

POSTHARVEST HANDLING TECHNICAL SERIES

PUMPKIN

Postharvest Care and Market Preparation

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

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Preface

This publication is part of a series of technical bulletins that seek to provide specific recommendations for improvements in postharvesting 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

Among the vegetable crops grown in Guyana, pumpkins have one of the longest potential storage lives. Under optimal temperature and humidity conditions, pumpkins may be held for up to 3 months. The species of pumpkin most commonly produced in Guyana is *Cucurbita mixta*. Fruit are produced along trailing vines that may spread up to 15 meters (16 yds.) from the crown of the plant. Each plant commonly produces several fruit that range in size from 2 to 20 kg (4 to 44 lbs) each. Fruit yield and quality is highly variable as many farmers save their own seed or purchase seed of a selected race from another grower. The fruits vary in size, shape, and colour. The most common rind colours are green, blue-green, or tan with a mottled or speckled surface (Figure 1). Commercially produced seed is not readily available, causing further variability in this already genetically diverse crop. The variability in fruit size causes problems in packaging and transport. The majority of pumpkins grown in Guyana are marketed within the country, although significant export volume exists to Barbados, Trinidad, Canada, U.S., and Antigua.



Figure 1. Pumpkins may be highly variable in rind colour.

Harvest Maturity Indices

Pumpkins should be harvested when the fruit are completely mature. Several different indices can be used to determine harvest maturity, including time after planting, external appearance, hardness of the rind, stem texture, die-back of the tendril nearest the fruit, and internal colour.

The number of days after planting can be used as a guide to predict the beginning of harvest. Pumpkin fruit are usually fully mature and ready for harvest about 3 months after sowing, or approximately 45 days after flowering.

External appearance of the fruit changes with maturity. Immature fruit typically have a bright surface sheen. As the fruit matures, the amount of shine diminishes. The rind of mature pumpkins has a dull waxy appearance that has lost much of its gloss (Figure 2). The fruit surface should have a good colour, characteristic of the cultivar. Also, there will usually be a noticeable lighter coloured ground spot on the fruit underside.



Figure 2. Mature pumpkin fruit with typical colour and dull waxy surface.



Figure 3. Fully developed mature seeds from pumpkin fruit at optimal harvest maturity.

Hardness of the rind is a good indicator of harvest maturity. As pumpkins mature, the rind tissue becomes noticeably tougher and harder. When the rind is sufficiently hard to resist puncture from the thumbnail or from fingernail scratches, the fruit is mature enough for harvest. At this stage of development the seeds are also mature (Figure 3).

Stem texture can be used to determine when to harvest pumpkins. As the fruit matures, the area of the stem attached to the fruit will change from a uniform green colour and fairly succulent texture to a brownish colour and hard dry texture.

Die-back of the tendril nearest to the fruit can also be used to determine harvest maturity. The tendril is a small curly appendage which grows on the vine in the node (joint) nearest the fruit. A green actively growing tendril indicates the fruit is immature. When the tendril starts to dry from natural senescence, the fruit is nearly mature. When the tendril completely dries, the pumpkin fruit nearest that node is mature and ready for harvest.

Internal flesh colour is also an indicator of fruit maturity. Immature fruit have a cream or light orange-coloured flesh. As the fruit matures, the content of carotenoid pigments increases and the flesh becomes a deep orange colour (Figure 4). An orange flesh colour is required for successful domestic and export marketing of pumpkins.



Figure 4. Deep orange internal flesh colour indicative of fruit maturity.

Dead vines are not an indication of fruit maturity. When vines die prematurely from disease, stress, or lack of water, the fruit is usually immature and of low quality. Immature fruit will not store as successfully as fully matured fruit produced on a healthy vine. The rind colour of immature pumpkins will not be as well-developed as matured fruit.

Pumpkins do not all mature at the same time on the plant, but will continue to colour up over a period of three to four weeks if diseases and insects are held in check. Do not harvest fruit that are immature, injured, seriously blemished, or beginning to decay.

Harvest Methods

Pumpkins are manually harvested when they have reached maturity. Pumpkins should be picked only when the fruit surface is completely dry. The fruit should be carefully clipped off the vine, leaving about a 2.5 cm (1 inch) stem attached to the fruit (Figure 5).

A pair of sharp pruning shears is needed to sever the stem and create an attractive, smooth, clean cut. Do not pick up the pumpkin by the stem, as it may separate from the fruit and provide an easy access for decay organisms. A short length of stem should always remain attached to the fruit.

