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## PACKINGHOUSE NEWSLETTER

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### DECAY AND SANITATION

There has been an unusually high incidence of stem-end rot since the beginning of the season and this has resulted in significant loss in fruit packed for the fresh fruit market. Hopefully, the following information will be of help in combating this and other decay problems in future years.

Stem-end rot is a postharvest decay common to citrus production areas which have high rainfall during the growing season. Inoculation of the fruit occurs in the grove during this time, when spores produced by the stem-end rot fungi are washed by the rain over the fruit; but decay does not develop until after the fruit is harvested. Decay usually starts at the button end through the abscission area, hence the name stem-end rot or stem-end decay. However, decay may also occur at injuries.

Control of decay depends on several factors: grove procedures to reduce inoculum, degreening conditions, packinghouse sanitation, postharvest decay control treatments and proper refrigeration of packed fruit during storage and transit.

A good method of reducing stem-end rot is to reduce the spore population. Since stem-end rot fungi exist on dead wood in citrus trees, removal of such wood, particularly from older and freeze-damaged trees, will significantly reduce the amount of spores available for inoculating the fruit.

The primary reason for early season stem-end rot is the long period of degreening required to meet color standards. The degreening room, with its high humidity and 85° temperature, is ideal for growth of the stem-end rot organism. Excessive ethylene enhances the development of stem-end rot. Therefore, the ethylene level in the degreening room must be closely monitored to stay within the recommended one to five ppm concentration. The time of degreening should also be watched so that the fruit is removed and packed as soon as an acceptable color is achieved. The use of a preharvest or predegreening fungicide treatment is helpful to control the development of stem-end rot during degreening. Benomyl may be used as a preharvest spray and either benomyl or thiabendazole are effective in a bin drench to control stem-end rot. Drenchers should contain chlorine to eradicate sour rot, brown rot and green mold resistant to benomyl and thiabendazole.

In any decay control procedure, the development of a good packinghouse sanitation program is of major importance. Organisms causing green mold and sour rot may be

brought into the packinghouse on decayed fruit from the grove and contaminate degreening rooms, soak tanks, rollers and brushes. These organisms have the potential to reinfect other non-decayed fruit through minor injuries, resulting in an increase in decay at the market. The best way to control this problem is to reduce the amount of *inoculum* by removing decayed fruit at the dump, cleaning up and discarding all decayed fruit from the packinghouse, and using a sanitizing spray on equipment, particularly the "wet line."

Soak tanks are sources of contamination by green mold, sour rot and brown rot. Soak tanks should contain chlorine if they are used to improve the washing procedure. Chlorine is probably the safest and most effective disinfectant to use in the soak tank; however, it has the disadvantage of being used up quickly when the water becomes dirty from field soil, sooty mold and broken and decayed fruit. To maintain effective levels of chlorine, it is necessary to meter the chlorine into the tank on a continuous basis, as well as to maintain the proper pH control to offset the effect of acid being introduced into the tank by juice from broken and decayed fruit. The soak tank should be drained, cleaned and recharged daily. Benzimidazole type fungicides; such as, benomyl and thiabendazole, are not recommended for use in the soak tank because of lack of control of resistant green mold, sour rot and brown rot. It is also wasteful, since washing removes much of the fungicide.

Postharvest fungicide applications help to control decay, and are required by the Division of Fruit and Vegetable Inspection enforcing Florida Department of Citrus Rules. Multiple fungicide treatments, including both orthophenylphenol (Dowicide) and benzimidazole type fungicides, are recommended. Orthophenylphenol applied on the washer provides an effective treatment. Benomyl and thiabendazole provide good decay control when applied as aqueous sprays in either water and/or water waxes. However, the effectiveness of these treatments is improved by maintaining the proper sanitation procedures, as previously indicated.

Once fruit have been harvested, properly degreened, run through a well kept packinghouse and treated with the appropriate postharvest treatments, a final and most important step in maintaining quality is proper refrigeration during storage and shipping. Refrigeration slows down the life processes of both the fruit and decay organisms. Since the stem-end rot organism prevalent at the beginning of the season has an optimal growth temperature of 86° F, it is obvious that cooling the fruit to their recommended storage temperature will greatly reduce stem-end decay. However, fruit which will be undergoing ethylene dibromide (EDB) fumigation may be severely injured if placed under refrigeration before fumigation or before desorption of EDB is essentially complete.

