

## Harvest Maturity Indices

There are several measures of pineapple maturity: surface colour, fruitlet flatness and internal appearance.

### *Fruit Surface Colour*

Pineapples change from green to yellow to reddish-brown as they mature. Pineapples harvested in the full green colour stage are often immature with a low sugar content and poor flavour. Pineapples are considered ripe and at their best eating quality when the fruit surface colour is the one-quarter to one-half yellow. If the fruit is not harvested until the full-yellow stage it will have a flatter, less desirable taste due to excess sugar content and decreased acidity. The fruit will also bruise easily and is more vulnerable to damage. Pineapples are over-mature when the surface colour of the fruit changes to reddish-brown.

Pineapples for the domestic markets should be harvested close to full ripeness, when external surface colour is one-half yellow. Fruit intended for the export market should be picked slightly sooner, at the quarter-yellow colour stage.

### *Fruitlet Flatness*

The pineapple has numerous individual fruitlets, which mature from the bottom part of the fruit to the top. As the fruitlets mature, they become flatter. A pineapple is typically mature and ready for harvest when the lower one-quarter to one-half of the fruitlets are flat.

### *Internal Appearance*

Random samples of fruit should be sliced horizontally at the point of the largest width. Immature pineapple fruit have a white flesh colour, and are slightly clear in appearance while mature or ripe fruit have a yellowish-white flesh. Fruit are over-mature when more than half of the cross sectional area of the fruit is transparent.

## Harvest Methods

Pineapple fruit should be broken off the stalk with a downward motion, or cut with a knife slightly below the base of the fruit. A large canvas picking sack carried over the shoulders is commonly used as a harvest-aid. The sack can be opened from the bottom to allow the fruit to be transferred to another field container or wagon. The harvested fruit may also be placed in wooden or plastic field

crates. The crown should be left intact and protected from damage. Removal of the crown increases the risk of disease and decay and is not recommended. <sup>1</sup>

The fruit should be moved as soon as possible to a shaded collection area or packing facility. Fruit left in the direct sun will sunburn and turn soft. The damaged tissue is more susceptible to postharvest decay.

## Preparation for Market

### *Cleaning*

The first step in market preparation is cleaning of the outside of the fruit. Trim off the stem at the base of the fruit to a length of 1 cm to 2 cm (less than an 1 in). Remove any damaged or unsightly leaves in the crown. Gently dry brush the fruit surface to remove dirt and dust.



Pineapples exported to Barbados must be washed and brushed in order to comply with Bajan phytosanitary requirements regarding pink mealybug avoidance. 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.

### *Waxing*

Wax can be applied to the fruit after cleaning to extend shelf life. The wax should be applied only to the fruit surface and not the crown. Benefits include less internal browning and moisture loss and a shinier external appearance. The most commonly used waxes for pineapples are mixtures of carnauba and paraffin or polyethylene and paraffin.

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<sup>1</sup> Under the current protocol with Barbados and Antigua, the crown must be removed prior to shipment. This is done at the packing house during sorting and before cleaning. In addition, the pineapples can receive a hot bath treatment that will help prevent black rot.

### *Sorting*

Grading of the fruit according to size, condition, and maturity should be done at harvest. Pineapples should be sorted according to size, shape, and decay. Visibly damaged fruit should be removed. The fruit should be clean, mature, firm, well-shaped, and have fully developed eyes (fruitlets). In addition, the fruit should be free of wounds, cuts, sunburn, insect damage and decay. The fruit should have a cleanly trimmed stem end with 4 or less bracts remaining and a single crown. Domestically marketed fruit should be separated into 3 different sizes: large, equal to or less than 2.1 kg (4.6 lb); medium, 1.2 kg to 2.0 kg (2.6 lb to 4.4 lb); and small, 0.7 kg to 1.1 kg (1.5 lb to 2.4 lb).

### *Packing*

Fruit packed in the same carton should be the same in size, shape, and external colour. Immature or over mature fruit should not be packed for export. The cartons must be properly ventilated and strong enough to withstand the hardships of shipping without breaking down. Weak cartons result in major losses of the fruit upon arrival in the destination market.