Once removed from the vine, the pumpkins should be put in wooden or strong plastic field crates for transport to the collection site or packinghouse. Out-grading is required in the field to remove pumpkins affected by disease, insects, or physical damage. During harvesting, handling, and field transport, every effort should be made to avoid bruising or puncturing the rind. Also, harvested pumpkins should not be exposed to direct sunlight or rainfall.



Figure 5. Pumpkin with short length of stem remaining attached to the fruit.

Ideally, pumpkins should not be stacked on top of each other. Stacking is a sure way to create bruises. Padding material, such as grain straw, should be used liberally if fruits have to be stacked during harvest. Spread out a layer of dry straw on the ground and set the pumpkins on this. Keep the fruit dry at all times and never store pumpkins on moist bare ground. If the pumpkins must be stacked for transport, the pile should not be more than 1 meter (3 ft) deep.

Preparation for Market

Cleaning

Any adhering soil in the ground spot area or other surface stains should be removed at the time of harvest with a soft cloth or cotton gloves. Washing is usually not desirable. However, if washing is required to remove excess soil or to enhance the appearance for a particular market, the wash water should be clean and properly sanitized to reduce the potential for spread of disease. Sodium hypochlorite (household bleach) is commonly used since it is an inexpensive and readily available wash water sanitizing agent. It is effective against decay organisms when added to the wash water at a concentration of 150 ppm and the water is maintained at a pH of 6.5. 150 ppm 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. As the wash water becomes contaminated with soil and organic matter, the sanitizing ability of the hypochlorous acid is diminished. Therefore, the wash water tank should be changed when the hypochlorous acid concentration cannot be maintained. The washed fruit should be placed on a flat surface or table to air dry prior to grading.

Sorting/Grading

Pumpkin fruit are quite variable in size, shape, and colour; therefore it is difficult to obtain consistent uniformity of product from a single harvest (Figure 6). However, grading for uniformity of appearance is important to meet market requirements. There are

3 established size categories (small, medium, and large) for domestic marketing of pumpkins, based on fruit weight. Small sized pumpkins weigh between 1.4 to 3.2 kg (3 to 7 lbs), medium sized pumpkins weigh between 3.3 to 5.5 kg (7 to 12 lbs) and large sized pumpkins weigh 5.6 kg (12 lbs) or more. Export markets accept a range in fruit size, although large sized fruit weighing between 5.6 to 8 kg (12 to 18 lbs) are preferred. Fruit shape may vary from round, to oval, to slightly flat. Similarly, rind colour ranges from green, to blue-green, to tan. The striping pattern or mottling of the rind also varies, although the striations are typically white or cream coloured. The rind may be smooth or sutured. Domestic consumers and importers prefer uniformly regular shaped fruit that have a smooth, tough rind.



Figure 6. Typical harvest variability in pumpkin fruit size and shape.

All fruit should be examined for external maturity characteristics, and only mature pumpkins should be packed. The fruit should be free of noticeable skin blemishes (Figure 7). The rind should not be discoloured or have any surface mould growth. Fruit should be free of insect or mechanical damage and any partially decayed fruit should be discarded. The fruit must have a closed blossom end and be free of cracking in order to avoid serious decay problems. The flesh should be thick and dark orange, since many pumpkins are sold as cut fruit in the market (Figure 8). Randomly selected fruit should occasionally be cut open for assessment of internal colour.



Figure 7. Poor quality pumpkins with missing stems and considerable rind scarring.



Figure 8. Fresh-cut pumpkin with desirable deep-orange flesh colour.

Packing

Packages used to market pumpkins vary depending on market destination. Fruit sold in the domestic market and nearby Caribbean export destinations is usually packed in mesh sacks (Figure 9). The sacks typically contain from 3 to 7 fruit and weigh around 23 kg (50 lbs). However, mesh sacks provide little or no protection against bruising and physical injury. Variability in fruit size will also cause bulging problems of the mesh sack. Smaller sized pumpkins intended for more distant export markets should be packed in strong, well-ventilated fiberboard cartons containing 19 kg (42 lbs) of fruit. The cartons should have a minimal bursting strength of 275 psi and internal dividers should be used to separate and protect the fruit. Large wooden bulk bins holding from 360 to 410 kg (800 to 900 lbs) of fruit may be used for marine transport to export market destinations. Pumpkins packed in cartons and transported by marine container should include an additional 5% weight to account for moisture and respiratory weight loss that will occur during transport.



