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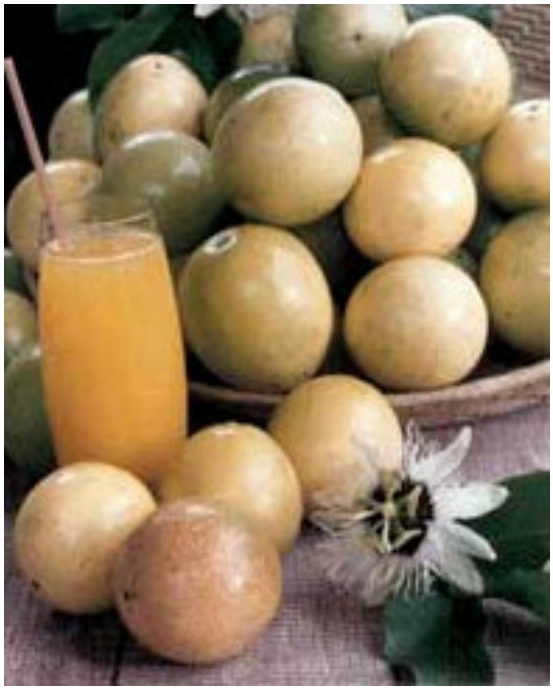
Postharvest Handling
Technical Bulletin

PASSION FRUIT

Postharvest Care and Market Preparation



Technical Bulletin No. 14

January 2004

POSTHARVEST HANDLING TECHNICAL SERIES

PASSION FRUIT

Postharvest Care and Market Preparation

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

Technical Bulletin No. 14

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Table of Contents

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

There are two main types of passion fruit, yellow (*Passiflora edulis* forma *flavicarpa*) and purple (*Passiflora edulis* forma *edulis*) (Figure 1). The yellow type is better adapted to tropical lowland areas and is the principal type produced in Guyana. The fruit is widely distributed in the domestic market and small volumes are exported to Barbados and Canada. The purple type is better adapted to tropical highland areas of production.

Figure 1. The two main types of passion fruit; purple (lower) and yellow (upper).

The most popular passion fruit for export is the purple type, although the yellow type is acceptable in some markets. The purple fruit is less acidic, has a better aroma and flavor, and normally has a slightly higher juice content. The yellow passion fruit has a more vigorous vine, and the fruit is normally larger than the purple type with a thicker fruit wall. Both types of passion fruit make excellent juice blends.

Harvest Maturity Indices

Several different indices may be used to determine harvest maturity of passion fruit, including the length of time after transplanting and external skin colour.

Initial fruit harvest from seeded yellow passion fruit plants normally begins about 10 months after transplanting, with full production occurring after 18 months. Grafted passion fruit plants begin initial production earlier, after about 7 months. The timing of initial harvest depends on the vigor of the plant and environmental growing conditions. The fruit matures in about 75 days after flowering and will naturally fall to the ground when fully coloured and mature. A mature passion fruit vine normally produces two to three crops annually; one main harvest followed by several smaller crops. Therefore, passion fruit are usually available for harvest year round.

The most obvious index of fruit maturity is external skin colour. As the fruit matures, the skin colour will change from green to either yellow or purple, depending on the type of passion fruit. Green fruit, or fruit with limited colour, is not fully ripe and should not be harvested (Figure 2). Incompletely coloured fruit will be higher in acidity, lower in flavor and aromatic compounds, and may not develop a full yellow or purple colour after harvest. The minimum ripeness stage for initiation of

Figure 2. Green colour stage passion fruit is typically immature and low in quality.

harvest should be when at least 50% of the fruit surface has turned yellow or purple. Fruit quality will improve if the fruit are allowed to completely change colour and ripen on the vine. Passion fruit will turn a deep purple or yellow colour when ripe and eventually fall to the ground after full colouration. Colour changes in the fruit begin 7 to 21 days before the fruit abscise, depending on cultivar and environmental conditions.

