EVALUATION OF SEVERAL INSECTICIDES FOR CONTROL OF STRAWBERRY GREEN PETAL DISEASE[1]

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Abstract

Field experiments were conducted in 1969–70 and 1970–71 at Oxford, Nova Scotia and Charlottetown, Prince Edward Island, to determine the efficacy of several insecticides in reducing the incidence of green petal disease in strawberries. In 1970, the least number of green petal infected plants occurred in plots treated by incorporating disulfoton into the soil prior to planting. In 1971, best control resulted from three foliar spray applications with either DPX-1410, endosulfan, or oxydemeton-methyl. Fruit yields were recorded only at Charlottetown and were not increased by any of the treatments.

Introduction

Green petal, a leafhopper transmitted disease of strawberries, has been reported to be of major economic importance in strawberry production in the Maritime Provinces (1, 3, 5). The infectious aqent of green petal appears to be a mycoplasma–like organism (2). Since the disease was first reported in Nova Scotia in 1955 (3), moderate to severe infections have occurred in some commercial fields in Nova Scotia and Prince Edward Island, with liqht infections occurring annually in most fields and in plant nurseries. Increasing concern by strawberry growers and those involved in disease–free stock programs during the 1960's promnted investigations into means of controlling the qreen petal disease with the use of insecticides, primarily systemic insecticides.

The results of field experiments to determine the protective capabilities of some insecticides when incorporated into the soil prior to planting or when sprayed on growing plants for control of leafhopper vectors of green petal are reported in this paper.

Materials and methods

In each of the years 1969–70 and 1970–71 an experiment of the same design was conducted at each of two Locations, Oxford, Nova Scotia and Charlottetown, Prince Edward Island. The vegetation surroundinq the experimental plots contained weeds which are known hosts of the green petal entity and its leafhopper vectors as well as older strawberry plants. The six treatments in 1969–70 and the seven treatments in 1970–71 were randomized within each of four blocks on 10–plant plots, with plants spaced 2 ft apart within rows and with 4.5 ft between rows. The plants were allowed to form matted rows. Disease–free strawberry plants, cv. Sparkle, from the Research Station, Charlottetown, were used as test plants. In the Atlantic Region, Sparkle is apparently more susceptible to green petal or its insect vectors than most other commonly grown cultivars (1, 4, 6). In 1970, in Nova Scotia the test area was fumigated for nematode control about 3 weeks prior to planting. Subsequent plant injury required that this test be reduced to 3 replications.

Granular soil insecticides were placed in a 4–5 inch band in the row and incornorated into the soil to a depth of 1 inch prior to planting. Spray treatments were applied with a hand–operated knapsack or upright qarden sprayer.

Assessment of green–petal infected plants was made during the harvest period of thr first fruiting year for both years of the test. Fruit yield data were recorded only at Charlottetown, as the fruit natured.

Results and discussion

The number of green–petal infected plants

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Table 1. Effect of insecticides incorporated into the soil prior to planting in 1969 on the incidence of green petal in Sparkle strawberries in 1970

Insecticide	Rate (lb a.i./acre)	No. of plants infected*			
		Oxford		Charlottetown	
		Mother plants	Total	Mother plants	Total
Carbofuran	3.0	4	11ab†	7	31ab
Disulfoton	6.0	3	8a	4	12 b
Nemacur	3.0	7	16ab	5	15 b
Phorate	1.5	3	9ab	12	52a
Propoxur	1.5	6	9ab	7	20ab
Untreated check		17	38 b	6	23ab

* Total number of plants infected in 4 replicates.

† Numbers within a column followed by same letter are not significantly different at P = 0.05.

