Ministry of Fisheries, Crops and Livestock
Regent Road, Bourda
Georgetown
Tel. (592) 226-1565
Fax (592) 227-2978
e-mail:
minfcl@sdnp.org.gy
www.agrinetguyana.org.gy
/moa mfcl

New Guyana Marketing Corporation
87 Robb Street
Georgetown
Tel. (592) 226-8255
Fax (592) 227-4114
e-mail:
newgmc@networksgy.com

National Agricultural Research Institute
Mon Repos
East Coast Demerara
Tel. (592) 220-2049
Fax (592) 220-2841-3
e-mail:
nari@networksgy.com
www.agrinetguyana.org.gy

Postharvest Handling
Technical Bulletin

TANGERINES

Postharvest Care and Market Preparation

Technical Bulletin No. 31

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POSTHARVEST HANDLING TECHNICAL SERIES

TANGERINE

Postharvest Care and Market Preparation

Ministry of Fisheries, Crops and Livestock
New Guyana Marketing Corporation
National Agricultural Research Institute

Technical Bulletin No. 31

May 2004

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Table of Contents

Preface 1

Introduction 2

Harvest Maturity Indices 2

Harvest Methods 2

A. De-greening 4

B. Cleaning 5

C. Grading 5

D. Waxing 6

E. Packing 6

Temperature Control 7

Relative Humidity 7

Principal Postharvest Diseases 8

A. Green Mould 8

B. Blue Mould 8

C. Brown Rot 9

D. Rhizopus Rot 9

E. Anthracnose 9

F. Phomopsis Stem-end Rot 10

G. Diplodia Stem-end Rot 10

H. Sour Rot 11

I. Aspergillus Rot 11

Postharvest Disorders 12

A. Chilling Injury 12

B. Puffiness 12

C. Zebra Skin 12

ANNEX I: Publications in the Postharvest Handling Technical Bulletin Series 13

Preface

This publication is part of a series of technical bulletins that seeks to provide specific recommendations for improvements in postharvest care and market preparation for selected non-traditional agricultural products. The intended audience for this series is primarily extension agents.

Initial market assessments in current export markets and visits with producers and exporters in Guyana have shown the quality of fresh produce currently exported is uneven and in some instances very poor. Stages all along the export chain from harvest and pre-harvest to transportation and final export are all in need of improvement. Pre-harvest practices, sanitation at the packinghouse, packaging, bacterial and fungal problems, and transportation were all identified as areas where improvement could benefit the quality and increase the shelf life of Guyana's fresh produce exports. The technical bulletins address these issues specific to each product. Harvesting techniques and crop maturity indices are provided. Preparation for market, including cleaning, sorting, packing and transportation are covered. The bulletins address and recommend specific storage conditions, covering temperature and humidity controls. Finally the bulletins address postharvest diseases, and insect damage.

The undertaking of these technical bulletins is a joint effort of the Ministry of Fisheries, Crops and Livestock; the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI) to improve quality, increase production and promote exports. As a team, the three agencies are working on the problems, limitations, and constraints identified in the initial reconnaissance surveys, from production and postharvest handling problems, to packaging and transportation, to final market.

Introduction

Tangerines (*Citrus reticulata*) are the second most important type of citrus grown in Guyana. Most of the tangerines produced in the country have seeded fruit, with Dancy being a leading cultivar. Tangerine fruit have a short shelf life compared to other types of citrus. Nearly all the tangerines produced in Guyana are sold as fresh fruit in the domestic fresh market, although small volumes are exported to Barbados and Canada.

Harvest Maturity Indices

There is no dependable non-destructive method of determining the maturity of tangerine fruit. The number of days from flowering is a sizeable period of time and is not a reliable index of harvest maturity. Also, fruit size is not always linked with maturity. The most common non-destructive method of assessing fruit maturity is based on peel colour. Tangerines are mature and ready for harvest when 50% of the peel surface has started to turn yellow in colour (Figure 1).

Figure 1. Tangerine fruit ready for harvest showing at least 50% yellow colouration.

