THE CONTROL OF LATE BLIGHT AND GRAY MOLD IN TOMATOES IN NOVA SCOTIA[1]

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Abstract

Maneb or zineb were effective fungicides against late blight of tomatoes but their use was associated with a high incidence of gray mold (Botrytis cinerea). Effective control of gray mold was obtained by adding thiram to either fungicide. Other carbamate fungicides also tended to increase the amount of gray mold of tomatoes.

Introduction

Commercial production of tomatoes in Nova Scotia is largely confined to the Annapolis Valley where conditions are moderately favorable for ripening the fruit, However, outbreaks of late blight, caused by Phytophthora infestans (Mont.) DeBary, occur and growers must spray regularly to control this disease, Prior to 1949, a Bordeaux spray formulation or one of the fixed coppers was used to control late blight, These were somewhat phytotoxic and left unsightly residues on the fruit, Annual fungicide tests were started in 1948 and the results of these tests led to recommendations for alternating applications of ziram and Bordeaux in 1949 and for an all maneb program in 1954. In 1956, a serious outbreak of gray mold fruit rot, caused by Botrytis cinerea Pers,, occurred where maneb had been used. Increases in this disease had also been noted where dichlone and carbamate fungicides other than maneb were tested for late blight control, In Nova Scotia, diseases caused by B. cinerea occur on many outdoor crops and on tomatoes in greenhouses.

Cox and Hayslip (1), in their report on experiments to control various diseases of the winter tomato crop in Florida, considered gray mold as one of the problems. In New Zealand, Newhook and Davison (2) obtained control of Botrytis infections, that followed the use of fruit set, by adding thiram to the hormone application. Starting in 1957 the tomato spray plots at Kentville were used for testing materials for the control of both late blight and gray mold. The results obtained are given in this paper,

Methods

The tomato spray treatments were laid out in a randomized block design with each treatment replicated 4 times. A block consisted of a single row of plots each containing 4 plants separated by a guard, The variety Stokesdale was used because of its vigorous growth and susceptibility to the various diseases. The fruit was picked as it ripened or became diseased.

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After the first light frost, which usually occurred the second week of October, the remaining green fruit was harvested and examined. The fungicides were applied at 100-125 lb. pressure with a single nozzle hand gun and the plants were sprayed to run-off. Four or five sprays were applied each year, the number and timing depending on humidity and rainfall. Normally spraying started about July 20 and was continued at 10 to 20 day intervals until the third week in September.

Results and Discussion

The results from the 1957 spray trials are presented in Table 1. The season was dry and not favorable for the development of late blight,

Table 1, Late blight and gray mold on tomato spray plots in 1957

Fungicide per 100 gal,	Percent	
	Late blight	Gray mold
Ziram, 2 lb. alternating with Bordeaux 10-7-100	0.2	4.3
Maneb, 2 lb.	0.2	27.0
Zineb,[1] 2 lb,	0.3	20.4
Dichlone, 1 lb.	0.3	7.7
Dyrene,[2] 1 1/4 lb.	0.4	1.9
Captan, 2 lb.	0.5	4.5
Thiram, 2 lb.	2.0	2.6
Control	39.4	4.6
L.S.D. at 5% level		8.0

[1] Factory mix

[2] 2,4-dichloro-6-o-chloroanilino-s-triazine

Gray mold was significantly higher where the carbamates, maneb and aineb, were used, These results confirm earlier observations on the effect of carbamate fungicides. Dichlonc was the only other material that increased the incidence of gray mold, The only materials considered promising for the control of gray mold were thiram and Dyrene.

The fungicidal tests in 1958 consisted of a comparison of various mixtures and of alternating thiram or Dyrene with maneb and zineb. Little disease developed, probably because the trials were on land on which tomatoes had never before been grown. Differences were not significant, There was 2.5 percent gray mold on the maneb treatment; the control had 2.2; and all mixtures containing Dyrene and thiram had under 1 percent gray mold.

