

## Harvest Maturity

The grapefruit peel will gradually lose its green colour and start to yellow as the fruit matures. Grapefruit should be harvested when at least 50% of the peel surface area has started to turn yellow.

Juice quality should also be measured to determine harvest maturity. Random samples of fruit from various trees should be picked and separated into different size categories. The percent of soluble solids (%SS) should be measured on a combined sample of 10 randomly selected fruit in each size category. Soluble solids content is determined by squeezing a few drops of juice on a hand-held refractometer. The juice should have a minimum SS of 7.5 % and a minimum SS: percent acidity ratio of 7:1 for the fruit to be considered mature and of acceptable eating quality.

## Harvest Methods

Grapefruit should be picked with a combination pull-twist-snap motion that leaves the woody stem and button (calyx) attached to the fruit.



The fruit that have stems remaining should be clipped close to the button to shorten the stem to prevent wounding and puncture damage of nearby fruits in the container. Never shake the tree to harvest the fruit. The harvested fruit should be carefully placed into well ventilated, smooth-walled wooden or plastic field crates or picking sacks equipped with a quick-opening bottom. Grapefruit should not be picked in large field sacks, as they provide limited protection to the fruit and overstuffing can result in bruising.

## Preparation for Market

### Cleaning

Cleaning can be done manually by rubbing the fruit with a damp cloth or in larger scale operations by passing the fruit under spray wash nozzles while revolving on a series of slowly moving brush rollers. The wash water should be sanitized with 150 ppm

hypochlorous acid (household bleach) maintained at a pH of 6.5. This is equal to 2 oz of household bleach (such as Marvex) per 5 gallons of water, or .3 liters of bleach per 100 liters of water. A dilute soap or detergent in the wash water will enhance cleaning. The fruit is then rinsed and treated with a fungicide (i.e. 500 ppm benomyl, 1000 ppm thiabendazole, or 1000 ppm imazalil) prior to grading.

### De-greening

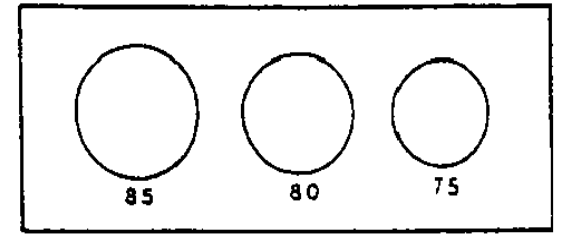
Grapefruit that are mature but not fully coloured can be de-greened by exposure to ethylene. This treatment is solely cosmetic in effect and does not alter the flavour of the fruit. The de-greening process involves exposing green-skinned grapefruit to low concentrations of ethylene (usually between 1 to 5 ppm) at 28-30°C (83-87°F), 90 to 95% relative humidity for several days. The optimal ethylene concentration and treatment duration varies by cultivar and growing conditions. Excess ethylene can cause stem end rot.

The de-greening process required keeping green-skinned grapefruit to low concentrations of ethylene (usually between 1 to 5 ppm) at 28°C to 30°C (83°F to 87°F), 90% to 95% relative humidity for several days. The ethylene concentration and treatment durations can vary. Excess ethylene can cause stem end rot.

A liquid ethylene-releasing compound, called ethephon is also an effective de-greening agent. It is applied by dipping the fruit in a tank of clean, sanitized water treated with ethephone (500 ppm) for 1 minute at room temperature. Ethephone (500 ppm) should be measured at 6.6 oz to 5 gl water (0.2 l ethephon to 19 l of water).

### Grading

The fruit should be sorted into different grades based on size, colour, peel blemishes, and over-all appearance. Only fruit even in appearance should be packed into the same container. Fruit that is seriously damaged by insects, decay, or below market standards should not be packed for sale. Export market destined grapefruit should have a minimum diameter of 10 cm (4 inches) to satisfy importer requirements. Individual fruit should have an average minimum weight of about 450 gm (1 lb). Grapefruit of slightly smaller minimum size may be sold in the domestic Guyanese market.



Grading by size or fruit diameter can be done manually in small-scale operations using sizing rings, which are placed within view of the workers for easy reference. Large-scale operations typically use more automated equipment to mechanically size grapefruit.