A commonly used method for determining fruit maturity is an assessment of the fruit's juice characteristics. Random samples of fruit of similar size are obtained and measured for the percent of soluble solids (% SS), titratable acidity (TA), and the % SS:TA ratio. In order to reduce inconsistency, the juice sample should be obtained from a minimum of 10 randomly selected fruit. Each fruit should be cut in half, squeezed, and filtered to clarify the juice. The combined juice sample should have a SS:TA ratio of 6.5 or higher. Soluble solids content is determined by squeezing a few drops of juice on a hand-held refractometer. A 10 ml (2 teaspoon) sample of filtered juice is titrated with 0.1 N sodium hydroxide to an end point of 8.1. The volume of 0.1 N sodium hydroxide required to reach the pH end point of 8.1 is then multiplied by the factor of 0.0064 to obtain the percent acidity.

Harvest Methods

Tangerine fruit should be carefully harvested by hand using clippers to detach the fruit (Figure 2). The fruit should not be pulled off the tree, as part of the skin tissue will remain attached to the stem, creating a small opening in the peel surface. This is known as 'plugging' and it results in an open wound in the skin for micro-organisms to enter and cause decay. Various styles of clippers or pruning shears can be used, but they should be small enough to prevent worker fatigue (Figure 3). The harvested fruit should be carefully placed into padded field crates, well-ventilated plastic containers (Figure 4), or small picking bags. Avoid rough harvesting practices which cause bruise damage and subsequent fruit decay. Ladders may be needed to facilitate harvesting of fruit borne on tall trees.

Figure 2. Detaching tangerines from the tree requires the use of a clippers.

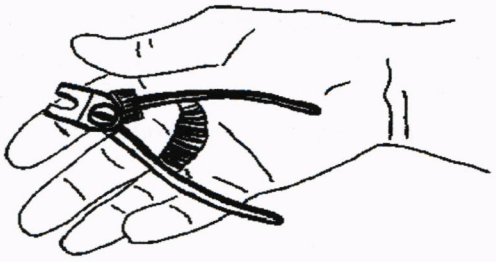

Figure 3. Small lightweight clippers used for harvesting tangerines.

Figure 4. Harvested tangerines placed in a well-ventilated plastic field container.

Figure 5. Large non-ventilated synthetic sacks are not ideal tangerine harvest containers.

The harvested fruit should not be left exposed to the sun. Large non-ventilated synthetic sacks that contain in excess of 20 kg (44 lb) of fruit are not recommended as harvest containers (Figure 5). These sacks do not provide protection to the fruit against compression injury, particularly if they are stacked on top of each other. They also do not allow for release of heat and the tangerines inside will be more likely to decay, especially if the fruit remains in the sack for several days.

Preparation for Market

Harvested tangerines should be brought to a packing area soon after harvest to begin the steps of preparing the fruit for market. These steps involve cleaning, grading, and packing the fruit. In addition, fruit destined for export may need to be treated with the natural ripening agent ethylene in order to improve the external peel colour. The ethylene treatment should be done prior to cleaning and grading.

De-greening

Tangerine fruit produced in Guyana is often mature and of acceptable eating quality when the rind is still green. High night temperatures slow down peel colouration. However, consumers in export markets associate external skin colour with internal flavour and believe that tangerines with a green-coloured peel are immature and not sufficiently sweet. In order to improve external skin colour and export market acceptance, tangerines can be treated with ethylene to de-green the peel. Ethylene breaks down the green chlorophyll pigment in the peel and allows the yellow or orange carotenoid pigments to be more prominent (Figure 6). The ethylene treatment does not change the flavour of the fruit.

Figure 6. Green-skinned tangerines beginning to turn yellow after ethylene treatment.

The general de-greening protocol involves exposing the green-skinned tangerine fruit to low concentrations of ethylene (usually between 1 to 10 ppm) at 28°C (83°F), 90% to 95% relative humidity for several days (Figure 7). The best ethylene concentration and treatment duration varies by cultivar and growing conditions. Atmospheric ethylene concentrations above 10 ppm can cause stem end rot and speed up decay.