In order to optimize flavor quality and storage life, passion fruit intended for export should be harvested with 75% purple or yellow colour (Figure 3). Fruit harvested at this stage of ripeness will have a longer storage life and are less likely to spoil than fruit picked at more advanced stages of ripeness. However, full yellow or purple coloured passion fruit can also be picked for export if the fruit is still firm (Figure 4). Export market destined fruit should be harvested twice a week, before the fruit falls naturally from the vine.

Figure 3. Ideal harvest stage (75 percent yellow colour) for harvesting fruit for export.

Figure 4. Firm and fully coloured fruit of high quality ready for harvest.

Fruit intended for the fresh market should not be allowed to drop to the ground, particularly if it is destined for export (Figure 5). Dropped fruit will suffer impact bruising and scarring of the skin tissue. Postharvest deterioration of dropped fruit will be significantly higher than picked fruit. The fruit will soon shrivel and brown spots will develop on the damaged area of the skin, lowering the market quality. Fallen fruit quickly lose moisture, which typically results in a 10% to 20% loss in original fresh weight within several days. In addition, freshly fallen passion fruit are very susceptible to sunburn damage.

Figure 5. Avoid postharvest deterioration of dropped fruit by picking before abscission.

Non-export fruit intended for immediate processing in the domestic juice market may be allowed to fully ripen on the vine and naturally abscise, falling to the ground. The fruit should be collected off the ground on a daily basis and processed as soon as possible.

Harvest Methods

Passion fruit is harvested manually by cutting or clipping the fruit off the vine. The recommended harvest tools are a sharp knife or clippers with a sharp edge (Figure 6). Fruit should be picked at the stricture in the stem and not close to the shoulder of the fruit. A short piece of stem, approximately 4 cm (1.5 inches) in length should be left attached to the fruit to help prevent water loss and fungal development (Figure 7). The fruit should not be pulled from the plant.

Figure 6. Sharp-edged clippers ideal for harvesting passion fruit.

Figure 7. Yellow passion fruit with short length of stem ready for clipping off the vine.

All the fruit on the trellis should be reachable from the ground. The fruit should be harvested with care and put in a plastic bucket or field container without dropping or throwing. The fruit should always be handled gently to avoid bruise damage and the inner surface of the field container should be lined with newspaper or padding to minimize fruit scarring. No more than 15 kg (30 lbs) of fruit should be put in the harvest container in order to avoid compression bruising of the fruit. The field container should be strong and capable of being stacked without damaging the fruit.

The initial sorting of marketable versus unmarketable fruit should be made in the field at the time of harvest. Severely damaged, decayed, over-ripe fruit, or unmarketable fruit should be put into a separate container and discarded in a location away from the passion fruit vines to minimize the build-up of decay-causing microbial inoculum in the field. The field containers with marketable fruit should be put in the shade to avoid overheating of the fruit prior to transport to the packing area.

Passion fruit should never be harvested when wet, as this will encourage the spread of disease. Fruit harvested when wet and stored in unventilated crates or sacks will rapidly spoil.

Preparation for Market

Ideally, the harvested passion fruit should be transported to the packing area during the coolest time of the day in order to minimize heat build-up. Upon arrival at the packing facility, the harvest containers should be unloaded with care and stacked in a shaded well-ventilated area. The fruit should be handled as little as possible to avoid unnecessary damage. Various steps should be followed in preparing passion fruit for market. These involve cleaning, possibly waxing, sorting/grading, and packing. These operations should be carried out in an easily accessible, shaded area which is protected from rain.

