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COOPERATIVE
EXTENSION SERVICE

PACKINGHOUSE NEWSLETTER

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IMPROVED CITRUS FRUIT QUALITY WITH EFFECTIVE DECAY CONTROL

Postharvest decay is one of the major factors affecting quality of Florida citrus fruit. Effective use of fungicides is our major method of reducing decay, but we should by no means overlook the importance of all proper cultural, harvesting, and packinghouse practices to minimize decay. Often, careful harvesting is as or more important than fungicide treatments for decay control, and by combining good fresh fruit handling practices with effective fungicide applications, one can expect maximum keeping quality.

To briefly review the use of fungicides for decay control, the major postharvest diseases, varieties most commonly affected by these diseases, seasonal occurrence, and the various methods of fungicide application for control are listed in the following table.

Timing of fungicide applications

Time of fungicide application is more critical for effective control than the amount of fungicide residue on the fruit. Generally, as delays between harvest and fungicide application exceed 24 hours, efficacy of the treatment decreases. Delays allow growth of decay fungi and penetration into the fruit rind through sound or injured tissue. Once established, these infections are more difficult to eradicate with fungicide treatments. For these reasons, more effective control of Diplodia SER, green mold and anthracnose is obtained if fungicides are applied before rather than after degreening. Preharvest sprays of benomyl or treatments in pallet bin or truck drenchers circumvent this problem.

Florida Citrus Postharvest Decays and Fungicide Application Methods

Disease	Varieties	Season	Fungicide Applications
Diplodia SER ^Z	All	Sept-Dec	1. Preharvest Benomyl spray 2. Benomyl or TBZ ^Y bin drench 3. Benomyl or TBZ ^Y packingline
Anthrachnose	Robinson	Sept-Nov	1. Preharvest benomyl spray 2. Benomyl bin drench 3. Benomyl packingline
Green Mold	All	Dec-June	1. Preharvest benomyl spray 2. Benomyl or TBZ ^Y bin drench 3. SOPP ^X , imazalil, benomyl or TBZ ^Y packingline 4. Diphenyl pads in cartons
Sour Rot	Specialty Grft & oranges	Nov-Feb Apr-June	1. SOPP ^X packingline 1. SOPP ^X packingline
Phomopsis SER ^Z	All	Jan-June	1. Benomyl or TBZ ^Y packingline
Brown Rot	Early	Aug-Dec	1. Grove copper sprays

x Sodium orthophenylphenate

y Thiabendazole

z Stem-end Rot

Sanitation

Good sanitation is a critical component of decay control. Effective sanitation practices reduce inoculum, particularly that of green mold and sour rot, and lessen chances for fruit infection during the packing process. Quarantine practices of trash removal and pallet bin and equipment sanitation required for canker eradication are beneficial, and should be continued even if canker regulations are relaxed. Decayed fruit in pallet bins should not contact and contaminate the washer brushes, but should be graded out at the dump. The packinghouse should be cleaned and all culled and dropped fruit removed from the house every day. The packinghouse and particularly the equipment should be washed daily with water and detergent, and then sprayed with a disinfectant such as quaternary ammonium chloride or chlorine. Under no circumstances should treated fruit with excessive green mold be repacked in the packinghouse. Airborne mold spores will be disseminated throughout the packinghouse and they will likely be resistant to the fungicide treatments.

Fungicide resistance

Green mold can develop resistance to any of the postharvest fungicides, but development is most difficult against imazalil. Preharvest sprays of benomyl or storage of fungicide-treated fruit in

the packinghouse may encourage accumulation of resistant spores in the packinghouse. During the winter season, when green mold populations are highest, spores should be collected and assayed for resistance. Good sanitary practices and alternate applications or mixtures of fungicides of unrelated chemistry should be used to suppress sporulation and to prevent or delay the possible build-up of resistance.

Fungicide programs for maximum decay control

Efforts to obtain maximum decay control have generally been directed to export fruit, and primarily grapefruit since this is the major export variety. However, these efforts should also apply to fruit destined for domestic markets, as recent declines in domestic sales can be partially attributed to lack of consistent decay control and subsequent loss of consumer confidence in Florida fresh citrus. Fungicide applications before degreening are required if Diplodia stem-end rot is to be consistently controlled. These should be followed with on-line treatments of additional fungicides. Of these, SOPP is the only fungicide with activity against sour rot. Treatments of SOPP during washing provide decay control and also sanitize the brushes to help prevent infection of healthy fruit by contact with contaminated brushes. Some problems, usually due to improper application or rinsing, have been experienced with SOPP phytotoxicity on early, degreened, tender-skinned fruit. Since sour rot is generally not a problem early in the season, SOPP can be applied later when the rind is less tender and sour rot is more prevalent. Fungicides are most effective when applied in water, but applications can be made in wax without too much loss in efficacy if concentrations are doubled. Wax preparations of benomyl should be prepared daily. Imazalil, however, should be applied in water because eradicated activity and protection against infections through post-treatment injuries are significantly decreased in wax applications. Sporulation of green mold on infected fruit must be controlled to prevent soilage of healthy fruit in packed cartons. Soilage severely detracts from the appearance of packed cartons at the market and increases labor costs if repacking is required. Imazalil and diphenyl are two fungicides that provide sporulation control. Our experiences indicate that imazalil applied in water (1000 ppm) followed by another 1000 ppm in the wax with TBZ (2000 ppm) is an effective sporulation control treatment. To achieve optimum benefits from diphenyl, always use fresh pads removed from air-tight containers that prevent loss of the volatile fungicide.

Brown rot

This is a localized disease, most frequently found on the East Coast, that occasionally causes significant decay losses, such as occurred last season. It is associated with long durations of rainfall and wetting, such as conditions accompanying tropical depressions or hurricanes that occur in the fall. For this reason, it is mostly early maturing varieties that are affected. Infected fruit usually fall from the tree, and if additional periods of infection do not occur, harvesting can be delayed a week to eliminate decayed fruit. Fruit on

the ground should be destroyed ahead of the pickers to avoid contamination of the good fruit. Field copper sprays are our only chemical control method, and one or two applications in August or September provide good control.

An exception occurred last year when the disease developed in February in association with rainy weather. Dry conditions that followed inhibited lesion development and many infected fruit did not drop from the tree. When these were harvested, they were not easily discerned and graded out, and when packed, the decay resumed development at the high relative humidities that existed in the cartons and spread to healthy fruit. This type of development presumably is rare, and can only be controlled by close monitoring of the grove for infection. Some samples can be picked before harvest and held at high relative humidity to assess disease potential. If significant disease is present, additional harvested fruit will have to be graded judiciously if utilized for the fresh market.

Summary

Effective uses of sanitation and fungicides for decay control have been briefly outlined. More extensive descriptions of the decays, fungicide efficacy and methods of fungicide application have been presented in Proceedings of the Fresh Citrus Quality short courses presented at Lake Alfred and Fort Pierce and in a review article published in the June 1988 issue of The Citrus Industry Magazine. Copies of these can be obtained by contacting the author or editor.

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CITRUS PACKINGHOUSE DAY

Thursday, September 8, 1988. Citrus Research and Education Center, Lake Alfred.

AVAILABLE PUBLICATIONS

Available from Dr. W. Wardowski, CREC, 700 Experiment Station Road,
Lake Alfred, FL 33850

Postharvest Decays of Florida Citrus, by G. E. Brown. The Citrus Industry 69(6): 31-33,35,37-39. June 1988.

Decay Control/Fungicide Applications, by G. E. Brown in Fresh Citrus Quality Short Course Proceedings, W. F. Wardowski, editor, January 1988.

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