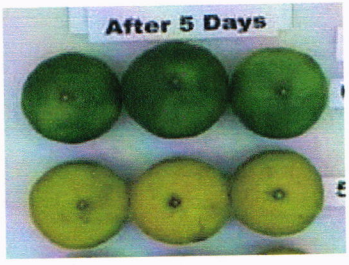

Figure 7. Result of de-greening tangerines with 5 ppm ethylene vs. 0 ppm.

In order to obtain adequate fruit de-greening, ample internal air movement is needed in the treatment chamber so that the entire air volume is circulated every 2 to 3 minutes. The CO_2 levels inside the treatment chamber should not be allowed to rise above 2000 ppm, as high levels of CO_2 will inhibit the effect of ethylene. The treatment chamber should be well insulated in order to maintain the required ethylene concentration.

A liquid ethylene-releasing compound, called ethephon [(2-chloroethyl) phosphonic acid], is also an effective de-greening agent. It is applied by dipping the fruit in a tank of clean water at ambient temperature with 500 ppm ethephon for 1 minute. It is important that the water be properly sanitized with sodium hypochlorite (i.e. 150 ppm at a pH of 6.5) and a fungicide (i.e. 500 ppm benomyl, 1000 ppm thiabendazole, or 1000 ppm imazalil) to prevent postharvest decay.

Cleaning

Harvested tangerine fruit is generally not clean enough to pack directly from the field. Sooty mould, surface stains, dust, and other residues need to be removed from the peel to improve the external appearance of the fruit. Tangerines may be cleaned manually or semi-mechanically. Small scale operations typically submerge the fruit in a wash tank, followed by a gentle scrubbing of the fruit surface. It is important to use clean and properly sanitized water with a small amount of detergent. The water should be treated with hypochlorous acid (150 ppm household bleach at a pH of 6.5). The concentration of hypochlorous acid and water pH should be frequently checked and maintained at the recommended levels during the entire cleaning operation.

Larger volume operations may choose to clean the fruit by passing them under high-pressure spray wash nozzles while moving along a series of roller brushes to gently scrub the fruit surface. Revolving brushes will remove most debris, after which soap or detergent is dribbled onto the fruit to enhance cleaning as the fruit continues across the brushes. Adequate cleaning usually requires about 30 seconds on the brushes, which should be horsehair grade and rotating at about 100 rpm. The tangerines should be thoroughly rinsed as they exit the brushes. The fruit surface should be dry prior to packing. A series of sponge rollers may be used to facilitate drying (Figure 8).

Figure 8. Sponge rollers used to dry tangerines prior to packing.

The spray wash water must be properly sanitized to reduce the spread of postharvest fruit rot. Chlorine and sodium o-phenylphenate (SOPP) are both effective sanitizing agents, with chlorine more readily available. It is sold as household bleach and typically comes in a 5.25% formulation. The effectiveness of chlorine is dependent upon water pH (ideal is 6.5), time of exposure, and the amount of hypochlorous acid present (ideal is 150 ppm). A fungicide (same as recommended for de-greening) should also be added to the wash water for maximum disease control. The fungicide can be added to either the wash tank or the overhead spray water, depending on the packinghouse set-up. Heating the wash water to 40°C (104°F) for green-coloured fruit has been found to provide enhanced decay control.

Grading

Grading and sorting of the fruit is done immediately after washing. Tangerines should be categorized according to size; colour intensity and uniformity; shape; firmness; and the degree of surface blemishes. Only uniform appearing fruit should be packed into each container. Fruit that is damaged by insects, decay, or below market standards should not be packed for sale. Export market destined tangerines should have a minimum diameter of 6 cm (2.4 in) to satisfy importer requirements. This is equivalent to a minimum of 176 fruit per 18 kg (40 lb) carton.

Grading can be done manually in small-scale operations or semi-automatically in larger volume operations. A series of perforated conveyor belts, roller bars, or drum rollers with different size hole openings (Figure 9) are effective in mechanically sizing tangerine fruit.

Figure 9. Drum roller sizing of tangerine fruit.

Waxing

Tangerine fruit benefit from a postharvest wax application. The simplest ways to apply the wax are as a manual rub or an overhead spray as the fruit are rotating on a bed of brushes made of horsehair. Various types of citrus wax formulations are available, but a water-emulsion wax is preferred. Waxing reduces moisture loss and shriveling of the fruit and extends the market life. Most of the fruit's natural wax is removed during washing, so it should be replaced. Waxing also imparts an attractive shine to the peel. Some commercial waxes have a postharvest fungicide incorporated, which provides additional protection against postharvest decay. Waxing can be detrimental to tangerines if it is applied too thick. This may reduce gas exchange through the peel and lower the internal O_2 concentration of the fruit resulting in off-flavour.

De-greening should always be done prior to waxing. The wax coating will partially restrict gas exchange through the peel and inhibit the action of ethylene.

Packing

Tangerines should be packed in strong, well-ventilated containers. Wooden crates are effective containers for domestic marketing of tangerines (Figure 10). Large sacks stuffed with 30 kg (66 lb) or more of fruit is undesirable. Sacks do not provide enough protection to the fruit and considerable compression bruising will occur.

The ideal containers for export marketing of tangerines are fiberboard cartons with a minimum test strength of 275 psi or wooden wire-bound crates (Figure 11). Export containers typically are packed with 12 kg (25 lb) or 18 kg (40 lb) of fruit. Small pads treated with the fungistat diphenyl may also be put inside the export carton to minimize development of postharvest decay.

Figure 10. Wooden crates are appropriate containers for the domestic market.

Figure 11. Wire-bound wood crate containing 18 kg of tangerines for export.

Temperature Control

Tangerines do not maintain good quality when kept at ambient temperature. The fruit will have a high rate of decay after 2 weeks, and will be nearly all decayed or shriveled after 4 weeks at 24°C (75°F). Tangerine fruit is also susceptible to puffiness, in which the peel separates from the pulp at high storage temperatures. The ideal storage temperature for tangerines is 4°C (40°F), and at this temperature the fruit will have a storage life of 4 to 6 weeks (Figure 12).

Figure 12. High quality tangerine fruit after 6 weeks at 4°C.

Relative Humidity

Although tangerines have a waxy peel, significant moisture loss can occur after harvest. Dehydration and shriveling of the fruit become apparent after the fruit has lost 5% of its original weight. In order to minimize postharvest water loss and preserve postharvest quality, tangerines should be stored at their optimum relative humidity (RH) of 90% to 95%. At a RH of less than 70%, the peel will become thin, dry, and shriveled within 3 weeks. This will negatively impact the appearance and market potential of the fruit.

Principal Postharvest Diseases

Tangerines are susceptible to a number of different postharvest pathogens. Some of these micro-organisms attack the fruit prior to harvest, but exist in a resting or dormant state until the conditions are right for infection. Others affect the fruit only after harvest. Tangerines must be harvested and handled gently to avoid bruising and skin injury, which greatly accelerates postharvest microbial decay. The fruit should be held at the appropriate storage temperature and RH conditions. Adequate ventilation during storage is also necessary to remove ethylene which increases the incidence of gray and blue mould. During cleaning, the wash water should be sanitized with hypochlorous acid (150 ppm with a water pH of 6.5). Fungicides added to the wash water also give additional protection against many postharvest pathogens. The most effective fungicides are benlate, thiabendazole, imazalil, and sodium-o-phenylphenate. In addition, pads impregnated with the fungistat diphenyl (at the rate of 4.7 gm/23 kg fruit) can be placed in shipping cartons to limit the development of postharvest decay during transport and distribution to market.

Green Mould

Green mould, caused by the fungus *Penicillium digitatum*, is typically the worst postharvest disease of tangerines. It attacks injured areas of the peel and first appears as a soft, watery, de-colourized spot on the rind. White fungal growth soon appears on the fruit surface, and after the spot enlarges, olive-green spores are produced in the center part of the spot (Figure 13). The rot eventually penetrates the peel and into the edible fruit segments. Under high RH conditions, the fruit collapses into a soft, decomposing mass. If the storage RH is low, the fruit shrinks to a wrinkled, dry mummy.

Green mould develops rapidly on non-refrigerated fruit, but can be nearly arrested by holding tangerines at 4°C (40°F). Also, a postharvest application of either benlate (500 ppm active ingredient), imazalil (1000 ppm), or thiabendazole fungicide (1000 ppm) will reduce the amount of green mould.

