

Harvest Maturity Indices

The best harvest stage for export market limes is when the peel colour has changed from dark to light green, the surface is smooth, and the fruit feels slightly soft to the touch. Limes left on the tree for extended periods will start to turn yellow and will have a shorter postharvest life than green coloured fruit.

Juice content should be determined prior to harvest. Random samples of fruit from various trees should be picked and separated into different size categories. The juice content (by volume) should be determined for each size category. Limes are mature enough for harvest when the juice content is 30% of weight or higher. Limes of the size categories meeting the minimum juice content should be harvested.

Harvest Methods

Limes should be harvested by carefully twisting and pulling the fruit from the tree so the button remains attached to the fruit. Stems left on the fruit at picking should be cut off in order to avoid puncture damage to other fruit. Careless picking that results in plugging is unacceptable. Plugging is when part of the peel tissue pulls loose from the rest of the fruit, creating an open wound at the top of the fruit. Pickers should wear protective gloves. The harvested fruit should be carefully put into padded field crates, well ventilated plastic containers, or picking sacks equipped with a quick-opening bottom. When filled, the sacks are emptied into larger field containers or the fruit may be taken to a collection site for preparation for market.

Preparation for Market

Cleaning

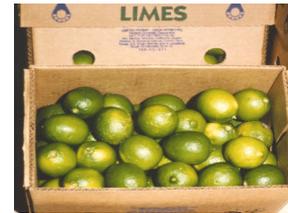
Putting the fruit in a wash tank and gently rubbing with a soft cloth or soft brush will clean the fruit. The wash water should be properly sanitized with 150 ppm hypochlorous acid (household bleach) and maintained at a pH of 6.5. This is equal to 2 oz of household bleach (such as Marvex) per 5 gallons of water, or .3 liters of bleach per 100 liters of water. The water should also contain soap or light detergent. In larger scale operations, passing the fruit along a series of revolving roller brushes will clean

limes. A postharvest fungicide or wax can be applied as an overhead spray after washing.

Grading

The main characteristics used in grading limes are size, colour, shape, and appearance of the peel. The minimum size requirement for marketing limes in the domestic market is a weight of 75 g (2.6 oz) and diameter of 4 cm (1 ½ in). There is no maximum limit for weight and diameter. Limes should be separated into small, medium, and large sizes. In small-scale operations, hand sizing is done using standard size gauges.

Within the size categories the fruit should also be separated according to peel colour and the amount of surface blemishes. The fruit should be free of noticeable peel scarring, insect injury, decay, wounds, sunscald, oil spotting, and stylar-end breakdown (explained later in this handout). The fruit should also have a well-formed uniform shape typical of the variety. High quality limes are shiny, uniformly coloured, and free of surface injury, shrivelling, and decay.



Waxing

Limes will benefit from a postharvest wax application, which will slow down the drying out of fruit during storage. Waxing also gives a shine to the fruit surface. The wax may be applied by hand rubbing. Spray application over a bed of rotating brushes is most commonly used in large operations.

Packing

Limes of the same colour, size, and shape should be packed together in separate containers. In order to avoid fruit bruising and injury, a maximum of 20 kg (44 lb) of fruit should be packed per container. Wooden crates provide much better protection to limes marketed domestically than synthetic or mesh sacks. Synthetic sacks do not protect the fruit from excessive bruising and puncture wounds that can occur during handling.

Export market fruit should be packed in strong, well-ventilated fiberboard cartons. The most common size cartons used for exporting limes contain 4.5, 9, or 18 kg (10, 20, or 40 lbs) of fruit.

De-greening

For most markets, the fruit should have a uniform green colour as long as possible. Several treatments will extend the time of green peel colouration. These include treating limes before harvest with gibberellic acid and dipping the fruit in hot water (50°C to 53°C; 120°F to 126°F) for 2 to 3 minutes prior to grading. Exposure to ethylene should be avoided, which causes limes to lose their green peel colour and slowly turn yellow. Limes should not be stored with high ethylene fruit such as bananas, breadfruit, jackfruit, mangos, papaya, passion fruit, and tomatoes.



