Postharvest Treatment for Control of Stem-Scar, Rind, and Decay Fungi on Cantaloup


ABSTRACT

Imazalil (R-23979) at 24 and 57 C and sodium dimethyl dithiocarbamate at 57 C were effective in controlling surface and stem- scar fungi and decay by Fusarium and Diaporthe on cantaloup. Concentration and temperature of solution had little or no effect on the efficacy of imazalil. Hot water (57 C) alone and chlorine were not effective in controlling surface and decay fungi. Vein tract and suture browning of fruits was not objectionable in any treatment.

Postharvest stem-scar, rind, and decay fungi are limiting factors in the marketing of cantaloup (Cucumis melo L.) from south Texas (4,5). Fruits decayed by these fungi are unattractive. Decay usually appears while the fruits are at retail outlets, but it may occur during shipment if conditions are not optimal.

Packers have used chemical and hot water treatments and a shipping temperature of 3 C to retard decay organisms (4,6,7). The U.S. Environmental Protection Agency has approved only captan, sodium ortho-phenyl phenate, and sodium dimethyl dithiocarbamate (SDDC) for postharvest treatments to control decay of cantaloup (2). In the Rio Grande Valley of Texas, SDDC and chlorine are the primary chemicals for treating harvested cantaloup. They are sometimes used in conjunction with hot water at the packinghouse. Although hot water treatments appear to be a practical alternative to chemical treatments, they are of limited value on cantaloup unless applied in combination with fungicides (3).

Because so few fungicides are available for postharvest use on cantaloup, I compared the effectiveness of the experimental fungicide imazalil (R-23979; 1-[2-(2,4-dichlorophenyl)-2-(2-propenyloxy)-ethyl]-1 H-imidazole) to that of commercially available fungicides in controlling surface and decay fungi. I also evaluated SDDC because no data on its effectiveness have been published.

MATERIALS AND METHODS
Perita cantaloup fruits at full-slip (complete abscission of the peduncle) and having firm texture were obtained from a packinghouse on the day of harvest but before grading or treatment. Fruits that were free from injury and decay were sorted into lots of similar size and appearance, washed in running tap water, air-dried, and stored at 26 C for 24 hr.

Fruits were individually dipped in water or fungicide solution at 24 or 57 (±1) C for 0.5 min. The temperature of the solution never dropped more than one degree during treatment. The fungicides and concentrations used were SDDC at 4,000 mg a.i./L, benomyl at 1,000 mg a.i./L, and imazalil at 1,000 or 500 mg a.i./L. Chlorine at 1,000 mg ClO-/L was used separately and in combination with benomyl and imazalil.

After treatment, fruits were stored at about 90% relative humidity and 5 C for 4 days and then 26 C for 4 days to simulate conditions during transit and at the retail market. Fruits were then rated for general appearance, surface fungal growth on stem scars and rinds, and browning of the vein tracts and rind. Rinds were removed from individual fruits to a depth of about 2 mm, and lesions caused by Fusarium roseum (Lk.) smnd. B. & Hans. 'Semitectum' and Diaporthe melonis Beraha & O'Brien were counted.

Each treatment was applied to a total of 16 fruits in four replications. Data were evaluated by analysis of variance and Duncan's multiple range test.

RESULTS
Fruits treated with imazalil and SDDC (57 C) were significantly better in general appearance than those in other (chemical or water) treatments (Table 1). The incidence of vein tract and rind browning was low in all treatments (trace or less); however, browning was significantly greater in the warmer of corresponding treatments. To a lesser extent, browning was greater in the chemical treatments—particularly those with imazalil—than in the water treatments.

Imazalil and SDDC at 57 C controlled rind fungal growth significantly better than any of the other treatments (Table 1). Fruits treated with chlorine at 24 C had the most fungal growth on rinds. All treatments with imazalil or SDDC and all those with benomyl at 57 C controlled stem-scar fungal growth (ie., one-fourth or less of stem-scar covered by fungal growth).

Cantaloupes treated with imazalil or with SDDC, benomyl, or chlorine at 57 C had significantly fewer Fusarium lesions than the other fruits (Table 1). The same treatments and benomyl at 24 C but not chlorine at 57 C significantly controlled D. melonis. Water at 57 C was ineffective in controlling either F. roseum 'Semitectum' or D. melonis.

DISCUSSION
Imazalil and SDDC were effective in controlling surface, stem-scar, and Fusarium and Diaporthe decay fungi on cantaloup. Except on the rind surface, concentration and solution temperature had no significant effect on the ability of imazalil to control all types of fungal growth. Because it is effective at 24 C, imazalil would be preferred to other chemicals that require the heating of large quantities of water.

Fruits treated with imazalil or SDDC at 57 C maintained the good quality and appearance necessary for consumer acceptance. The increase in browning caused by imazalil, although significant, was slight and unobjectionable. SDDC, the only fungicide tested that is approved by the Environmental Protection Agency, was not significantly distinguishable in its effect at 57 C from imazalil. To my knowledge, this is the first published data on SDDC as an agent for controlling postharvest decays on cantaloup. Wells and Stewart (8) found that mancozeb is effective in controlling Fusarium rot of cantaloup in California.

Chlorine was not effective in controlling surface or decay fungi, nor did it have any significant effect when used with imazalil or benomyl. Barger et al (1) found that chlorine treatments are erratic in controlling decay, and other researchers (5,8) found that chlorine gives moderate control of surface fungi. The value of

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<table>
<thead>
<tr>
<th>Treatment</th>
<th>Concentration (mg a.i./L)</th>
<th>Appearancea</th>
<th>Browningb</th>
<th>Funigal growth</th>
<th>Lesions per fruit (no.)</th>
<th>Fusarium</th>
<th>Diaporthe</th>
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<tr>
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<td>1.5 b</td>
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<td>26.1 b</td>
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<td>3.7 d</td>
<td>31.6 bc</td>
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</table>

*a1 = excellent: no decay, rind or stem-scar fungal growth, or rind or vein tract browning; 2 = good: melons salable, with a trace of detrimental factors; 3 = fair: melons salable, with moderate detrimental factors; 4 = poor: melons marginally salable, with severe detrimental factors; 5 = unsalable because of excessive detrimental factors.

*b1 = none, 2 = trace, 3 = slight, 4 = moderate, and 5 = severe browning of vein tracks and rind.

*c1 = no fungal growth, 2 = trace to one-fourth of the stem scar covered, 3 = one-fourth to one-half covered, 4 = one-half to three-fourths covered, and 5 = stem scar between three-fourths and completely overgrown by fungi.

*d1 Estimated percentage of the rind covered by fungal growth. Percentages transformed to degrees, percentage + sin² θ.

*e1 Means within a column followed by the same letter are not significantly different (P = 0.05).

*f Chlorine concentration expressed as milligrams of ClO₂ per liter.

Adding chlorine to postharvest dip solutions, although a standard practice in south Texas, appears to be of questionable value.

Heated water (57 C) alone was not effective as a postharvest treatment. In a previous study (3), the only value of hot water was to increase the efficacy of fungicial action.

LITERATURE CITED