### Waxing

Grapefruit will benefit from a postharvest application of a carnauba-based wax. Waxing slows the rate of shrivel and extends market life. Water-emulsion waxes do not require completely dry fruit, so the wax can be applied right after washing and grading. In small volume operations, the wax can be applied manually by rubbing individual grapefruit with a cloth soaked in a water-emulsion wax. Larger volume operations will find it easier to apply the wax from overhead spray jets, as the fruit is moving underneath on a series of slowly rotating brushes.

### Packing

Grapefruit should be packed in strong well-ventilated containers that can be stacked without breaking. The large sacks commonly used for domestic marketing do not provide enough protection against bruise damage. In addition, they cannot be stacked without causing serious injury to the fruit. Wooden crates provide better protection to the fruit. The preferred containers for export marketing are strong fiberboard cartons, typically holding 18 kg (40 lb) of fruit. All fruit within the carton should have the same appearance.

## Temperature Control

The recommended storage temperature for grapefruit is 12°C (54°F). At this temperature, grapefruit will have a storage life of 8 to 12 weeks. Storage at ambient temperature will result in rapid deterioration. Storing grapefruit at temperatures below 10° C (50° F) can cause chilling injury (CI). Fruit symptoms of CI include pitting and sunken spots on the peel surface, surface scald, decay, and off-flavour of the juice. The recommended relative humidity

(RH) for storing grapefruit is 90% to 95%. A lower RH will increase fruit dehydration and softening and foster rind breakdown.

### Principal Postharvest Diseases

Grapefruit is vulnerable to a number of fungal and bacterial postharvest diseases. The fruit must be harvested and handled gently to avoid wounding, which can cause postharvest decay. Good ventilation during storage is necessary to remove ethylene and other volatiles. Postharvest decay is controlled through a combination of treatments, including good sanitation of the wash water (150 ppm hypochlorous acid at a pH of 6.5); the use of appropriate fungicide (500 ppm benomyl, or 1000 ppm thiabendazole or imazalil); and proper temperature (12°C) and RH (90%). Benomyl (500 ppm) should be measured at 6.6 oz to 5 gl water (0.2 l benomyl to 19 l of water). Thiabendazole or imazalil (1000ppm) should be measured as 13.2 oz. to 5 gl waters (390 ml to 19 l). Dipping the fruit in a tank of hot water (50°C to 53°C; 120°F to 125°F) for 2 to 3 minutes can also reduce postharvest decay. In addition, pads with the fungistat diphenyl (at the rate of 4.7 gm/23 kg fruit) can be placed in shipping cartons to limit the postharvest decay during transport market.

#### Green Mould

Green mould is one of the worst postharvest diseases. The first signs appear as a soft, watery, discoloured spot on the rind that grows into a mass of white fungal growth on the fruit surface. The entire fruit may eventually become covered with a mass of dusty olive-green spores.



#### Blue Mould

Like green mould, blue mould develops rapidly at room temperatures. 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 fungal growth. Unlike green mould, blue mould



spreads in packed containers and results in nests or pockets of diseased fruit.

#### Brown Rot

This fruit disease is common during the rainy season. The fruit must be wet for some time before infection occurs. Decay signs begin as a light brown discolouration of the rind. The affected area is firm and leathery. In humid storage conditions, a white fungal growth forms on the lesion surface. Decay will spread to healthy fruit in packed cartons. The fruit will have a bad, rancid odour. Brown rot is controlled through pre-harvest sprays of copper or fosetyl-AI (Aliette) fungicides.

#### Anthracnose

Anthracnose occurs with fruit that has been stored for more than several weeks. Symptoms are brown to black circular sunken spots on the peel. The decay may be firm and dry and cause fruit to soften.

#### Black Rot

Black rot occurs as a stem-end rot on grapefruit, but usually only after they have been stored for a month or more. Spots developing from infections of the button become light brown to black in colour, and gradually progress over the fruit surface from the blackened button towards the blossom end. Control of black rot is obtained by applying 2, 4-D as a 500 ppm dip to delay button aging. 2,4-D (500 ppm) should be measured at 6.6 oz to 5 gl water (0.2 l benomyl to 19 l of water).

**Technical bulletins are also available on waxing fruits and vegetables, hot bath treatment and de-greening procedurings. Contact:**

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# GRAPEFRUIT

## Postharvest Handling and Market Preparation Information Sheet



*This information sheet provides growers and agriculture extension personnel a summary of the recommended harvesting and postharvest handling practices for grapefruit. A more technical and detailed bulletin is available from the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI).*