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

W. W. CARTER, Research Plant Pathologist, Agricultural Research Service, U.S. Department of Agriculture, Weslaco, Texas 78596

ABSTRACT

Carter, W. W. 1981. Postharvest treatment for control of stem-scar, rind, and decay fungi on cantaloup. Plant Disease 65:815-816.

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.

This article reports the results of research only. Mention of a pesticide does not constitute a recommendation for use by the USDA nor does it imply registration under FIFRA as amended.

Accepted for publication 10 February 1981.

MATERIALS AND METHODS

Perlita 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 ($\pm$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.) emend. Snyd. & 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).

Cantaloups 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

Table 1. Effectiveness of various treatments in controlling stem-scar and rind fungi and decay by *Fusarium roseum* 'Semitectum' and *Diaporthe melonis* on cantaloup

		Effect on cantaloup					
				Fungal growth		Lesions per fruit (no.)	
Treatment	**Concentration (mg a.i./L)**	**Appearance**[a]	**Browning**[b]	**Stem scars**[c]	**Rinds (%)**[d]	***Fusarium***	***Diaporthe***
Imazalil at 24 C	500	1.4 a[e]	2.0 c	1.6 a	21.9 b	7.3 ab	0.4 a
Imazalil + chlorine[f]	1,000 each	1.4 a	2.0 c	1.8 a	10.6 a	3.2 ab	0.4 a
Imazalil at 57 C	1,000	1.5 a	2.1 c	1.6 a	3.2 a	0.3 a	0.1 a
Imazalil at 24 C	1,000	1.5 a	1.6 bc	2.2 ab	5.6 a	1.4 ab	0.3 a
SDDC at 57 C	4,000	1.8 a	1.9 c	2.2 ab	12.9 a	2.9 ab	0.9 ab
Benomyl at 57 C	1,000	3.1 b	1.5 b	3.0 cd	26.1 b	2.7 ab	0 a
Benomyl + chlorine at 57 C[f]	1,000 each	3.1 b	1.5 b	2.8 bc	24.0 b	3.5 ab	0.2 a
Chlorine at 57 C	1,000	3.3 bc	1.4 b	3.7 d	31.6 bc	13.3 bc	3.6 d
SDDC at 24 C	4,000	3.4 bc	1.0 a	2.9 bc	37.2 cd	20.4 cd	1.6 bc
Water at 24 C	···	3.9 cd	1.0 a	4.9 e	45.0 de	20.8 cd	2.5 cd
Benomyl at 24 C	1,000	4.1 de	1.0 a	4.9 e	49.0 e	17.8 cd	0.1 a
Water at 57 C	···	4.1 de	1.4 b	4.4 e	48.4 e	21.8 cd	3.0 cd
Chlorine at 24 C[f]	1,000	4.7 e	1.0 a	5.0 e	62.3 f	28.1 d	2.2 cd

[a] 1 = 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.

[b] 1 = none, 2 = trace, 3 = slight, 4 = moderate, and 5 = severe browning of vein tracks and rind.

[c] 1 = 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.

[d] Estimated percentage of the rind covered by fungal growth. Percentages transformed to degrees, percentage + $\sin^2 \theta$.

[e] Means within a column followed by the same letter are not significantly different ($P = 0.05$).

[f] Chlorine concentration expressed as milligrams of ClO^- 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 fungicidal action.

LITERATURE CITED

1. Barger, W. R., Wiant, J. S., Pentzer, W. T., Ryall, A. L., and Dewey, D. H. 1948. A comparison of fungicidal treatments for the control of decay in California cantaloupes. Phytopathology 38:1019-1024.
2. Carter, E. P., Smith, K. L., and Davis, R. A. 1979. USDA compilation of registered uses of fungicides and nematicides. Prelim. ed. Agric. Res. Pestic. Assess. Staff. U.S. Dep. Agric. Sci. Educ. Adm.
3. Carter, W. W. 1981. A reevaluation of hot water as a postharvest treatment for control of surface and decay fungi of cantaloup. HortScience 6:334-335.
4. Johnson, H. B. 1968. Heat and Other Treatments for Cantaloupes and Peppers. United Fresh Fruit Veg. Assoc. Yearb. Pp. 51-52, 54, 56.
5. McDonald, R. E., and Buford, W. R. 1971. Effect of hot water and fungicides for control of stem-scar and rind molds of cantaloups. Plant Dis. Rep. 55:183-185.
6. Stewart, J. K. 1970. Cantaloupe decay control. West. Grower Shipper 41:4.
7. Stewart, J. K., and Wells, J. M. 1970. Heat and fungicide treatments to control decay of cantaloupes. J. Am. Soc. Hortic. Sci. 95:226-229.
8. Wells, J. M., and Stewart, J. K. 1968. Heat pasteurization and chemical fungicides for control of Fusarium rot of California cantaloups. Plant Dis. Rep. 52:262-264.