Many of the 1958 treatments were repeated in 1959 and 1960. The 1959 growing season was very favorable for the spread and development of late blight. The results indicated that the alternating programs were not effective against late blight but that mixtures of Dyrene *or* thiram with either zineb or maneb were satisfactory. The percentage of gray mold was low on all plots but, again, was highest where maneb was used alone.

The results on the control of gray mold in 1960 are shown in Table 2. It was a dry season and no late blight developed. The data confirm the previous

Table 2. Gray mold on tomato spray plots in 1960

Fungicide per 100 gal.	Percent gray mold
Maneb, 2 lb.	25.1
" 1 lb. + Dyrene, 1 1/4 lb.	15.3
" 1 lb. + thiram, 1 lb.	8.6
" 2 lb. + thiram, 2 lb.	4.4
Zineb (factory mix), 2 lb.	23.6
" 1 lb. + thiram, 1 lb.	12.5
" 2 lb. + Dyrene, 1 3/4 lb.	9.8
Zineb (tank mix-nabam, 1 qt. + 3/4 lb. zinc sulphate)	26.2
" 1/2 strength + Dyrene, 1 1/4 lb.	16.0
" 1/2 strength + thiram, 1 lb.	12.4
" full strength + thiram, 2 lb.	7.2
" full strength + Dyrene, 1 3/4 lb.	7.0
Ziram, 2 lb. alternating with Bordeaux 10-7-100	13.3
Blitox,[1] 3 lb.	12.7
Control	15.0
L.S.D. at 1% level	8.8
L.S.D. at 5% level	6.6

[1] 50% copper as the oxychloride

findings that the carbamates, maneb and zineb, were associated with an increase in the incidence of gray mold. Additions of thiram or Dyrene at the rates of 2 lb. and 1 3/4 lb. per 100 gal. respectively, to the carbamate sprays, gave the best control. When the rates were reduced there was a decrease in effectiveness. The copper-containing fungicides had no effect on gray mold and there was no apparent difference between tank mix and factory mix zineb.

Conclusions

The results presented in this paper give some indication of the problems involved in the search for fungicides for the control of late blight of tomatoes in Nova Scotia. Maneb or zineb controlled late blight but caused a marked increase in the incidence of gray mold. This occurred mainly in dry seasons when late blight was not serious. Thiram and Dyrene controlled gray mold but were ineffective against late blight. Both diseases were controlled when 2 lb. of thiram was added to 100 gal. of the recommended spray of maneb or zineb.

References

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SUSCEPTIBILITY OF SAIA AND FULGHUM OAT VARIETIES TO SOME STRAINS OF BARLEY YELLOW DWARF VIRUS

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Introduction

Breeding cereals for resistance to barley yellow dwarf virus (BYDV) is being undertaken in the United States, Canada and New Zealand. A basic requirement for success in this work is a knowledge of the relative resistance of the varieties of cereals being used as a source of resistance to different strains of BYDV,

The most comprehensive field observations on the relative resistance of oat varieties to BYDV have been recorded in the United States (3, 4). There, the variety Saia has quite consistently been moderately resistant while Albion, Fulghum, Newton, Putnam and Kanota have been slightly resistant. The resistance of Saia was confirmed for two seasons in New Zealand, but in the 1960-61 season this variety was severely affected by BYDV. Field evidence of the breakdown of BYDV resistance in wheat was also noted in New Zealand in 1960-61, when resistant selections from Arawa an Aotea proved to be no more resistant than the original variety. The existence of strains in BYDV has been recognized by many investigators. They have been clearly demonstrated on oat varieties in greenhouse experiments by Allen (1) and Slykhuis et al. (5) and on different host species by Bruehl and Toko (2). Strain differences have also been shown by Toko and Bruehl (6), Rochow (4), and Watson and Mulligan (7) to exist when different aphid vectors were used.

The existence of strains of BYDV that can cause severe infection on crop varieties now being used as sources of resistence in plant breeding has not yet been reported. The purpose of this paper is to show that such strains do exist and to suggest that more extensive surveys for the occurrence of BYDV strains, especially in relation to the resistant varieties, should be undertaken.

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