Figure 9. Pumpkins packed in mesh sacks for export to Barbados.

Temperature Management

Pumpkins not intended for immediate sale should be held in a cool, dry, well-ventilated area. The optimum temperature for pumpkin storage is 12°C (54°F). Sound fruit can be stored for up to 3 months at this temperature without a significant loss in quality. Storage at ambient temperature will result in excessive weight loss, loss of surface colour intensity, and a decline in culinary quality. Green-skinned cultivars will gradually turn yellow at high temperature and the flesh will become dry and stringy. Storage life of pumpkins at ambient temperatures is limited to several weeks. On the other hand, the fruit should not be stored at cold temperatures. Pumpkins are susceptible to chilling injury (CI) and should never be stored below 10°C (50°F).

Relative Humidity

The optimum relative humidity (RH) for storage and transport of pumpkins is between 85% and 90%. This RH range will minimize postharvest weight loss and avoid the growth of surface moulds. Holding pumpkins at a RH above 90% will result in increased decay. Storage at RH's below 80% will result in drying out of the flesh and adverse textural changes.

Storage

Long-term storage facilities for pumpkins should have accurate temperature and humidity controls, and a ventilation system to provide at least one air exchange per day. A fan to provide internal air circulation is also recommended to maintain a uniform temperature and RH throughout the storage room. Ventilation can be provided by placing pumpkins on slatted benches, which allow air movement around the fruit. Total fruit weight loss during storage should not be allowed to exceed 15%. Higher amounts of weight loss will result in an unacceptably dry texture and hollow flesh. Pumpkins should not be stored with bananas, mangoes, or high ethylene producing commodities as this will cause discoloration of the fruit surface. Continuous exposure to high levels of ethylene (i.e. >10 ppm) for more than a week may also result in stem abscission.

All pumpkins should be well-matured and free from injury and decay prior to storage. Even the slightest amount of rind damage will likely result in postharvest decay after a short period of time (Figure 10).

Principal Postharvest Diseases

Mature pumpkins have a firm hard rind that protects the starchy pulp from decay. However, cracks or injuries to the rind may result in various fungal and bacterial diseases. Control of postharvest diseases can be obtained by using good pre-harvest sanitation practices, following a pre-harvest fungicide and insecticide spray program to minimize the build-up of disease inoculum and surface wounds, harvesting/handling the fruit carefully to avoid injuries, using a postharvest fungicide dip or spray treatment (500 ppm benomyl or 1000 ppm thiabendazole) following cleaning, and holding the fruit at 12°C (54°F) to retard pathogen growth. A hot water dip treatment at 60°C (140°F) for several minutes prior to storage may also help to reduce storage rots.

The most common postharvest rots of pumpkins are black rot, charcoal rot, watery soft rot, rhizopus soft rot, dry rot, alternaria, anthracnose, stem-end rot, and bacterial soft rot.

Black Rot

Black rot, caused by the fungus *Didymella bryoniae*, can be particularly severe on pumpkins harvested from wet soil or during periods of extended rainfall. Symptoms begin as roughly circular water-soaked lesions on the rind. They eventually become dark, sunken, and cracked. These darkened spots may have a hardened droplet of a gummy substance in the center. The spot later turns black and may penetrate through the rind. The chief diagnostic sign of the spots is the presence of the closely spaced groups of the dark brown to black fruiting bodies, just large enough to be seen without a hand lens. Sometimes these are arranged in rings on the fruit surface (Figure 11). Under humid



Figure 10. Pumpkins with even slight rind damage (lower left) should not be stored.

storage conditions a whitish mould may develop on the lesion. The disease is transmitted by planting infected seed and is accentuated by rough handling practices and injury to the rind.



Figure 11. Black rot on pumpkin (left); close-up of ring pattern of fungal growth (right).

Charcoal Rot

Charcoal rot, caused by the fungus *Macrophomina phaseolina*, is more common during hot, dry weather. Fruit may become infected through a wound in the skin at the time of harvest or before. Symptoms begin with the formation of a water-soaked spot on the skin, which enlarges rapidly without a definite boundary. The affected area generally remains firm in texture and a purple or pink colouration may be associated with the lesion. As the decay progresses, the skin may wrinkle and become covered with a powdery black fungal growth. Sometimes infected fruit become hollow shells, in which the interior is also blackened.

