CONTROL OF ANTHRACNOSE OF STORED TOMATOES WITH VENTURICIDIN[1]

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Abstract

A post-harvest dip of Venturicidin 12 to 24 hours after inoculation with Colletotrichum coccodes gave highly significant control of anthracnose. Venturicidin was more effective at 200 ppm than at lower concentrations, but gave inconsistent control of field infections of anthracnose and other rots of stored tomatoes.

Introduction

Anthracnose caused by Colletotrichum coccodes (Wallr.) Hughes was found by Lockhart and Harrison (2) to be a major disease of stored tomatoes in Nova Scotia. Latent infections take place in the field and the disease develops in storage as the tomato ripens. Lockhart and Eaves (1) showed that the post-harvest treatment of tomatoes with deposits of captan smoke residue gave some control of anthracnose. Recently Rhodes et al (3) produced a strong antifungal antibiotic; Venturicidin, which has no oral toxicity. Because toxic residues are a limiting factor in selecting fungicides or antibiotics for post-harvest treatment of tomatoes, Venturicidin appeared suitable to use in further investigations on the control of anthracnose.

The object of this investigation was twofold; (1) to determine the effect of various concentrations of Venturicidin dips on anthracnose, and (2) to assess the effect of different levels of inoculum and the inoculation-treatment intervals on the development of disease and control obtained with the antibiotic,

Materials and Methods

Immediately after harvesting, mature-green tomatoes, of the variety Harrow, were inoculated by dipping the tomatoes in a spore suspension of C. coccodes (500,000/ml) and incubated for 24 hours at 72° F unless stated otherwise. Ten grams of Venturicidin (Glaxo Research Ltd., Sefton Park, Stoke Poges, Buckinghamshire, England) were dissolved in 65.7 ml of ethylcellusolve, to which was added 27.6 gm of Sorbester PQ12 (mixed monolaurate and polyoxyethylene condensate from Howards of Ilford Ltd., Ilford, Sussex). Preliminary experiments showed that these levels of solvent and surfactant had no fungicidal effect. The 10 per cent formulation of Venturicidin was added to water to give desired concentrations. Each replicate consisted of 25 tomatoes. All treatments were replicated 4 times and all

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experimetits were done in duplicate at different times, hereafter indicated as I and II. The tomatoes were dipped in Venturicidin for 1 to 2 minutes. Following the dip treatments all tomatoes were stored at 52. 5°F for 4 or 5 weeks in single layers on trays (18" x 56") lined with brown paper. The tomatoes were examined at weekly intervals and all fruits showing anthracnose or other rots were removed from the trays. Total rots, indicated in brackets in the tables, include anthracnose and those caused by other microorganisms.

In the level of inoculum experiments tomatoes were inoculated in 0, IX, 2X, 4X and 8X levels of C. coccodes (X=250,000/ml). At the end of the 24-hour incubation period 4 replicates at each inoculum level were dipped in Venturicidin and 4 replicates were left untreated. In another experiment tomatoes were inoculated and incubated for 0, 3, 6, 12, 21 1/2, 24, 30 and 48 hours. At the end of each incubation period 4 replicates were dipped in Venturicidin and four were left untreated.

Results and Discussion

Venturicidin was more effective ip the control of anthracnose and total rots of tomatoes at 200 ppm than at lower concentrations (Table 1). Anthracnose infections increased with increasing levels of C. coccodes inoculum and, at the same time, a corresponding decrease in control of anthracnose was obtained with Venturicidin (Table 2). Rots were also caused by Alternaria tenuis Nees, Botrytis cinerea Pers. ex Fr., Sclerotinia sp., Phoma sp. Phytophthora infestans (Mont.) de Bary, spotted wilt and bacteria. Except for Alternaria and bacteria the other microorganisms were of minor importance.

The percentage of Alternaria rots on the uninoculated tomatoes for the level of inoculum in the first and second experiments were:

Venturicidin treatment	Dipped		Untreated	
	I	II	I	II
Per cent Alternaria rots	21	3	5	3

The high incidence of Alternaria rots of the dip-treated tomatoes in the first experiment accounts for 21 of the 25 per cent total rots (Table 2). The increase in Alternaria rots is attributed to minute cracks which appear to be induced during dip treatments and subsequently become centres of infection in storage. An increase in the number of rots caused by bacteria was also noted in some tests with dipped tomatoes. Bacterial rots have often been troublesome in tomatoes subjected to various fungicidal dips. Perhaps this cracking of tomatoes might be overcome by adding a non-toxic salt to the dip solution in order to increase the osmotic pressure and thus enhance the value of the fungicide or antibiotic.