A commonly used package in the international trade of pineapples is the full-telescopic two-piece corrugated fiberboard carton. Another commonly used export carton for pineapples is the single-layer corrugated fiberboard carton. The ideal method of packing the single-layer carton is to place the fruit horizontally inside the box in alternating directions. Thin cardboard dividers should be put between the fruits and between the layers to prevent rubbing.

Fruit are normally packed to a net weight of 10 kg to 15 kg (22 lb to 33 lb) depending on the carton and the market. High value small pineapples may be shipped in 6 kg (13 lb) boxes, whereas the large fruit in some cases may be packed up to 20 kg (45 lb).



## Temperature Control

Pineapple fruit should be stored at 8°C (47°F) for maximum postharvest life. At this temperature, pineapples harvested at the quarter-yellow stage have a shelf life of approximately 3 weeks. Storage at higher temperatures will result in an abbreviated shelf life

to as short as only a few days at ambient temperature. Fruit at the quarter-yellow maturity stage at harvest will gain about four additional days of shelf life for every 6°C decrease in storage temperature from 32°C to 8°C (89.6°F to 47°F). Pineapples harvested at more advanced stages of ripeness will have a shorter market life. Fruit harvested at the half-yellow colour stage will have about 10 days of storage life at 8°C followed by an additional week of shelf life.

Pineapple fruit are subject to chilling injury (CI) and should not be stored below 7°C (44.6°F). External symptoms of CI include surface pitting, discoloration, failure of green-coloured fruit to turn yellow, and postharvest decay. Internal symptoms of CI include flesh darkening, tissue softening, and off-flavour development. CI becomes more severe with decreasing storage temperatures and increasing lengths of exposure. Mature green fruit are more at risk to CI. Pineapples should be kept at 90% to 95% relative humidity.

### Postharvest Disease

Pineapples are prone to a number of postharvest diseases. Decay can be controlled by good pre-harvest sanitation, careful harvesting and handling practices to minimize injury to the fruit, properly sanitized wash water, and storing the fruit at 8°C. A postharvest fungicide treatment (500 ppm benomyl or 1000 ppm thiabendazole) is effective in reducing fungal decay of the stem end. Follow manufacturer's instructions for use of fungicides. For effective control, the fruit must be dipped in the fungicide within 6 hours after harvest.



### Black Rot

Black rot is the most common and severe postharvest disease of pineapple. It is also referred to as stem end rot, water blister, or soft rot and is characterized by a soft watery rot of the flesh. Black rot usually starts at the stem end. Symptoms begin as a soft, watery rot which later darkens due to growth of the dark-coloured fungus.

### Fruitlet Core Rot

This disease is also called black spot or fruitlet brown rot. Symptoms appear as brown to black coloured areas in the center part of individual fruitlets. The principal means of reducing the incidence of fruitlet core rot is by spraying the crop with an acaricide, a specific insecticide to control the mites that spread the disease.



### Yeasty Fermentation

Pineapple fruit are not sterile inside and contain many non-growing viable yeasts and bacteria. In damaged, overripe, and inter-fruitlet cracked fruit, existing yeasts may start to grow or new yeasts may invade. Symptoms include fermentation, with bubbles of gas and juice escaping through cracks in the skin. The skin eventually turns brown and leathery and the internal flesh becomes spongy with a bright yellow flesh.

### Postharvest Insects

Mealybugs are typically the worst postharvest insect problem of pineapples. They invade the fruit prior to harvest and hide in crevices between fruitlets, underneath the crown leaves, or inside the whorl of the crown. They can be significantly reduced with the use of preharvest insecticide sprays and ant control. After harvest, they need to be removed by brushing the fruit.



**Technical bulletins are also available on waxing fruits and vegetables and hot bath treatment. Contact:**

New Guyana Marketing Corporation (NGMC)  
87 Robb & Alexander Sts., Georgetown, Guyana  
Tel: 226-8255, 226-2219

National Agricultural Research Institute (NARI)  
Mon Repos, East Coast Demerara, Guyana Tel: 220-2950



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# PINEAPPLE

## Postharvest Handling and Market Preparation Information Sheet



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