Cleaning

The initial step in preparing passion fruit for market is to clean the surface of the fruit and remove any dirt, surface stains, sooty mould, or adhering leaf tissue. Remains of the calyx left attached to the fruit are unsightly and can be a source of fungal decay. Depending on the volume of fruit to be cleaned, the process can be done manually or automatically. Small scale operations usually choose to clean the individual fruit by wiping them with a damp cloth just prior to grading. Larger volume operations may choose to use a water dump tank or overhead spray wash system to clean the fruit. In order to avoid the spread of disease, the wash water should be clean and regularly sanitized by maintaining a 150 ppm sodium hypochlorite concentration (or household bleach) and a water 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. The chlorine level and pH of the wash water should be checked at least hourly during the day with paper test strips or portable meters. Trimming of the fruit stem to an appropriate length should be done at the time of washing (Figure 8). Stem length is typically 4 cm (1.5 in) for export destined fruit, but trimmed to shorter lengths for domestic marketing. Following washing, the fruit should be placed on a flat surface to air dry prior to grading/sorting, possibly waxing, and packing.

Grading/Sorting

Pre-sorting of fruit should be carried out in the field, and additional grading performed at the packing area to remove fruit that does not meet market requirements. Passion fruit must be sorted and graded according to various external quality characteristics prior to packing. The main characteristics used in grading passion fruit are size, skin colour and uniformity, shape, firmness, and the amount of surface blemishes. Fruit marketed domestically should be clean, firm, free from visible signs of disease, mature, uniformly coloured, and free from damage which detracts from the appearance or edibility of the fruit (i.e. bruises, cuts, healed or open

Figure 8. Washing and stem trimming of yellow passion fruit for the domestic market.

cracks, insect damage, sunburn, etc.). At least 90% of the fruit in any lot should have a glossy appearance and not be soft or shriveled.

Three different grades have been established by the National Bureau of Standards for domestic marketing of passion fruit (Grade 1, Grade 2, Grade 3). Grade 1 passion fruit are the highest quality. All Grade 1 fruit shall be firm with a shiny appearance, absent of any signs of shriveling, free from visible evidence of insects, disease, and surface blemishes. Grade 2 passion fruit must be of good quality, although 10% of the fruit in this grade may be soft or show signs of shriveling, and not have a glossy appearance. Grade 3 passion fruit do not qualify for inclusion in the higher grades, but should be clean, mature, free from pests and disease, and have similar colour, shape, and size. Tolerances with respect to quality and size shall be allowed in any lot for product not satisfying the requirement of the grade. A total of 5%, 10%, and 15% by number or weight of passion fruits not satisfying the requirements of grades 1, 2, and 3, respectively, shall be allowed. However, the fruit not meeting the minimum grade requirements must not be rotted or affected by another type of deterioration rendering it unfit for consumption.

The quality standards of export grade passion fruit should meet the minimum requirements of Grade 1 fruit. Export quality fruit must be firm, uniformly coloured and shaped, and free of insect damage, physical injury, disease, brown discolouration, and other surface blemishes (Figure 9). The skin colour should be at least 75% yellow or purple, depending on type. The pulp should be juicy and without air cavities. The fruit should have a smooth, shiny external appearance, and should be either round or egg-shaped.

Figure 9. Passion fruit with surface scarring and slight decay is not suited for export.

Passion fruit should be separated into 3 different size categories (small, medium, large), based on fruit diameter. Marketable fruit sizes typically range from 4 to 9 cm (1.5 to 3.5 in) in diameter and 4 to 12 cm long (1.5 to 4.7 in). The average diameter for fruit classified as small size is 5 cm (2 in), for medium size is 6.5 cm (2.2 in), and for large size fruit is 8 cm (3 in). A 1 cm (½ in) variation above or below the specific diameter is acceptable. Yellow passion fruit generally have a larger size and weight 50 to 150 gm (2 to 5 oz) than purple passion fruit 25 to 50 gm (0.8 to 2 oz). In small-scale operations, passion fruit are usually sized manually by one or more workers. Sizing rings made of

wire or wood and having the diameter of the 3 different size categories should be available to the workers to check the fruit when necessary. Larger-scale operations can use various types of sizing equipment to automate and speed up the grading process.

Figure 10. Separation of green from coloured fruit is important when grading passion fruit.