The inoculation-treatment interval wag. found to be an important factor in the degree of control of anthracnose of tomatoes obtained with Venturididin

Table 1. Effect of Venturicidin in two experiments on the control of tomato rots at the end of 4 weeks in storage at 52.5° F.

Venturicidin in ppm	Per cent anthracnose and total rots: Inoculated I	Inoculated II	Uninoculated I	Uninoculated II
0	50 (71)*	47 (55)	12 (37)	11 (29)
25	28 (40)	46 (51)	13 (30)	9 (13)
50	30 (37)	40 (47)	13 (26)	8 (14)
100	32 (42)	31 (38)	8 (19)	3 (9)
200	27 (45)	29 (33)	4 (14)	1 (7)
L.S.D. .05 Dips			7.9 (8.1)	3.8 (5.8)
L.S.D. .01			10.9 (11.4)	11.7 (8.1)
L.S.D. .05 Inoculations			2.8 (5.0)	4.6 (3.7)
L.S.D. .01			5.9 (7.0)	6.3 (5.1)

* Total rots in brackets

Table 2. Control of rots on inoculated tomatoes treated with 200 p.p.m. Venturicidin and stored for 5 weeks at 52.5° F.

Level of inoculum (C. coccodes)	Per cent anthracnose and total rots: Dipped I	Dipped II	Untreated I	Untreated II
0	3 (25)*	7 (17)	2 (14)	6 (14)
1X	27 (52)	21 (55)	32 (55)	46 (71)
2x	26 (50)	26 (49)	38 (63)	48 (59)
4x	40 (51)	39 (61)	45 (61)	59 (77)
8X	43 (50)	38 (60)	54 (66)	48 (66)
L.S.D. .05 Dips		6.8 (9.9)		6.5 (6.7)
L.S.D. .01		9.4 (12.6)		8.9 (9.3)
L.S.D. .05 Inoculum levels		5.5 (11.9)		7.9 (5.3)
L.S.D. .01		7.7 (16.7)		11.1 (6.2)

* Total rots in brackets

(Table 3). Anthracnose infections due to artificial inoculations occurred after 12 or 3 hours incubation for the first and second experiments respectively and highly significant control of anthracnose by Venturicidin was attained 12 to 24 hours after inoculation. It is of interest to note that field infections of anthracnose were not more than 7 per cent as indicated by tomatoes receiving no inoculum (Table 2). A longer storage period would result in a higher incidence of anthracnose from field infections. The control obtained with Venturicidin may depend upon when infection occurs, since in dipping experiments the Venturicidin had to be applied within 24 hours following inoculation to be effective.

Table 3. Control of rots on tomatoes treated with 200 p. p. m. Venturicidin at various intervals following inoculation and stored for 4 weeks at 52. 5° F.

Inoculation-treatment intervals in hours	Per cent anthracnose and total rots: Dipped I	Dipped II	Untreated I	Untreated II
0	5 (26)*	5 (9)	6 (25)	11 (28)
3	8 (22)	9 (30)	9 (24)	22 (38)
6	7 (28)	22 (25)	8 (25)	26 (40)
12	28 (43)	32 (48)	60 (74)	44 (57)
21 1/2	48 (62)	29 (42)	79 (87)	42 (52)
24	64 (75)	37 (47)	69 (80)	48 (62)
30	65 (80)	77 (86)	67 (78)	70 (79)
48	70 (86)	78 (90)	74 (93)	80 (94)
L,S. D. .05 Dips		6. 8 (5. 1)	6. 5 (7. 8)	
L.S.D. .01		9.2 (6. 8)	8. 9 (10. 6)	
L. S. D. .05 Intervals		6. 3 (8. 9)	7. 2 (6. 1)	
L.S.D. .01		8. 8 (12.2)	9.9 (8. 3)	

* Total rots in brackets

Literature Cited

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