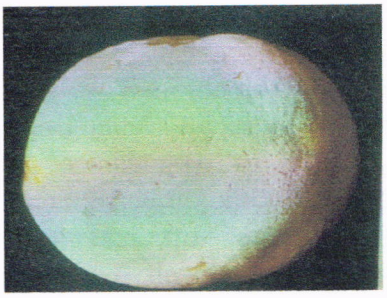

Figure 13. Olive-green spores covering tangerine fruit with severe green mould infection.

Blue Mould

Blue mould, caused by the fungus *Penicillium italicum*, is a common postharvest disease of tangerines during long term cool storage. Like green mould, blue mould develops most rapidly at about 24°C (75°F). However, blue mould grows at temperatures too low for green mould (below 6°C/43°F) and may predominate over green mould on fruit held in cold storage. It attacks injured areas of the peel and first appears as soft, watery, de-colourized spots on the rind. Soon afterwards, a blue mould growth begins, surrounded by a zone of white mycelium. Healthy fruit in packed containers become soiled by spores shed from the diseased fruit. Unlike green mould, blue mould spreads in packed containers and results in nests or pockets of diseased fruit.

Blue mould can be minimized by timely pre-harvest fungicide applications (i.e. benlate, thiabendazole) and careful harvesting practices to avoid wounding. Immediately after harvest, the fruit should be submerged in a benzamidazole fungicide solution, similar to the recommendation for green mould control.

Brown Rot

Brown rot, caused by two species of the fungus *Phytophthora*, is a serious postharvest disease of tangerines during extended periods of rainy weather. Spores of the fungus are produced in the soil and splashed onto low-hanging fruit in the tree canopy. Additional spores may be produced on these infected fruit, and disseminated by water to other fruit in the tree. Spores germinate in free water on fruit surfaces and the fungus can penetrate the intact rind in a matter of a few hours.

Symptoms first appear as a light brown discolouration of the peel. The affected area is firm and leathery. White fungal growth appears on the fruit surface under humid conditions (Figure 14). Infected fruit have a characteristic pungent, rancid odour, which distinguishes this disease from other rots. Control of brown rot is obtained using a combination of field sanitation, disinfection of the harvest containers, wash water sanitation, and holding the fruit at 4°C (40°F).

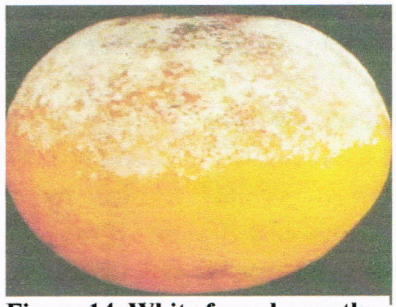

Figure 14. White fungal growth characteristic of advanced stage of brown rot.

Rhizopus Rot

Rhizopus rot, caused by the fungus *Rhizopus stolonifer*, infects fruit through wounded areas in the peel. Lesions begin as rapidly enlarging, water-soaked areas located adjacent to wounds or openings in the button area. Normally the infected area is not discoloured, but the lesions are soft and somewhat watery. Under high humidity, grayish white masses of mould structures develop over the surfaces of diseased fruit (Figure 15). In packed cartons of tangerines, nests of fungal growth will develop on decayed fruit. The optimum temperature for disease development is 24°C to 27°C (75°F to 80°F). Rhizopus can be controlled by holding the fruit below 10°C (50°F), however a temperature of 4°C (40°F) is ideal.

Figure 15. Rhizopus soft rot of tangerine.

Anthracnose

Anthracnose, caused by the fungus *Collectotrichum gloeosporioides*, usually appears on fruit previously injured or held for more than several weeks in storage. Symptoms generally appear as brown to black spots on the peel, 1.5 cm (.6 in) or more in diameter.

Under humid storage conditions, the fungal spores associated with the peel lesions are pink or salmon-coloured, while under drier conditions they appear brown or black.

Tangerines which need a higher concentration of ethylene to de-green the peel will have a higher incidence of anthracnose. Ethylene triggers the growth of the dormant fungus and it also increases the susceptibility of the rind to further fungal invasion.

