSION

The trial row was heavily infected with leaf spot at the time of the 1981 post-harvest evaluation was commenced, with the highest incidence near the base of the bushes, probably due to a micro-climate effect (R. Beresford pers comm). Visual assessments on 20 Feb and 13 March 1981 (Table 2) showed small but significant differences of percent leaf area infected between treatments with prochloraz giving the highest level of control.

Although the DSIR recorded peak levels of air-borne ascospores, the primary source of inoculum during late September 1981, it was not until 20 Oct that the first symptoms of leaf spot were observed on the leaves attached to the strigs of untreated and treatment No. 6.

Differences between treatments of leaf area infected were not high enough to assess accurately until 22 Nov. The mean leaf area infected and percent of leaves infected on untreated plots increased during the 6 week pre-harvest period, although the leaf area infected on all fungicide treatments remained at a low level (Table 3). The leaf sampling technique provided an accurate assessment of the high levels of disease control provided by all fungicide treatments. However, the assessment of 22 Nov did not reflect the greater leaf area infected near the base of untreated bushes as the mean percent

infection was reduced by a low level of infection near the top of the bushes. Towards the end of Nov the number of air-borne ascospores decreased (Fig. 1), so the build up of leaf spot on untreated after this period was attributed to secondary infection by conidiospores of the *Sceptoria* state from within the bush (White 1945). By harvest the disease was widespread throughout the untreated bushes.

TABLE 2: Fungicide treatments post harvest 1981 and percent leaf area infected with leaf spot.

Treatment	Rate g/100 litres	Mean % leaf area infected		
		Top 5 mature leaves (20 Feb.81)	Top 7 new leaves (20 Feb.81)	Top 7 new leaves (13 March 81)
1 untreated	-	13 ab	1.0 a	6.6 a
2 benomyl 50 WP	25	16 a	1.2 a	4.5 b
3 triforine 19EC	19	11 abc	0.9 a	3.2 b
4 triforine 19EC	38	9 bc	0.4 a	3.3 b
5 prochloraz 40EC	40	6 c	0.5 a	0.9 c
CV %		19	31.1	33.0

Means followed by same letter do not differ significantly at $P=0.05$ (Duncan's new multiple range test).

TABLE 3: Leaf spot infection, crop yield, percent leaves retained and cane growth increment.

Tmt No.	Mean % leaf area infected*				Crop yield as a % of untreated	% leaves retained 22 April 82	cane growth increment as a % of untreated
	22 Nov.81	16 Dec.81	harvest 3 Jan.82	14 Jan.82			
1	6.6 a (69)	15.2 a (95)	19.0 a (93)	11.2 a (88)	100 b 4.72 t/ha	6.0 d	100 b 151 mm
2	2.4 b (53)	3.6 b (77)	2.8 bc (63)	1.7 b (65)	161 a	75.0 a	130 ab
3	1.8 b (45)	2.8 b (80)	1.9 c (53)	0.8 bc (45)	153 a	75.0 a	132 ab
4	1.7 b (51)	2.1 bc (76)	1.4 c (49)	0.9 bc (44)	150 a	81.2 a	136 a
5	0.1 c (2)	0.1 d (8)	0.1 d (9)	0.1 d (10)	155 a	93.7 a	148 a
6	1.9 b (54)	2.1 bc (71)	4.4 b (89)	1.9 b (66)	151 a	14.7 c	129 ab
7	1.6 b (53)	1.1 c (53)	1.9 c (69)	1.6 bc (67)	143 a	35.0 b	152 a
8	0.1 c (4)	0.1 c (8)	0.9 cd (37)	0.5 cd (33)	155 a	85.0 a	164 a
SED	0.016	0.013	0.019	0.015	0.120	0.399	1.808

* Figures in parenthesis = % leaves infected

Means followed by same letter do not differ significantly at $P=0.05$ (Turkey's studentized range).

Untreated plots had a premature fruit drop calculated at 4.3% of the untreated crop yield which was small by comparison with the mechanical harvesting loss of 13.2% of the mean trial yield. All fungicide treatments provided significant yield responses over untreated, with a trial mean response of 53% (Table 3). No significant yield differences were recorded between fungicide treatments.

A fruit taste panel conducted by DSIR Division of Horticulture and Processing, Auckland (M. Hogg pers comm) reported an unacceptable taint in black currants treated with prochloraz 40EC. This confirmed indications from the manufacturers, FBC Limited, England that this formulation may be unsuitable for use on black currants after the end of flowering. Black currants treated with the MAF export programme and treatment No. 4 were acceptable.

Mechanical harvesting contributed to premature defoliation of untreated and treatment No. 6. Research at Luddington (1976) reported that defoliation at harvest had an accumulated reduction on the following season's yields so emphasis was placed on assessing the rate of post-harvest defoliation. In the final disease assessment on 14 Jan the highest leaf area infection recorded was 20%, whereas immediately pre-harvest up to 35% leaf area infected was recorded on untreated. Differences between treatments of percent leaves retained on the bush reached a maximum by 22 April 1982. Although it is difficult to relate the leaf retention figures in Table 3 to disease infection levels in the pre-harvest period, the proportion of leaves lost in treatments No. 6 and 7 suggests that the chemicals used pre-harvest could be an influencing factor.

The measurement of cane growth increments (Table 3) showed that growth in fungicide treatments were significantly higher than untreated reflecting the improved bush vigour as a result of leaf spot control.

Further work is required to ascertain the optimum timing of fungicide treatment applications in relation to epidemiology.

CONCLUSIONS

The results of this paper confirm that black currant leaf spot can cause significant crop yield losses (30-38%), premature defoliation and a reduction of bush vigour. High levels of disease control can be achieved with treatment programmes which are acceptable for use on export crops, using triforine 38 g/100 litres pre-flowering and post-harvest and folpet 75 g/100 litres during fruit-set to harvest.

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