Watery Soft Rot

Watery soft rot, caused by the fungus *Sclerotinia sclerotiorum*, is most common after periods of extended rainfall. The soil-borne pathogen can become established in wounded areas of the rind. Decay is rapid, characterized by a watery, odourless rot and an abundance of white cottony mould in which the black resting bodies of the fungus are embedded (Figure 12). Infected pumpkins become soft and eventually collapse. The decay can spread within the sack or carton of packed pumpkins. High temperature and humidity coupled with injury to the rind tissue promote development of watery soft rot.

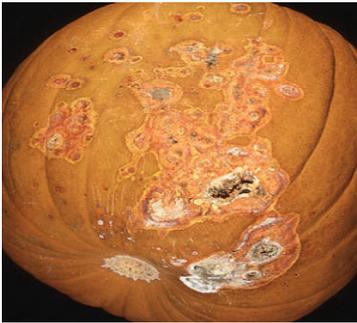


Figure 12. Advanced stage of watery soft rot of pumpkin.

Rhizopus Soft Rot

Rhizopus soft rot, caused by the fungus *Rhizopus stolonifer*, is a common postharvest disease of pumpkins. The fungus becomes established in wounded areas of the fruit. Initially, yellowish-brown water-soaked spots form with a fairly distinct boundary. The spots are irregular in shape and develop into sunken lesions that eventually rot. Grayish-white masses of mould develop over the wounded area, which eventually turn black. Diseased tissue is soft and the pumpkin eventually collapses into a wet rotted mass. Storage of pumpkins at ambient temperatures that have been partially injured will likely result in significant Rhizopus soft rot development.

Dry Rot



Various species of the soil-borne *Fusarium* fungus can infect pumpkin fruit and cause postharvest dry rot. Fruits are attacked at the fruit-soil interface. Severity of dry rot depends on soil moisture and the stage of rind maturity at the time of infection. Fruit lesions begin as small corky cracks that develop into sunken necrotic lesions (Figure 13). Internal tissue near the site of infection becomes off colour and corky. Fruit decay results in a firm, dry rot.

Figure 13. Fusarium dry rot of pumpkin.

Alternaria Rot

Alternaria rot, caused by the fungus *Alternaria alternata*, is a common soil-borne pathogen that causes postharvest fruit rot of pumpkins. Fruit that have been stored for extended periods are more susceptible to Alternaria, along with fruit which have been damaged due to chilling injury. Infection typically begins in injured areas or natural openings in the rind. Symptoms begin as circular to oval-shaped lesions on the pumpkin surface that are bleached or light brown in colour. The lesions soon become sunken and under humid conditions are rapidly covered by a dark mould.

Anthraco

Anthraco, caused by the fungus *Colletotrichum lagenarium*, is characterized by the formation of numerous circular, black, sunken lesions on the fruit surface (Figure 14). When abundant moisture is present, the center of the lesion is surrounded by a gelatinous pink spore mass. Anthracnose is usually confined to the skin, although the flesh may be invaded by secondary bacteria causing a soft rot. Infection is particularly severe after prolonged wet periods. Disease development is rapid at ambient temperatures.



Figure 14. Anthracnose lesions on orange-skin pumpkin.

Stem-end Rot

This fungal disease, caused by *Botryodiplodia theobromae*, can cause serious losses of pumpkins grown in warm, humid areas. Fruits are infected via wounds, including those made by cutting the stem at harvest. Symptoms include the formation of buff-coloured lesions that are spongy with a water-soaked margin. The lesions may occur anywhere on the fruit, but are frequently found at the stem end. A dark gray mould may develop on the surface of the lesions. The fungus also produces a tough layer beneath the skin of the fruit, causing it to become severely wrinkled. The fruit usually undergoes a soft rot and loses its shape. A sour odour usually accompanies the decay. The optimal temperature for fungal growth is 30°C (86°F). Little or no growth occurs at 10°C (50°F).

Bacterial Soft Rot

Bacterial soft rot, caused by *Erwinia carotovora*, is the principle postharvest bacterial disease of pumpkins. It infects the fruit via cracks or wounds in the skin and often becomes established in areas infected with fungal disease. Soft rot rapidly disintegrates the flesh, turning it into a soft mass of leaky tissue. The infected pumpkins typically have a foul odour.