Control of anthracnose is obtained by using timely pre-harvest fungicide applications to lower the inoculum level, avoiding injury to the fruit during harvest and handling, application of a postharvest fungicide application (i.e. either benomyl, thiabendazole, or imazalil), and holding the fruit at 4°C (40°F).

Phomopsis Stem-end Rot

Stem-end rot, caused by the fungus *Phomopsis citri*, is a serious postharvest disease of tangerines grown in humid coastal production areas. Decay begins at the stem end of the fruit and spreads evenly down the peel. Eventually the rot will penetrate the rind and enter the juice sacs. The infected tissue shrinks and shows a clear line of separation between diseased and healthy rind tissue (Figure 16). The disease does not spread from decayed to healthy fruit in packed cartons. Control of stem-end rot is through pre-harvest fungicide sprays, postharvest application of imazalil (1000 ppm active ingredient) and storage of the fruit at 4°C (40°F).

Figure 16. Advanced stage of Phomopsis stem-end rot.

Diplodia Stem-end Rot

Stem-end rot, caused by the fungi *Diplodia natalensis*, is another serious stem-end rot disease of tangerines. The fungus becomes active at the stem end of the fruit and symptoms appear within several weeks after harvest at ambient temperature. Symptoms include the formation of water-soaked spots near the stem end of the fruit, which turn blackish-brown. The decay proceeds unevenly through the rind, producing finger-like projections of brown tissue. Decayed tissue is initially firm, but later becomes wet and mushy. Decay usually does not spread from infected to healthy fruit in packed containers.

The incidence of stem-end rot will be greater on fruit which requires a high concentration of ethylene to de-green the peel. The recommended methods for controlling Diplodia stem-end rot are similar to those for Phomopsis.

Sour Rot

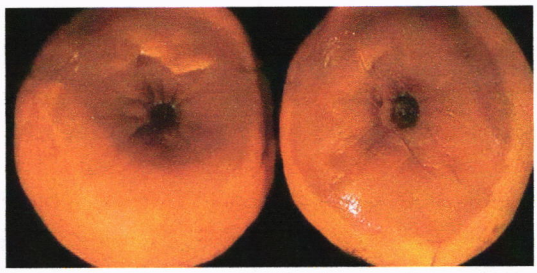

Figure 17. Sour rot developing on plugged tangerines.

Tangerines are very susceptible to sour rot, caused by the fungus, *Geotrichum candidum*. The disease organism is present in debris on the fruit surface and in the button area. Over-mature fruit and fruit which have been de-greened with ethylene are the most susceptible to sour rot. Infection originates through injuries incurred during harvest and handling. Plugged fruit are especially susceptible to sour rot (Figure 17). Initial symptoms of sour rot are easily confused with those of green or blue mould. The lesion is water-soaked, easily broken, with radiating cracks in the cuticle. A sparse amount of white mycelium develops slowly on the lesion surface. The infected fruit becomes a watery mass that is very attractive to fruit flies and gives off a sour odour. Sour rot will spread by contact from one fruit to another. Decayed fruit that are dumped onto a packinghouse line will contaminate brushes and belts, thus increasing the potential for spreading the decay. An effective control of sour rot is a postharvest dip or spray with sodium ortho-phenylphenate (0.9 kg/380 liters or 2 lb/100 gal). The benzimidazole fungicides are not effective against sour rot.

Aspergillus Rot

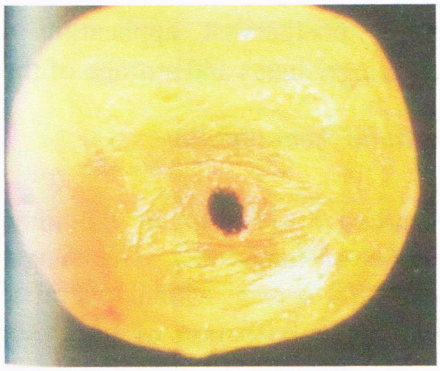

Figure 18. Aspergillus rot on a Dancy tangerine.