External colour is another important fruit quality characteristic used in sorting passion fruit. It is important to pack only uniformly coloured fruit in each container. The fruit should have a minimum of 75% of the surface area coloured to type (i.e. yellow or purple). Firm, fully coloured fruit are ideal for marketing. Totally green coloured fruit are not ripe and should not be packed, especially for export (Figure 10).

Other external appearance parameters important in classifying passion fruit include shape, firmness, and amount of surface blemishes. Round fruit are normally preferred to oval-shaped fruit, particularly in export markets. The fruit should be symmetrical and not misshaped. Also, the skin of export market destined fruit should not be wrinkled or show any signs of shriveling (Figure 11).

Figure 11. Passion fruit showing signs of shriveling should not be packed for export.

Internal fruit quality should be checked on randomly selected fruit. Soluble solids content (SSC) of marketable fruit should range between 10% and 18% for yellow passion fruit and between 10% and 20% for purple passion fruit. Passion fruit with less than 10% SSC should not be packed for market due to its inferior flavor quality. Acidity of the pulp should range between 3% to 5%, with yellow passion fruit generally having more acidity than purple passion fruit.

Waxing

Passion fruit may benefit from a postharvest wax application. Much of the fruit's natural wax is removed during washing, so it should be replaced. Waxing enhances the shine and external appearance of the fruit, reduces postharvest weight loss, minimizes shriveling, and extends market life. A carnauba-based wax is preferred for passion fruit. The simplest ways to make the wax application are as a manual rub or an overhead spray of water-emulsion wax as the fruit are rotating on a bed of soft brushes made of horsehair or equivalent grade. A liquid paraffin wax dip may also be used, but it is more costly and does not impart a shine on the fruit surface. After waxing, the fruit is packed for market.

Packing

Passion fruit should be packed in strong, well-ventilated containers capable of being stacked without damaging the fruit. The fruit surface should be free of moisture before packing. Passion fruit in Guyana are typically packed in large synthetic mesh sacks for both the domestic and export market (Figure 12). This type of package provides little or no protection to the fruit, and the sacks are typically overstuffed with product. Compression bruising of the passion fruit often occurs when the sacks are piled on top of each other, resulting in deformed or split fruit.

Wooden containers or durable plastic crates are preferred for the domestic market. The preferred export package for passion fruit is a single-layer fiberboard carton containing either 2 or 3.5 kg (4 to 7 lb) of fruit (Figure 13). The cartons should be strong and self-locking so they can be stacked. Ventilation holes are needed for horizontal air movement and efficient cooling. If sea shipment is used, the carton should also have vents for vertical air flow.

Figure 12. Passion fruit packed in large mesh sacks for export to Barbados.

Figure 13. Purple passion fruit packed in 2 kg carton for the U.K. market.

Only fruit of the same size category and stage of ripeness should be packed in the same carton. Product uniformity is essential. The carton should have a plastic liner moulded with individual cells to protect and separate the fruit (Figure 14). Larger-fruited oval shaped passion fruit should be oriented in a horizontal position, with the stem either protruding above the adjacent fruit or below (Figure 15).

Figure 14. Plastic liner with individual cells for passion fruit inside fiberboard carton.

Figure 15. Passion fruit with stems protruding above adjacent fruit in export carton.

The fruit are packed according to individual fruit count (i.e. size) and the most common number of counts per 2 kg carton is 24 and 28. The most common number of counts per 3.5 kg carton is 24, 36, and 48 (Figure 16). A 24-count fruit is considered to be a large size, 36-count a medium size, and 48-count a small size.

Figure 16. Purple passion fruit (48-count size) packed in 3.5 kg carton for export.

Temperature Control

The ideal storage temperature for passion fruit differs between yellow and purple-fruited types. Maximum postharvest life of yellow passion fruit is obtained at 7°C (45°F) storage, while purple passion fruit should be stored at 4°C (39°F) Passion fruit held at temperatures above optimum will ripen more quickly and lose more weight. Below the optimum storage temperature the fruit will suffer from low temperature chilling injury. At the ideal storage temperature, partially ripe yellow passion fruit will have an average market life of 2 to 3 weeks and purple passion fruit will have a 4 to 5 week market life. Partially ripe fruit may be exported by marine container if transport time is less than 2 weeks and the container is kept at the recommended temperature for the specific type of passion fruit.