Postharvest Disorders

Chilling Injury

Pumpkins are susceptible to chilling injury (CI) if held at temperatures below 10°C (50°F) The longer the period of exposure and the lower the temperature, the greater is the amount of damage sustained. For example, holding the fruit at 5°C (41°F) for only several days is unlikely to cause much damage. However, holding pumpkins at 5°C for 1 month will result in irreversible tissue damage. Symptoms of CI will develop after 2 month at 10°C. Early symptoms of CI include pitting and the formation of sunken water-soaked lesions on the rind. The lesions are very susceptible to microbial decay, especially the fungi alternaria and anthracnose. Prolonged exposure to temperatures below 10°C also results in internal tissue browning, softening, and off-flavor development.

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.

PLANNED PUBLICATIONS - 2004

Cassava: Postharvest Care and Market Preparation.

Eggplant (Boulangier): Postharvest Care and Market Preparation.

Yam: Postharvest Care and Market Preparation.

Ginger: Postharvest Care and Market Preparation.

Harvest Maturity Indices

Several different measurements that can be used to determine harvest maturity, including time after planting, external appearance, hardness of the rind, stem texture, die-back of the tendril nearest the fruit, and internal colour.

Time after Planting

Pumpkin fruit are fully mature and ready for harvest about 3 months after planting, or, approximately 45 days after flowering.

External Appearance

The fruit surface should have a good colour, characteristic of the cultivar. Immature fruit typically have a bright surface shine that lessens as the fruit matures. The rind of mature pumpkins has a dull waxy appearance. There will usually be a noticeable lighter coloured ground spot on the fruit underside.



Hardness of the Rind

As pumpkins mature, the rind tissue becomes noticeably tougher and harder. When the rind is hard enough to resist puncture from the thumbnail or from fingernail scratches, the fruit is mature enough for harvest. At this stage of development the seeds are also mature.

Stem Texture

As the fruit matures, the area of the stem attached to the fruit will change from a uniform green colour to a brownish colour with a hard dry texture.

Die-back of the Tendril

The tendril is a small curly piece which grows on the vine in the joint (node) nearest the fruit. A green actively growing tendril indicates the fruit is immature. When the tendril starts to dry from natural aging, the fruit is nearly mature. When the tendril completely dries, the pumpkin fruit nearest that node is mature and ready for harvest.

Internal Flesh Colour

Immature fruit have a cream-coloured flesh. The intensity of internal pulp orange colour will increase as the fruit matures.

Harvest Methods

Pumpkins are manually harvested. A pair of sharp pruning shears is needed to sever the stem and create an attractive, smooth, clean cut. The fruit should be carefully clipped off the vine, leaving about a 2.5 cm (1 in) stem attached to the fruit. Do not pick up the pumpkin by the stem. A short length of stem should always remain attached to the fruit. Pumpkins should be picked when the fruit surface is totally dry.

The pumpkins should be put in strong field crates for transport to the collection site or packinghouse. Sorting and grading pumpkins in the field should be done to remove those affected by disease, insects, or physical damage. Every effort should be made to not bruise or puncture the rind. Padding material, such as grain straw, should be used if fruits have to be stacked. Keep the fruit dry at all times and never store pumpkins on moist bare ground. Pumpkins stacked for transport should not be in piles more than 1 meter deep.

Preparation for Market

Cleaning

Soil in the ground spot area or other surface stains should be wiped off at the time of harvest with a soft cloth or cotton gloves. If washing is required to remove excess soil or to enhance the appearance for a particular market, the wash water should be clean and properly sanitized with 150 ppm hypochlorous acid (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. Wash water will need to be changed in order to maintain the hypochlorous acid concentration. The washed fruit should be placed on a flat surface or table to air dry prior to grading.

Sorting and Grading

Pumpkins come in many different sizes, shapes, and colours; so it is difficult to have consistent uniformity of product from a single harvest. However, sameness of appearance is important for marketing. There are 3 established size categories (small, medium, large) for domestic marketing of pumpkins. Small pumpkins weigh between



1.4 kg to 3.2 kg (3 lb to 7 lb), medium pumpkins weigh between 3.3 kg to 5 kg (7.3 lb to 12 lb), and large pumpkins weigh 5.6 kg (12 lb) or more. Export markets accept a range of fruit sizes, although large sized fruit weighing between 5.6 kg to 8 kg (12 lb to 17.5 lb) are preferred. Fruit shape may vary from round, to oval, to slightly flat. Similarly, rind colour ranges from green, to blue-green, to tan. The striping pattern or mottling of the rind also varies, although the striations are typically white or cream coloured.