Aspergillus is generally a minor postharvest fungal disease of tangerines, but can become serious on fruit stored at ambient temperature. Infection occurs through injuries inflicted during harvesting and handling. The decay begins as a soft, lightly discoloured lesion that is easily punctured. Eventually the lesion becomes sunken and wrinkled (Figure 18). As the fungus continues to grow the rotted surface will become covered with a black, powdery layer of spores. The decay can spread in packed containers from infected to adjacent healthy fruit. The optimal temperature for fungal growth is 32°C (90°F).

Aspergillus is controlled by storing tangerines below 15°C (59°F), with the recommended temperature of 4°C (40°F) arresting all disease development. A postharvest fungicide application of thiabendazole or imazalil (1000 ppm active ingredient) is also effective in inhibiting this disease.

Postharvest Disorders

Chilling Injury

Tangerines are vulnerable to low temperature injury, commonly known as chilling injury (CI), if held below 4°C (40°F). It is a physiological disorder which adversely affects the appearance and quality of the fruit. Different types of tangerines have different limits of vulnerability to CI. Symptoms include pitting and sunken lesions on the peel surface, secondary decay, and off-flavour of the pulp (Figure 19). Damage is the result of temperature and time, with more CI incurred at lower temperatures and longer exposure.

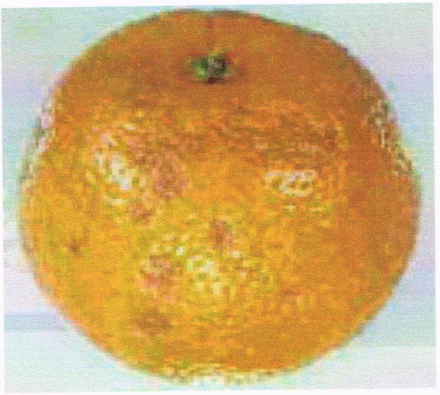

Figure 19. Pitting and sunken lesions of chilling injured tangerine fruit.

Puffiness

Puffiness is a common postharvest disorder of tangerines in which the peel separates from the pulp. It generally affects tangerines that are very mature when harvested. It can be reduced by pre-storage curing of the fruit (several days at high temperature) and adequate air movement in the storage room. The disorder becomes more pronounced with increased time in storage. The cause of the disorder is not known.

Zebra Skin

Zebra skin occurs primarily on tangerines that are picked early in the season, particularly if they have been de-greened with ethylene. The name is derived from the striped pattern of darkened rind associated with a necrosis of the rind over some of the underlying fruit segments (Figure 20). The disorder is more common on small fruit and frequently leads to decay. Fruit picked while wet from a tree that has been under moisture stress are particularly susceptible to this disorder.

Figure 20. Zebra skin of tangerine fruit.

ANNEX I

PUBLICATIONS IN THE POSTHARVEST HANDLING TECHNICAL BULLETIN SERIES

PH Bulletin No. 1	Pineapple: Postharvest Care and Market Preparation, November 2002.
PH Bulletin No. 2	Plantain: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 3	Mango: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 4	Bunch Covers for Improving Plantain and Banana Peel Quality, June 2003.
PH Bulletin No. 5	Papaya: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 6	Watermelon: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 7	Peppers: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 8	Oranges: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 9	Tomato: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 10	Okra: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 11	Pumpkin: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 12	Lime: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 13	Grapefruit: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 14	Passion Fruit: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 15	Green Onions: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 16	Sweet Potato: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 17	Eggplant (Boulanger): Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 18	Avocado (Pear): Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 19	Bitter Melon: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 20	Bora: Postharvest Care and Market Preparation, April 2004.
PH Bulletin No. 21	Cassava: Postharvest Care and Market Preparation, April 2004.

PH Bulletin No. 22	Eddoes: Postharvest Care and Market Preparation, April 2004.
PH Bulletin No. 23	Ginger: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 24	Breadfruit: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 25	Cabbage: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 26	Calaloo: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 27	Coconut: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 28	Cucumber: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 29	Lemon: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 30	Starfruit: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 31	Tangerine: Postharvest Care and Market Preparation, May 2004.
PH Bulletin No. 32	Yam: Postharvest Care and Market Preparation, May 2004.