Passion fruit picked fully ripe will have only about a 7 to 10 day market life. The sooner the optimum storage temperature is obtained, the longer fruit quality can be maintained and water loss minimized.

Relative Humidity

Passion fruit will lose a significant amount of moisture if held under low relative humidity (RH) conditions. This may result in noticeable shriveling of the peel and unsightly appearing fruit, making it difficult to market the product (Figure 17). In order to avoid peel desiccation and excessive weight loss, passion fruit should be stored at 90% to 95% RH. Also, water loss can be prevented if the time between harvesting and packing is kept to a minimum. Storage of the fruit in perforated plastic bags or in containers lined with perforated plastic film will reduce postharvest weight loss and minimize fruit shriveling. Peel shriveling does not adversely affect the edible quality of the pulp. In fact, partially shriveled fruit are typically sweeter.

Figure 17. Passion fruit held at a low RH for several weeks become noticeably wrinkled.

Principal Postharvest Diseases

Passion fruit are susceptible to a number of postharvest diseases. Infections normally originate in the field and disease development is accentuated with tissue injury. Using inappropriate harvesting techniques, dropping fruit, overfilling containers, and allowing stems to rub against adjacent fruit during handling and transport may result in punctures and bruising injury. During storage and ripening, these damaged areas serve as an entry point for fungal infection.

Postharvest decay can be reduced by using good field sanitation practices, pruning to open the canopy of the plant, pre-harvest fungicide applications, careful harvesting and handling practices to avoid injury to the fruit, proper wash water sanitation, and holding the fruit at its ideal storage temperature (7°C or 45°F for yellow types and 4°C or 39°F for purple types). The principal postharvest diseases of passion fruit are caused by various fungi, including brown spot, Phytophthora, and Septoria.

Brown Spot

Brown spot, caused by the fungus *Alternaria passiflorae*, and is the worst postharvest disease of passion fruit. The disease is most severe during the rainy season. Symptoms of brown spot first appear as tiny spots, which enlarge into sunken circular lesions with brownish centers (Figure 18). Eventually the rind around the diseased area becomes wrinkled and the fruits shrivel and drop.

Figure 18. Brown spot on purple passion fruit.

Phytophthora Fruit Rot

Fruit rot, caused by the soil-borne fungi *Phytophthora nicotianae var. parasitica*, can be a serious postharvest disease of passion fruit produced on poorly drained soils. Symptoms appear as water-soaked, dark-green patches that dry out.

Septoria Spot

Septoria spot, caused by the fungus *Septoria passiflorae*, typically infects fruit while on the plant but may be overlooked at the time of harvest. Initial symptoms of infection appear as tiny irregular light brown spots on the fruit surface. The spots eventually develop into blotches filled with minute black fruiting bodies of the fungus. These blotches often coalesce to cover large areas of the fruit. Infection results in uneven ripening and a mottled fruit colouration.

Postharvest Disorders

Chilling Injury

Passion fruit are sensitive to chilling injury (CI), which is a low temperature physiological disorder that occurs below 7°C (45°F) in yellow types and below 4°C (39°F) in purple types. Symptoms of CI include pitting and sunken lesions on the fruit surface, uneven skin colouration, internal darkening of the pulp, off-flavour development, and decay. The amount of tissue damage caused by CI depends on the temperature and duration of exposure, with lower temperatures and longer durations of exposure causing more injury. Postharvest decay rapidly develops when chilling injured fruit are transferred to ambient temperature for marketing.

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 (Boulanger): Postharvest Care and Market Preparation.

Yam: Postharvest Care and Market Preparation.

Ginger: Postharvest Care and Market Preparation.

