

## Harvest Maturity Indices

Distinct changes in carambola colour occur as the fruit begin to ripen which can be used to determine fruit maturity. External colour remains green during fruit development. As the fruit approaches maturity, the shade of green becomes lighter. Soon after this, a bit of yellow colouration becomes noticeable. As ripening continues, the fruit will turn more yellow and eventually become completely yellow. Finally, the fruit will turn a deep yellow or orange colour as it becomes fully ripe. The ripening stages of carambola are categorized as green, light-green, green-yellow, yellow-green, yellow, and orange.



The quality and flavour of green stage fruit will be inferior and therefore picking these fruit should be avoided. For maximal market life, carambolas should be picked at the light-green stage. They will be better able to stand the stress of handling and transport at this stage.

Fruit allowed to ripen to a yellow or orange stage of maturity before picking will have a significantly shorter market life and be much more vulnerable to injury during harvest and postharvest handling. This will result in more damage and postharvest decay.



The harvest maturity stage depends on the intended market destination and the time needed to market the fruit. Carambolas intended for export should be harvested at the light green to green yellow stage. Carambolas sold in local markets can be harvested at the light green stage if they will be held for more than several weeks, or they can be allowed to develop more yellow colour before picking. Fruit for nearby markets that will be sold within several days can be left on the tree until the yellow colour stage.

Fruit size may also be used to determine harvest maturity. Each cultivar has a typical average fruit size which can be used as a guide for establishing maturity. Marketable fruit are generally 8 to 15 cm (3 in to 6 in) in length.

## Harvest Methods

Carambola fruit is harvested manually and should be cut or clipped from the tree. The recommended harvest tools include knives or clippers with a sharp-edge. The fruit should be handled gently at all times in order to minimize bruise damage and later postharvest loss. Fruit should not be allowed to drop to the ground, as it will result in impact bruising, injury, and surface scarring. The initial sorting of marketable versus unmarketable fruit should be made at the time of picking. The marketable fruit should be placed horizontally in the field container to reduce rubbing at the rib edges. The container should be lined with paper or padding and be filled with no more than 10 kg (22 lb) of fruit. Woven synthetic sacks should not be used for harvesting or transport as they provide little or no protection to the fruit and considerable damage and browning will occur to the delicate ribs.



The ideal type of field container is a durable plastic crate that is well ventilated and has a smooth inside finish.

## Preparation for Market

Fruits that are clean, shiny, and without dust or dirt may be directly put on the sorting table for grading and packing. However, in most cases the harvested fruit will need some degree of cleaning. Dirt and stains can be removed by putting the fruit in a tank of water and gently rubbing the fruit surface with the fingertips. The fruit can also be cleaned with a very soft bristled brush or cotton cloth. The water used for cleaning should be sanitized with 150 ppm hypochlorous acid and 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 0.3 liters of bleach per 100 liters of water. The water should be frequently checked to ensure the recommended concentration of hypochlorous acid and pH level are maintained. It is also very important to keep the wash water free of dirt which may cause scratches and browning of the delicate skin tissue. After cleaning, the fruit should be carefully transferred to a flat surface for air drying prior to inspection and packing.

### Sorting/Grading

The fruit should be sorted according to size, colour, shape, and amount of surface blemishes. Fruit should be clean, firm, free from

visible signs of disease, mature, evenly coloured, and free from damage (i.e. bruises, cuts, healed or open cracks, insect damage, sunburn, etc.). The skin should not be spongy or puffy. Up to 20% of the fruit in any lot can show signs of wilting and skin puffiness. At least 80% of the fruit should have the proper shape characteristic.

Three different classes have been established for domestic marketing of carambola (Extra Class, Class 1, Class 2). Extra Class carambola should be of high quality and free from blemishes (with the exception of very slight surface defects). Class 1 carambola must be of good quality, although slight defects in colour, shape, and scars/bruises are allowed. The total surface area affected with these flaws shall not exceed 5%. Class 2 carambola do not qualify for the higher classes, but meet the minimum requirements stated above. Imperfection in colour, shape, and scars/bruises are allowed, provided the total surface area affected with these defects does not exceed 10%.

Three different fruit sizes have been established for domestic marketing: small 80 to 129 gm (3 to 5 oz), medium 130 to 190 gm (5 to 7 oz), and large more than 190 gm (7 oz). The quality standards of export grade fruit should meet the minimum requirements of Extra Class fruit. Export quality fruit must be firm, evenly coloured, and balanced with 5 ribs. The fruit must be free of insect damage, physical injury, disease, brown discoloration, and other surface damage.

