Incidence and Control of *Myrothecium roridum* on Cantaloup in Relation to Time of Fungicide Application

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ABSTRACT

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A mixture of benomyl and zinc ion-maneb complex significantly controlled *Myrothecium roridum* on cantaloup leaves and stems. No relationship was found among rainfall, time of fungicide application, and incidence of *M. roridum*. Primary infection by the fungus apparently occurred immediately before first bloom, because a single application at the onset of flowering controlled the disease. Significant differences in virulence were found among individual isolates, but not among leaf, stem, and fruit groups of isolates.

Fruits of cantaloup, *Cucumis melo* L., in the lower Rio Grande Valley of Texas are susceptible to a variety of fungi that cause both field and postharvest decay (1,2,4,5). These fungi often occur sporadically as pathogens, depending on the coincidence of favorable environmental conditions and the stage of maturity of cantaloup plants and fruits (3). In 1961, *Myrothecium roridum* Tode ex Fr. was reported as causing leaf spot, stem decline, and rind decay on cantaloup (6). In 1977, I found the fungus on the foliage of a fall planting of cantaloup near Weslaco, TX. However, in June 1975, lesions caused by *M. roridum* were frequently found on fruits at packinghouses before grading. The fungus also caused a leaf, stem, and fruit disease in a 1979 fungicide experiment near Rio Grande City, TX. Thus, in the Rio Grande Valley of Texas, *M. roridum* could cause severe losses of fruit and premature death of entire vines.

Foliar sprays of zineb on *Hypocyrta glabra* (9) and copper sprays on coffee (8) have been used effectively to control *M. roridum*; however, no work has been reported on control of this fungus on cantaloup. The objectives of this study were to 1) determine the effect of timing of fungicide applications on control of *M. roridum* on cantaloup fruit, foliage, and stems; 2) determine the extent of fruit losses at the packinghouse; and 3) compare the relative virulence of fruit, stem, and leaf isolates of the fungus through a series of cross-inoculations back to cantaloup stems and leaves.

This paper reports the results of research only, and mention of a pesticide does not constitute a recommendation by the USDA or imply registration under FIFRA.

MATERIALS AND METHODS

Fungicide treatments. A combination of the fungicides benomyl (Benlate 50 WP) and zinc ion-maneb complex (Manzate 200 80W) was applied as foliar spray at the rate of 1.1 kg a.i. of each fungicide in 935 L of water per hectare. These two fungicides were selected because they are routinely used commercially to control foliage disease and because *M. roridum* was sensitive to them in preliminary in vitro tests.

Fungicide treatments were applied as follows: 1) once after the first male blossoms appeared, 2) once after netting appeared on the fruit, 3) weekly after female blossoms appeared, 4) within 24 hr of rainfall, and 5) no fungicides applied. Fungicides were applied to the foliage with a Hudson hand-pumped 7.6-L sprayer (H. D. Hudson Mfg. Co., Chicago, IL).

A split-block design with four replications was used. Each treatment was one 9-m row; rows were spaced 203 cm apart. 'TAM-Uvalde' cantaloup seed was planted on 27 March 1979. Seedlings were thinned to 30 cm, for a total of 30 seedlings for each treatment within a replicate. The fertilization and irrigation regimens practiced by the commercial grower in whose field the plots were located were followed.

Fruits were examined at harvest, and the number of *Myrothecium* lesions was recorded. At the end of the experiment, 15 leaves from each treatment and replication were randomly collected and the lesions counted. Leaf lesions were distinguished from those caused by *Alternaria* by the presence of sporodochia. Dead and infected plants were also counted.

Incidence of *M. roridum* on fruits. A packinghouse processing fruit harvested from fields infested with *M. roridum* was surveyed three times. One-hundred melons randomly selected before they reached the first grading station on the treatment and packaging assembly line and another 50 melons culled from the line by packinghouse crews were examined, and the percentage of melons with *M. roridum* lesions was recorded.

Virulence of fruit, stem, and leaf isolates. Five fungal isolates each from fruits, stems, and leaves were used to inoculate 6-wk-old TAM-Uvalde cantaloup seedlings growing in 25-cm plastic pots in the greenhouse. Ten-day-old cultures of each fungal isolate grown on potato-dextrose agar were washed with 25 ml of sterile water, and the spore suspension was then decanted into a sterile 250-ml Erlenmeyer flask. The concentration of conidia was adjusted to 10^6/ml. From each isolate, 0.2 ml of each conidial suspension was injected into the stems of 12 plants immediately above the cotyledons. Leaves were inoculated by saturating a cheesecloth square with the same spore suspension diluted 1:20 with sterile water and lightly swabbing the upper surface of four to six leaves per plant. Each isolate was used to inoculate 12 plants (ie, four replications of three plants each). Plants were observed 3, 7, and 14 days after inoculation. Greenhouse temperatures ranged from 18 to 34 C.