Only mature pumpkins should be packed and should be free of skin bruises, insect damage, or decay. The fruit must have a closed blossom end and be free of cracking. Randomly selected fruit should occasionally be cut open to check internal colour.

Packing

Pumpkins sold in the domestic market and nearby Caribbean export destinations are usually packed in mesh sacks containing from 3 to 7 fruit and weighing around 23 kg (50 lb). However, mesh sacks provide little or no protection against bruising and physical injury. Pumpkins intended for more distant export markets should be packed in strong, well-ventilated fiberboard cartons containing approximately 19 kg (42 lb) of fruit. Internal dividers should be used to separate and protect the fruit. Large wooden bulk bins holding between 360 to 410 kg (800 to 900 lb) of fruit may be used for marine transport to export destinations.

Temperature Management

The best temperature for pumpkin storage is 12°C (54°F). Healthy fruit can be stored for up to 3 months at this temperature without change in quality. Storage at average or room temperatures will result in a high weight loss, a decline in eating quality, and loss of surface colour in only a few weeks. Green-skinned cultivars will gradually turn yellow at high temperature and the flesh will become dry and stringy. Pumpkins are vulnerable to chilling injury (CI) if stored below 10°C (50°F). Injury increases the longer the fruit is exposed and the lower the temperature. For example, holding the fruit at 5°C (41°F) for only a few days is unlikely to cause much damage. However, storing pumpkins at 5°C for 1 month will result in permanent damage. Early signs of CI include pitting and the formation of sunken water-soaked spots on the rind, and development of decay. Long exposure to temperatures below 10°C can result in internal tissue browning, softening, and off-flavour.

Relative Humidity

The best relative humidity (RH) for storage and transport of pumpkins is between 85% to 90%. This RH range will minimize postharvest weight loss and avoid the growth of surface molds. Holding pumpkins at a RH above 90% will result in more decay. Storage at RH's below 80% will result in drying out of the flesh and textural changes. Total fruit weight loss during storage should not exceed 15%.

Principal Postharvest Diseases

Pumpkins are vulnerable to a number of postharvest diseases. Decay can be controlled through good pre-harvest sanitation practices, harvesting and handling the fruit carefully, using a postharvest fungicide dip or spray treatment (500 ppm benomyl or 1000 ppm thiabendazole) following cleaning, and storing fruit at 12°C (54°F) to slow disease growth. A hot water dip treatment at 60°C (140°F) for several minutes prior to storage may also help to reduce storage rot.

Black Rot

Signs begin as roughly circular water-soaked spots on the rind, which eventually become dark, sunken, and cracked. These darkened spots may have a hardened droplet of a gummy matter in the center. A good indication of black rot is closely spaced groups of the dark brown to black spots, just large enough to be seen.



Watery Soft Rot

Watery soft rot is common after periods of extended rainfall. A watery, odourless rot and a large area of white cottony mould in which the fungus is embedded characterize the decay. Infected pumpkins become soft and eventually collapse. The decay can spread within the sack or carton of packed pumpkins.



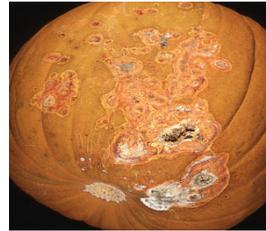
Rhizopus Soft Rot

Yellowish-brown water-soaked spots form with a fairly distinct outline. The

spots are irregular in shape and develop into holes that eventually rot. Grayish-white masses of mould develop over the wounded area and turn black. Diseased tissue is soft and the pumpkin falls into a wet rotted mass.

Dry Rot

Fruit spots begin as small corky cracks that develop into sunken holes. Internal tissue near the infection becomes off colour and corky. Fruit decay results in a firm, dry rot.



Alternaria Rot

Signs begin as circular to oval-shaped spots on the pumpkin surface that are bleached or light brown in colour. The spots soon become sunken and in humid conditions are covered by a dark mould.

Anthracnose

Anthracnose is characterized by the formation of numerous circular, black, sunken spots on the fruit surface. Anthracnose is usually confined to the skin, however, the flesh may be invaded by secondary bacteria causing a soft rot.

Bacterial Soft Rot

Bacterial soft rot infects the fruit wounds in the skin and often becomes established in areas infected with fungal disease. Soft rot breaks up the flesh, turning it into a soft mass of leaky tissue. The infected pumpkins typically have a foul odour.

For additional technical bulletins contact:

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With the assistance of
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New Guyana Marketing Corporation

PUMPKIN

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