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PACKINGHOUSE NEWSLETTER

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EARLY SEASON FROM BLOOM TO END

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The 1990-91 Florida citrus crop had an extremely early bloom beginning in January 1990, and the entire season has been unusual with many fruit problems. In addition to early bloom, unseasonably warm weather accelerated the loss of acid in the fruit. In some cases, low acid resulted in atypical bland flavors. Some packers relate lower acid to increased decay: low acid usually indicates advanced maturity which corresponds to higher decay. The normal optimum maturity was early, with varieties harvested well ahead of normal calendar dates. Peel injuries were sometimes excessive on peel which had not had normal environmental conditioning. Sour rot normally reported in April and May on late season fruit, was reported in January. See the following article by G. E. Brown for more information on late season decay.

Numerous calls from packers and marketers emphasized that the problems in the 1990-91 season were general rather than for a particular organization, variety or crop. Some crops were strong but many more were problematic. Packers and marketers have requested that we include this information in Packinghouse Newsletter so that they can share it with their customers and have reasonable expectations of more normal fruit next season.

Now that California citrus growers have experienced a severe freeze, the opportunity exists for longer and stronger markets for Florida oranges. Both domestic and export markets are attractive for Florida and also for other citrus producing countries. Careful selection and handling of the highest quality crops for external appearance and for near normal seasonal maturity will aid in keeping the customers happy. Many packers are selecting crops on the basis of high acid and relatively clean blemish-free appearance for this unusual marketing opportunity.

FLORIDA CITRUS DECAYS THAT NEST IN PACKED CARTONS

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The 3 decays, blue mold, brown rot and sour rot, have the ability to spread from a single infected fruit to surrounding healthy fruit in packed cartons. This spread is known in the industry as "nesting". Blue mold will not be discussed because it only occasionally develops in long term cold storage of Florida citrus fruit and is of minor importance. Brown and sour rot, however, frequently cause significant commercial losses. The extent to which spread may occur is dependent upon the length and temperature of storage. Long storages, such as in export shipments, allow more time for spread while cold temperatures reduce the rate at which the spread develops.

Brown Rot

Brown rot is caused by 2 species of *Phytophthora*, *P. citrophthora* and *P. parasitica*. Brown rot is a localized disease, most frequently found in the higher organic soils of the East Coast. It may recur year after year in the same grove. It is most severe when long durations of rainfall and wetting occur during slow-moving tropical depressions or hurricanes. Such conditions are more likely to occur in the early fall than later in the season. Early maturing varieties are therefore more commonly affected. Severe losses are usually attributed to *P. citrophthora* which has the potential to produce more inoculum than *P. parasitica* under comparable climatic conditions. Under wet conditions, zoospores are splashed from the soil where they are produced by the fungus to low hanging fruit of the tree canopy. Fruit contacting the soil also become infected. Spores produced on infected low hanging fruit can be dispersed higher into the canopy to other healthy fruit. Infected fruit surfaces are firm and leathery, light to dark brown and retain the same degree of firmness and elevation as the surrounding healthy surfaces. Delicate white mycelium forms on the rind under humid conditions. Five to 7 days are normally required after infection before symptoms are easily observed during grading at packing. Unfortunately, significant numbers of symptomless infected fruit may be packed.

Control

Postharvest fungicides are presently not available for brown rot control. Copper applied to the lower part of the tree canopy about the middle of August into September has provided brown rot control in groves of early and mid-season varieties where the disease has been troublesome in the past. A second copper treatment may be needed if the year is unusually wet. Where brown rot is only an occasional problem, spraying with copper may be delayed until immediately after appearance of the disease when the entire tree should be sprayed. In the absence of fungicides, harvesting can be delayed for 2 weeks after detecting the disease when infected fruit usually decay and fall to the ground, providing weather conditions are unfavorable during that period for additional infection. Brown rot is reduced by cultural practices which minimize long periods of

wetness in the field. These are proper irrigation management, reducing or removing ground vegetation, pruning to remove low hanging branches, and adequate soil drainage.