Nearly mature fruit at the half-slip stage, when half the abscission layer of the peduncle has formed, were surface-sterilized in an 0.5% solution of calcium hypochlorite and swabbed with 95% ethyl alcohol at inoculation sites. Each fruit was then injected with 0.5 ml of the spore suspension 5–10 mm beneath the rind at three equidistant locations around the equator of the melon. Nine fruits were inoculated for each isolate. Both inoculated and uninoculated fruits were stored at 21 C and 95% relative humidity and examined 3, 5, and 10 days after inoculation. For controls, sterile water was injected into stems and fruits and swabbed onto leaves.

Table 1. Effect of fungicide application timing on the number of dead cantaloup plants and leaf lesions caused by *Myrothecium roridum*

Treatment[x]	Dead plants[y] No./replicate	Dead plants[y] Percentage of total	Lesions/leaf[y]
No fungicide (control)	7 a	23.3	2.0 a (0–21)
Fungicide, first netting	4 b	13.3	0.4 b (0–3)
Fungicide, first bloom	2 bc	6.7	0.7 b (0–8)
Fungicide, after rainfall[z]	1.3 c	4.3	0.1 b (0–1)
Fungicide, seven weekly applications	0.5 c	1.7	0.2 b (0–2)

[x] Benomyl and Manzate 200 were each applied at the rate of 1.1 kg in 935 L of water.
[y] Values in columns followed by the same letter do not differ significantly ($P = 0.05$) according to Duncan's new multiple range test. There were 30 seedlings per replicate and four replicates per treatment. Numbers in parentheses refer to range in lesions/leaf.
[z] Rain fell on 16, 21, and 29 April and on 3, 11, and 22 May.

RESULTS AND DISCUSSION

The incidence of *M. roridum* on leaves and stems of cantaloup was significantly lower on plants treated with a mixture of benomyl and zinc ion-maneb complex than on untreated plants, regardless of the time of application (Table 1). The percentage of dead plants ranged from 23.3 in the untreated controls to 1.7 in treatments receiving weekly fungicide applications. The number of lesions on individual leaves varied from 0 to 21 for untreated controls, from 0 to 1 for treatments after rainfall, and from 0 to 8 for treatments after the first bloom.

Rainfall was recorded six times at 4- to 11-day intervals during the experiment. No relationship was found between rainfall and the incidence of *M. roridum*. Primary infection by the fungus probably occurred immediately before first bloom, because a single application of fungicide at the onset of flowering controlled the disease (Table 1). Incidence of *M. roridum* on fruits ranged from 0.2 to 0.5 lesions per fruit. The low number of lesions on fruit in untreated controls also suggests that the plants were infected before flowering.

Table 2. Incidence of *Myrothecium roridum* on cantaloup fruit at the packinghouse

Inspection date	Percentage of fruit with lesions: 100 fruit chosen at random before culling	Percentage of fruit with lesions: 50 culls
29 May	1.1	8.2
5 June	7.7	44.6
11 June	4.6	23.1

Table 3. Length of stem lesions and number of leaf lesions on 6-wk-old cantaloup plants 14 days after inoculation with stem, fruit, and leaf isolates of *Myrothecium roridum*

Isolate	Length of stem lesions (mm)[z]	Number of lesions/leaf[z]
Stem		
1	30 ab	79 bc
2	76 b	83 bc
3	42 ab	20 a
4	65 b	52 ab
5	28 ab	60 ab
Mean	49	59
Fruit		
6	61 b	84 bc
7	32 ab	103 c
8	27 ab	61 ab
9	41 ab	38 ab
10	22 a	32 ab
Mean	37	64
Leaf		
11	52 ab	69 ab
12	23 a	80 bc
13	32 ab	22 a
14	29 ab	96 bc
15	36 ab	93 bc
Mean	34	72
All isolates	40	65

[z] Values in columns followed by the same letter do not differ significantly ($P = 0.05$) according to Duncan's new multiple range test.

Fruits with *M. roridum* lesions were readily identified and culled at the packinghouse. The incidence of infection was highest on fruit inspected on 5 June in both randomly chosen, unculled fruit and the culls themselves (Table 2). A high percentage of the fruit culled on 5 and 11 June was chosen because of *M. roridum*

lesions. A cursory inspection of packaged fruit indicated that few infected fruit were packaged and shipped. Fruits examined at the packinghouse were from fields that matured earlier than fruits from the fungicide experiment, which may account for the larger percentage of infected fruit at the packinghouse than from the experimental plots. These commercial cantaloup fields had been sprayed four to six times with maneb.

No significant differences in length of stem lesions or number of leaf lesions were found among stem, fruit, and leaf groups of isolates. Significant differences were found, however, among individual isolates ($P = 0.05$) (Table 3). The considerable variation of measurements within individual isolates resulted in separation into overlapping sets of data. Variation could have been due, in part, to the inoculation technique and/or the heterogeneity of the TAM-Uvalde cantaloup cultivar. No significant differences in number of infected fruits or lesion diameter on fruits were found among isolates. All isolates appeared to infect fruits equally, regardless of plant tissue source.

M. roridum is usually regarded as a weak parasite (6,7). However, these data indicate that the fungus could cause serious losses of both cantaloup plants in the field and fruits at the packinghouse.

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