Harvest Maturity Indices

The fruit matures about 75 days after flowering.The first fruit harvest from seeded yellow passion fruit plants normally begins about 10 months after transplanting, while grafted plants begin production several months earlier.

The most obvious measure of fruit maturity is skin colour. As the fruit matures, the skin colour will change from green to either yellow or purple, depending on the type of passion fruit. Green fruit, or fruit with limited colour, is not fully ripe and should not be harvested. Fruits that have not developed colour have higher acidity, less flavour and may not develop a full yellow or purple colour after harvest. The minimum ripeness for harvest should be when at least 50% of the fruit surface has turned yellow or purple. Fruit quality will improve if the fruit are allowed to completely change colour and ripen on the vine. In order to get the best flavour quality and storage life, passion fruit intended for export should be harvested with 75% purple or yellow colour. Fruit harvested at this stage will have a longer storage life and are less likely to spoil than fruit picked at more advanced stages of ripeness. Full yellow or purple coloured passion fruit can also be picked for export if the fruit is still firm. Export fruit should be harvested twice a week.

Fruit intended for the domestic juice market may be allowed to fully ripen on the vine and naturally fall off the vine. The fruit should be collected off the ground on a daily basis and processed as soon as possible.

Harvest Methods

Passion fruit is harvested manually by cutting or clipping the fruit off the vine. The recommended harvest tools are a sharp knife or clippers with a sharp edge. A short piece of stem, approximately 4 cm (1.5 inches) in length should be left attached to the fruit to help prevent water loss and fungal development. The fruit should not be pulled from the plant. Passion fruit should be harvested when the surface is dry.

The fruit should be harvested with care and placed in a strong bucket or field container without dropping or throwing. No more than 15 kg (33 lb) of fruit should be put in the harvest container in order to avoid bruising. The first sorting of marketable versus unmarketable fruit should be made at the time of harvest. The field containers with marketable fruit should be put in the shade to avoid overheating of the fruit.

Preparation for Market

Cleaning

The first step in preparing passion fruit for market is to clean the surface of the fruit and remove any dirt, surface stains, sooty mould, or leaf tissue. Small-scale operations usually choose to clean the individual fruit by wiping them with a damp cloth. Larger operations may use a water dump tank or overhead spray wash system to clean the fruit. In order to avoid the spread of disease, the wash water should be clean and regularly sanitized by maintaining a 150 ppm sodium hypochlorite concentration. 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 PH should be maintained at 6.5. The chlorine level and pH of the wash water should be checked regularly. Stem length is typically trimmed to about 4 cm for export-destined fruit, but to shorter lengths for domestic marketing. Following washing, the fruit should be placed on a flat surface to air dry.

Grading/Sorting

Three different grades have been established for the domestic marketing of passion fruit. Grade 1 passion fruit are firm with a shiny appearance, no signs of shriveling, free from insects, disease, and surface damage. Grade 2 passion fruit must be of good quality, although 10% of the fruit in this grade may be soft or show signs of shriveling, and not have a glossy appearance. Grade 3 passion fruit do not qualify for the higher grades, but should be clean, mature, free from pests and disease, and have similar colour, shape, and size. A total of 5%, 10%, and 15% by number or weight of passion fruits not satisfying the requirements of grades 1, 2, and 3, respectively, are allowed. However, the fruit not meeting the minimum grade requirements must not be rotten or unfit for consumption.

The quality standards of export grade passion fruit should meet the minimum requirements of domestic Grade 1 fruit. Export quality fruit must be firm, evenly coloured and shaped, and free of insect damage, physical injury, disease, brown discolouration, and other surface damage. The skin colour should be at least 75% yellow or purple, depending on type. Firm, 100% coloured fruit are ideal. Totally green coloured fruit are not ripe and should not be packed for export. The fruit should be round or egg-shaped, have a smooth and shiny appearance, and have a juicy pulp.