In summary, if you are having a problem with decay, the following suggestions should be of help in reducing the problem:

1. Check grove for excessive dead wood. If economical, prune and burn or remove dead wood from the grove.
2. Use a preharvest or predegreening fungicide application. Benomyl as a preharvest spray or benomyl or thiabendazole in a bin drench, would be most effective.
3. Use recommended degreening room procedures. Control ethylene level, temperature, and relative humidity closely and degreen no longer than necessary.

4. Maintain a good packinghouse sanitation program. Clean up and remove decayed fruit from the packinghouse. Use a sanitary spray on packing-line equipment.
5. Use a disinfectant in the soak tank. Chlorine is probably the safest and most effective material to use. The tank should be cleaned and changed daily.
6. Use multiple fungicide applications. These should include both orthophenylphenol (Dowicide) and benzimidazole type fungicides (thiabendazole and/or benomyl).
7. To maintain packed fruit in best condition and to reduce the development of decay, place fruit under refrigeration as soon as possible and continue during transit and storage.

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#### CHIMERA HUNT

Everyone has seen chimeras, those striking sections on occasional citrus fruits that are totally different from the rest of the fruit. Sometimes the anomalous section has some marked improvement such as better color, smoother rind, or immunity to some pest such as rust mite, melanose, or greasy spot.

Twenty-three years ago, I reasoned that if the peeled chimera exactly matched with the flesh segments beneath, there was a chance that a whole segment of the fruit might carry the beneficial quality. If that segment carried a seed, there was a possibility of getting nucellar seedlings that logically might carry the improved character. I passed the word to packer friends and soon had many striking chimeras gathered by ladies on the grade tables. In an occasional fruit, the chimera matched the segments and seeds were available from each part of the fruit (to give us a basis of comparison). By 1962 we had a number of little trees starting to set fruit. I was out-of-state at the time of the December 12-13, 1962 "freeze of the century" and we lost them all.

So? Now Dr. Gloria Moore, a new faculty member in the Fruit Crops Department at Gainesville, is interested in taking up this project and, unlike me, she is young enough to have a chance of seeing it through to a possibly successful conclusion. But first, we need to once again gather potentially useful chimeras. Once again my packer friends are asked to have their graders look for them. Then send them to me or to Dr. Will Wardowski. With each fruit, please put a label with the name of your packinghouse, and the name of the person (usually a lady grader) who spotted it. This information will be recorded so that if a valuable new variety results, its complete history will be known. But don't anyone hold their breath waiting. Last time we cut dozens of promising chimeras for every one in which we found the necessary matching segments and properly located seeds.

Bill Grierson  
AREC, Lake Alfred

AVAILABLE PUBLICATIONS

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

"Postharvest decay control recommendations for Florida citrus fruit" by A. A. McCornack, W. F. Wardowski and G. E. Brown. Fla. Coop. Ext. Serv. Circ. 359-A. February, 1976.

Available from Mr. Harvey H. Hester, Jr., FMC Corporation, Fairway Avenue Box 1708, Lakeland, FL 33802

"Sanitary Spray" by H. Hester. Technical Bulletin 105T.

"A Sanitation Program for Fresh Fruit and Vegetable Packinghouses" by H. Hester. Technical Bulletin 106T.

Available from Mr. J. Fredrick Kelly, American Machinery Corporation, P. O. Box 3228, Orlando, FL 32802

"Sanitation in Citrus Packinghouses" as individualized responses to requests by citrus packers.

Available from Mr. Jack Petrie, Decco Division, Penwalt Corp., P. O. Box 120, 1713 S. California Avenue, Monrovia, CA 91016

"Technical Data: Stericide Sanitizer"

"Technical Data: Stericide PR"

Available from Mr. David J. Hall, Agri-Chem, Inc., Box 17477, Orlando, FL 32860

"Packinghouse Strategies for the Control of Fungicide Resistant Molds" by D. J. Hall and J. R. Vice. Proc. Fla. State Hort. Soc. 90:138-141. 1977.

Available from Mr. Rich Phillips, Brogdex Co., 1421 N. Orange Ave., Orlando, FL 32804

"Citrus Packinghouse Sanitation" as individualized responses to requests by citrus packers.

Available from Dr. Brian L. Wild, Gosford Horticultural Postharvest Laboratory, P. O. Box 355, Gosford, N.S.W. Australia 2250

"Guazatine Control of Sour Rot in Lemons, Oranges and Tangors Under Various Storage Conditions" by L. E. Rippon and S. C. Morris. Scientia Horticulturae 14:245-251. 1981.

This newsletter is published at a cost of \$110.67 or 9 cents per copy, to give the latest news to the packinghouse industry.

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