The skin colour should be light green to green yellow in order to withstand the rigors of long distance transport. The flesh should be clear, crisp, juicy, and without fiber. Export market fruit are sorted according to size into 3 categories (which differ slightly from domestic standards). Small-sized fruit weigh between 130 and 160 gm (5 and 6 oz), medium sized fruit weigh between 160 and 190 gm (6 and 7 oz), and large size fruit weigh more than 190 gm (7 oz).

### Packing

Carambolas should be packed in strong, well-ventilated containers that have a smooth inner surface to protect against abrasion injury to the delicate fruit ribs. Wooden containers lined with newspaper, a thin cloth, or soft padding, are appropriate for the domestic market. Durable plastic crates are also acceptable.

Carambolas packed for export are usually put in well-ventilated fiberboard cartons of either 3 kg or 9 kg (7 lb or 20 lb) net weight. The fruit should be placed in a vertical position, with the stem end resting on an insert of foam padding. This minimizes damage to the rib edges. The fruit are packed according to individual fruit count (i.e. size) and the most common number of counts per 3 kg (7 lb) carton is 16, 20, 26, and 30. A 16 count fruit is considered to be a large size, 20 count a medium size, 26 count a small size, and 30 count an extra small size. The inside of the carton should be lined with foam or padding to minimize bruise damage and abrasion of the delicate skin tissue. Additional protection to the fruit is often provided in the form of styrofoam sleeves or plastic over-wraps.



### Temperature Control

Carambola fruit should be held at 6°C (43°F) for best postharvest life. At this temperature light green harvested fruit will have a potential market life of up to 2 months. Light green stage or more advanced maturity stage fruit will develop a normal yellow or orange colour after they are transferred to warmer temperatures for ripening. Holding the fruit at higher temperatures will result in fruit softening and more rapid ripening. Light green maturity stage fruit stored at 16°C (60°F) will have a maximum market life of 3 weeks, while fruit stored at 21°C (70°F) will have a 2 week maximum market life.

Storage of carambola at 5°C (41°F) or below should be avoided as the fruit will suffer chilling injury (CI) and not ripen properly. Damage from CI is cumulative and depends on both the temperature and exposure time. Symptoms of CI include the formation of pits and sunken spots on the fruit surface, irregular external colour development during ripening, rib-edge browning, internal tissue darkening, off-flavour development, and increased postharvest decay.

### Humidity Management

The best relative humidity (RH) for keeping carambola is between 90% to 95%. This will minimize postharvest weight loss and rib dryness, which leads to an unsightly dark discolouration along the rib edge. Rib discolouration can be severe if the fruit are held below

70% RH. Symptoms become visible when the fruit lose more than 5% of their weight.

### Principal Postharvest Diseases

Good handling practices are necessary to avoid the build-up of fungus responsible for postharvest decay. These practices include proper tree spacing to avoid overcrowding, periodic pruning to allow more air movement through the canopy, regular foliar fungicide applications, and removal of fallen leaves under the tree. Incidence of postharvest decay can also be minimized by careful harvesting and handling practices to avoid injury to the delicate skin tissue, cleaning of the fruit, proper wash water sanitation, and holding the fruit at 6°C (43°F).

#### *Alternaria Rot*

Alternaria rot infects immature green stage fruit while on the tree and remains dormant until ripening. Symptoms include the development of small black circular spots, 0.5 mm to 1 mm (0.02 in to 0.04 in) in diameter, on the fruit surface. The spots enlarge to cover a substantial part of the fruit. Later, the disease progresses into the flesh which darkens and becomes soft.

#### *Anthraxnose*

Typical symptoms include small black spots and/or larger black lesions on the surface of the skin. The lesions may coalesce and penetrate deep into fruit, resulting in extensive fruit rotting. Ripe yellow stage fruit, with its weaker and softer skin, are more susceptible to anthracnose.

#### *Sooty Mould*

Sooty mould causes a blackish discolouration of the fruit surface. The fungus does not typically penetrate the skin and the mould growth is usually on the surface, without causing fruit rot.

#### **For additional information 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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# CARAMBOLA (FIVE FINGERS)

Postharvest Care and Market Preparation  
Information Sheet



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