Passion fruit should be separated into 3 different sizes (small, medium, large), based on fruit diameter. The average diameter for fruit classified as small is 5 cm (2 inches); for medium, 6.5 cm (2.6 inches); and for large, 8 cm (3 inches). A 1 cm variation above or below the specific diameter is acceptable. In small-scale operations, passion fruit are usually sized manually. Sizing rings with the diameter of the 3 different size categories should be available for workers to check the fruit when necessary. Larger-scale operations use various types of sizing equipment to automate the grading process.

Other appearance standards for passion fruit include shape, firmness, and amount of surface blemishes. The fruit should not be misshaped. Also, the skin of export market destined fruit should not be wrinkled or show any signs of shriveling.
Internal fruit quality should be checked on randomly selected fruit. Soluble solids content (SSC) of marketable fruit should range between 10% and 18% for yellow passion fruit and between 10% and 20% for purple passion fruit. Acidity of the pulp should range from 3% to 5%.

Waxing

Benefits of waxing include enhanced shine, reduced weight loss, and extended market life. A carnauba-based wax is preferred for passion fruit. The simplest ways to apply the wax is a manual rub or an overhead spray as the fruit are rotating on a bed of soft brushes.

Packing

Passion fruit should be packed in strong, well-ventilated containers capable of being stacked without damaging the fruit. Wooden containers or durable plastic crates are better for the domestic market. Large synthetic or mesh sacks provide little or no protection to the fruit. Bruising of the fruit occurs when the sacks are piled on top of each other and result in deformed or split fruit. Export packaging for passion fruit should be a single-layer fiberboard carton containing either 2 kg or 3.5 kg (4.5 lb or 7.7 lb) of fruit. The cartons should be strong, self-locking so they can be stacked with ventilation holes for air movement and cooling.

Only the same sized and coloured fruit should be packed in the same carton. The carton should have a plastic liner with individual cells to protect and separate the fruit. Larger oval-shaped fruit should be placed on their side, with the stem either protruding above the adjacent fruit or below. The fruit are packed according to count (size). The most common number of counts per 3.5 kg (7.7 lb) carton is 24 (large), 36 (medium), and 48 (small).

Temperature Control

Maximum postharvest life of yellow passion fruit is achieved at 7°C (45°F) storage, while purple passion fruit should be stored at 4°C (39°F) Passion fruit held at temperatures above this will ripen more quickly and lose weight. Fruits kept below the best storage temperature will suffer from chilling injury (CI). Symptoms of CI are pitting, sunken spots on the fruit surface, uneven skin colouration, internal darkening of the pulp, off-flavour development, and decay. At the best storage temperature, 75% surface coloured yellow passion fruit will have an average market life of 2 to 3 weeks and 75% purple coloured fruit will have a 4 to 5 week market life. Passion fruit picked fully ripe will have only about a 7 to 10 day market life. Fruit should be stored at 90% to 95% RH in order to avoid peel shriveling. Passion fruit will lose a significant amount of moisture if held under low relative humidity (RH). Storage of the fruit in perforated plastic bags (bag with very small holes) or in containers lined with perforated plastic film will also minimize moisture loss.

Postharvest Diseases

Postharvest decay can be reduced by using good field sanitation practices, pruning to open the canopy of the plant, pre-harvest fungicide applications, careful harvesting and handling practices to avoid injury to the fruit, proper wash water sanitation, and holding the fruit at its ideal storage temperature (7°C or 45°F for yellow types and 4°C or 39°F for purple types).

Brown Spot

Brown spot is one of the worst postharvest diseases of passion fruit. Symptoms appear as tiny spots, which enlarge into sunken circular spots with brownish centers. Eventually the rind around the diseased area becomes wrinkled and the fruits shrivel.

Technical bulletins are also available on waxing fruits and vegetables. Contact:

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With the assistance of
The United States Agency for International Development

New Guyana Marketing Corporation

PASSION FRUIT

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 passion fruit. There are two main types of passion fruit, yellow and purple. The yellow type is the principal one produced in Guyana. A *more technical and detailed bulletin is available from the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI).*