Sour Rot

Sour rot caused by the fungus *Geotrichum candidum* is a major decay of tangerines, tangelos, Temples, and navel oranges. It can also be serious on round oranges and grapefruit when they become quite mature. Infections *occur only th*rough injuries, primarily those that extend into the albedo from punctures and plugging. Sour rot is often associated with green mold and is stimulated by the presence of the mold fungus. *Geotrichum* occurs commonly in soil and is windborne or splash-borne to surfaces of fruit within the tree canopy, particularly to the lower fruit. Higher populations of the fungus are recovered from fruit surfaces where soil may be entrapped, such as under the button or on scarred areas, than from other areas of the rind. Contamination can also occur through soil contact by dropping fruit on the ground during harvest. Even in ripe fruit, the fungus may not produce an active lesion unless the peel has a relatively high water content and the fruit are held at high relative humidities. The fungus will accumulate with dirt and debris in drenchers and soak tanks. Soil and diseased fruit contaminate washer brushes, belts, and other fruit on the packing line. The sour odor associated with the advanced stages of sour rot attracts fruit flies, which can disseminate the fungus to other injured fruit.

Initial symptoms of sour rot are similar to those of green and blue mold. The lesion first appears water-soaked, light to dark yellow, and slightly raised. The cuticle is more easily removed from the epidermis than it is from lesions caused by *Penicillium*-induced green or blue mold. Enzymes produced by the sour rot fungus degrade the rind, segment walls, and juice vesicles, causing the fruit to disintegrate into a slimy, watery mass. Following exposure to high relative humidities, the lesion may be covered with a yeasty, sometimes wrinkled layer of white or cream-colored mycelium.

Control

Sour rot can be reduced by harvesting the fruit carefully to minimize injuries and by preventing contact between the fruit and the soil. Contamination can be reduced by cleaning equipment and the packingline with water and detergent followed by a sanitizing spray of hot water (160°F), chlorine solution or quaternary ammonium. Recycled aqueous solutions in drenchers or soak tanks should be chlorinated to prevent a build-up of *Geotrichum* inoculum. Sodium o-phenylphenate (SOPP) is the only postharvest fungicide with activity against sour rot. This fungicide is normally applied during the washing process where it also helps control decay by reducing inoculum left on the brushes in dirt and debris from infected fruit. Exposure times to the fungicide up to 2 minutes are more effective than shorter periods. Thorough grading is important at the dump to remove rotten and split fruit before washing. It will help reduce contamination of the brushes by *Geotrichum* and phytotoxicity from the SOPP treatment that may occur when the pH of the formulation is reduced by rotten and broken fruit. Immediate storage of packed fruit at 50°F or less delays disease development.

AVAILABLE PUBLICATIONS

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

Internal Quality Attributes of the Florida Valencia Orange and Their Relationship to Fruit Density Measurements, by W. M. Miller. 1990. Applied Engineering in Agric. 6(4): 461-464.

Florida Citrus Packingline Studies with an Instrumented Sphere, by W. M. Miller and Charles Wagner. 1990. Paper No. 906006, American Society of Agricultural Engineers, June 24-27.

Economic Factors Affecting Postfreeze Production Decisions in the Florida Citrus Industry, by Ronald P. Muraro and Gary F. Fairchild. 1985. Proc. Fla. State Hort. Soc. 98: 65-70.

Economic Comparison of Southern and Northern Citrus Production in Florida, by Stephen A. Ford, Ronald P. Muraro, and Gary F. Fairchild. 1989. Proc. Fla. State Hort. Soc. 102: 27-32.

Available from D. J. Hall, Agri-Chem, Inc., P. O. Box 607477, Orlando, Florida 32860

Peel Disorders of Florida Citrus as Related to Growing Area and Color-Add Formulations, by David J. Hall and Michael D. Bowers. 1989. Proc. Fla. State Hort. Soc. 102: 243-246.

Postharvest Treatment of Florida Fresh Market Tomatoes with Fungicidal Wax to Reduce Decay, by David J. Hall. 1989. Proc. Fla. State Hort. Soc. 102: 365-367.

Available from Dr. M. White, Virginia Tech, Sardo Pallet & Container Research Laboratory, School of Forestry & Wildlife Resources, Blacksburg, Virginia 24061

Effect of Mat Fastener Stiffness on the Diagonal Rigidity of Wooden Block Pallets, by Marshall S. White. 1991. Pallet and Container Laboratory Bulletin No. 14.

Quality Variations in Helically Threaded Nails, by Marshall S. White and Teresa L. Gales. 1991. Pallet and Container Laboratory Bulletin No. 15.

Hardiness Gradients Within Roll-Threaded Steel Nails, by M. S. White, T. E. McLain, D. Padla, and B. Kasal. 1991. Pallet and Container Laboratory Bulletin No. 16.

Relationships Between the Results of Nail Impact Bend Tests and Selected Nail Material Properties, by M. S. White, T. E. McLain, and D. Padla. 1991. Pallet and Container Laboratory Bulletin No. 17.