Table 2. Effect of insecticides applied during 1970 on the incidence of green petal in Sparkle strawberries in 1971

Insecticide	Rate (lb a.i./acre)	Site of application*	Plants infected†			
			Oxford		Charlottetown	
			No.**	%	No.	a
Carbofuran	3.0	soil	9a	2.0	6ab	0.5
DPX-1410††	3.0	foliage	6a	1.3	3 b	0.2
Endosulfan***	2.0	foliage	2a	0.5	4 b	0.3
Oxydemeton-methyl	0.375	foliage	2a	0.5	2 b	0.1
Phorate	1.5	soil	11a	2.5	30a	2.0
Propoxur	1.5	soil	1a	0.2	8ab	0.8
Untreated check			11a	2.6	25a	1.7

* Soil treatments were applied just prior to planting. Sprays were applied to the foliage three times at monthly intervals beginning approximately July 15 of the planting year.

† Number of plants infected in 3 replicates at Oxford and 4 replicates at Charlottotown; percent infection based on total of all plants in 3 and 4 replicates, respectively.

** Numbers within a column followed by the same letter are not significantly different at P = 0.05.

†† DPX-1410, S - methyl 1-(dimethylcarbamoyl)-N-[(methylcarbamoyl)oxy] thioformidate, DuPont of Canada Ltd.

*** Miller Nu-Film-P sticking agent was added to endosulfan sprays at 4 oz/acre.

in the test plots at Charlottetown and Oxford was low in both years, making it difficult to satisfactorily evaluate the efficacy of the treatments. In 1971, the percentage of plants infected in the untreated check was 2.6% at Oxford and 1.7% at Charlottetown; incidence of green petal was only slightly higher in the checks in 1970. In both provinces, plots treated with granular disulfoton prior to planting in 1969 had the

Table 3. Effect of insecticides applied during the planting year on strawberry yields at Charlottetown

Insecticide	Site of application*	Yield (lb/20-ft plot) 1970	1970
Carbofuran	soil	20.75a**	12.4 b
Disulfoton	soil	19.97a	
DPX-1410	foliage		16.5a
Endosulfan	foliage		13.9ab
Nemacur	soil	18.95a	
Oxydemeton-methyl	foliage		13.5ab
Phorate	soil	14.97a	13.0ab
Propoxur	soil	18.22a	13.7ab
Untreated check		19.52a	13.8ab

* Rates as in Tables 1 & 2.

** Numbers within a column followed by the same letter are not significantly different at P = 0.05.

least number of green-petal infected plants in 1970 (Table 1); however the incidence of the disease was significantly lower than in the untreated check only at Oxford (Table 1). Results with the other granular soil treatments were inconsistent between provinces in 1970, particularly with phorate. In Prince Edward Island, plots treated with phorate had the greatest number of infected plants and also yielded the least amount of fruit (Tables 1 and 3). Fruit yields were not increased significantly by any of the treatments.

In 1971, the best control resulted from the three foliar spray treatments with DPX-1410, endosulfan, or oxydemeton-methyl although differences were significant only at Charlottetown (Table 2). Less green petal occurred in plots treated with propoxur and carbofuran than in the phorate treated plots. Fruit yields in Prince Edward Island were neither reduced by the amount of green petal present in the check plots, nor increased as a result of the insecticide treatment (Table 3).

In 1958, in New Brunswick, Collins and Morgan (1) reported fewer green petal infected clones in strawberry plots that received weekly applications of malathion during the growing season than in untreated plots. However, the reduction in the number of infected clones was not as great as expected and they assumed that considerable transmission of the disease must have occurred before the insecticide inactivated the vectors on the plants.

Further test plots were established at Charlottetown and Oxford in the spring of 1971 involving insecticidal spray treatments only. The Charlottetown plots were almost completely winterkilled so that records could not be taken in 1972. At Oxford, plots survived the winter well, but by July 1972 not a single infected plant was found.

Because of the low rate of infection during the period of these tests, and because of poor or inconsistent results in attempting to control green petal with insecticides, work on the screening of insecticides has been discontinued. However, the results may be useful in selecting chemicals for future tests or in other areas where green petal is a problem. Also, the possibility that there is varietal resistance to this disease or its insect vector cannot be ignored (2, 4), and plant breeding for resistance to green petal or its insect vectors may be the most promising approach to the control of this disease in strawberries.

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