Temperature Control

The West Indian lime loses its green peel colour and turns yellow if held at room temperature. The fruit also loses weight rapidly and begins to shrivel. In order to maximize market life and preserve fruit quality, limes should be cooled soon after harvest. The optimum storage temperature for limes is 9°C (48°F). At this temperature, limes will have a potential storage life of 6 to 8 weeks. Some loss of green colour will occur after 3 to 4 weeks and the peel is often yellow-green after 8 weeks. Limes stored at temperatures below 9°C are vulnerable to chilling injury. In order to minimize water loss and preserve postharvest quality, limes should be held at their optimum relative humidity (RH) of 90% to 95%.

Postharvest Diseases

Prevention of postharvest decay is achieved through careful harvesting and handling to avoid skin injury, use of appropriate pre-harvest and postharvest fungicides (500 ppm benomyl, 1000 ppm thiabendazole or imazalil), proper sanitation of the wash water, and appropriate storage temperature (9°C) and RH (90% to 95%). Benomyl should be measured at 6.6 oz to 5 gl water (0.2 l benomyl to 19 l of water). Thiabendazole or imazalil (1000 ppm) should be measured as 13.2 oz. to 5 gl waters (390

ml to 19 l). In addition, pads treated with the fungistat diphenyl (at the rate of 4.7 gm/23 kg or 1.7 oz/50 lb fruit) can be placed in shipping cartons to limit the development of postharvest decay.

Green Mould

Green mould attacks injured areas of the peel and first appears as a soft, watery, de-colourized spot on the rind. Soon an olive-green mould growth begins, surrounded by a broad zone of white mycelium. The decay spreads very little in packed cartons, but masses of spores produced on one infected fruit can soil surfaces of healthy fruit with green-coloured spores.

Blue Mould

Blue mould 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, enclosed by a zone of white fungus. A pronounced halo of water-soaked, faded tissue surrounds the spot between the fringe of fungal growth and the sound tissue. Unlike green mould, blue mould spreads in packed containers and results in nests or pockets of diseased fruit.

Stem-end Rot

Limes are vulnerable to two different kinds of stem-end rot. Symptoms include the formation of water-soaked spots near the stem end of the fruit, which turn light or dark brown. The decay spreads unevenly down the rind, producing brown finger-like marking, or it may spread evenly down the fruit surface. Decayed tissue is at first firm, but later becomes wet and mushy. The infected tissue shrinks and shows a clear line of separation between diseased and healthy rind tissue. Stem-end rot decay does not usually spread in packed containers

Postharvest Disorders

Chilling Injury

Limes are very prone to low temperature chilling injury (CI) at temperatures below 9°C (48°F). Fruit symptoms include pitting, the formation of leathery brown sunken spots on the peel surface, decay, and off-flavour of the pulp. Injury increases the longer the fruit is exposed and the lower the temperature.

Oleocellosis

Oleocellosis is called oil spotting and is caused by the toxic action of peel oil released onto the surface of the rind as a result of scratches, rough handling, punctures, and other injuries. Oleocellosis results in oddly shaped yellow or brown spots. The fruit surface develops a bumpy texture along with the rind discolouration. Wet conditions at harvest bring out this disorder by making the rind dull and subject to the splitting of the oil glands. The contact of wet fruit with sand in the field container during harvest is especially damaging. Oil spotting normally does not show up until several days after harvest.

Oil spotting can be reduced by picking fruit in the afternoon on sunny days, waiting to harvest for several days after a rain or irrigation, using padded field containers, and having pickers wear cotton gloves.

Stylar-end Breakdown (SEB)

Limes are vulnerable to a break down of the rind at the blossom or stylar-end of the fruit. The first sign of stylar-end breakdown (SEB) is a water-soaked grayish or tan patch, especially near the blossom end. It happens rapidly and the affected area dries and becomes sunken. Fruit picked early in the morning are more at risk to SEB. High temperatures at the time of picking and during transit and rough handling increase the chance of SEB. Large fruit are the most vulnerable to this disorder. SEB can be minimized by storing the fruit at 9°C (48°F).



Technical bulletins also available on Waxing Fruits and Vegetables. Contact:
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LIMES

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 limes. A more technical and detailed bulletin is available from the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI).