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Postharvest Handling
Technical Bulletin

BOULANGER (EGGPLANT)

Postharvest Care and Market Preparation

Technical Bulletin No. 17

January 2004

POSTHARVEST HANDLING TECHNICAL SERIES

BOULANGER (EGGPLANT)

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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

Boulanger (*Solanum melongena*) is one of the leading vegetable crops grown in Guyana. The most popular cultivars are large-fruited, purple skinned, and are egg-shaped to elongate (i.e. Black Beauty, Surinam Long). Pink, white, and green skinned types are also produced along with miniature size fruit.

Harvest Maturity Indices

Boulanger is harvested at a range of maturity stages, depending on market demand. Days from flowering can be used as a harvest maturity index, and range from about 10 days for small fruit to about 4 weeks for large fruit. Large fruit should weigh in the range of 0.34 kg to 0.5 kg (0.75 lb to 1 lb). Elongated type fruit should weigh 136 g to 226 g (0.3 lb to 0.5 lb).

Optimum maturity is best judged by size, and the fruits should be relatively heavy in relation to their size. The ideal harvest size for Black Beauty is when the fruit reaches a diameter of 10 cm to 15 cm (4 in to 6 in) and a minimum length of 10 cm, while Surinam Long should be harvested when fruit length is at least 5 cm (2 in) in diameter and 23 cm (9 in) in length.

Boulanger fruit is typically harvested at an immature stage, before the seeds begin to enlarge and harden. As the fruit matures, the flesh softens and becomes spongy. Boulanger becomes pithy and bitter when they are over-mature. Boulanger is over-mature if an indentation remains after pressing the tissue with the thumb. Over-mature fruit have a dull external appearance and the seeds turn brown. Fruit should be harvested when it is firm, fully formed, glistening, and the seeds and pulp are white.

Purple-skinned fruit should be harvested when it reaches a dark, glossy, uniform, purple-black colour. The fruit should be firm and non-wrinkled. Frequent pickings will result in higher yields.

Harvest Method

Fruits of marketable size should be harvested by cutting the tough stem of the fruit with a sharp clippers (Figure 1) rather than tearing it off the plant. The calyx or cap should be fresh and green in appearance and left attached to the fruit. The length of the stem should be cut short (≤ 2.5 cm or 1 in) to avoid puncturing of adjacent fruit. Cotton gloves should be worn during harvest to protect the picker's hands against injury from spines on the calyx and to minimize fruit damage. Deformed, sunburned, insect damaged, and diseased fruit should be removed from the plant and discarded. Harvest frequency is typically once per week.

Figure 1. Straight bladed hand shears for harvesting boulanger

Boulanger should be harvested during the coolest time of the day, preferably early in the morning. Harvested fruit should be kept as cool as possible. If cool storage is not possible, the fruit should be harvested the same day or no earlier than one day prior to the intended sale.

Harvested boulanger should be carefully placed in a suitable container for transport from the field. Careful handling is necessary, because even slight bruising will disfigure the skin. Harvested fruits, especially the purple skinned types, should be protected from the direct rays of the sun because they are highly susceptible to sunburn. Under conditions of high solar radiation, an exposure period of one hour is sufficient to cause fruit softening and skin shriveling, which may render fruits unmarketable. Boulanger should be kept in well-ventilated shaded areas to minimize the buildup of heat and maintain acceptable fruit quality.

Over-mature fruits should be removed from the plant and discarded in the field to stimulate further flowering and fruit set. The skin is tender and easily bruised or punctured, so it should be handled with care.

Field Containers

Harvested fruit should be carefully placed inside smooth-walled field containers with the stem oriented away from the skin of an adjacent fruit. Strong ventilated plastic containers are ideal. If wooden crates or baskets are used as field containers, they should be lined with newspaper or protective padding. Sacks or bags should not be used since they typically cause abrasion and mechanical damage to the fruit.

Preparation for Market

Cleaning

The surface of the boulanger fruit should be cleaned prior to packing to remove any dust, dirt, or stains. The fruit can be cleaned by washing in chlorinated water (150 ppm free chlorine with pH 6.5) or wiping with a damp cloth. This also helps to add shine to the surface and improve the external appearance. Consumers are typically attracted to a smooth, shiny eggplant.

Grading

Fruits are generally sorted by size and colour, and packed into either baskets (for the domestic market) or fiberboard cartons (for the export market). Fruit of uniform size should be packed in each container. Typically, the fruit are sized into three different categories, small, medium, and large. High quality boulanger is firm, heavy (in relation to size), glossy in appearance, and void of scars.

The calyx and stem should be fresh and green. Boulanger are not acceptable for export if they are soft or wilted. Fruit should not have surface scars exceeding 4 cm (1.5 inches) in length. Also, they should be free of green streaking from the stem. Fruit curvature of > 20 is also not acceptable (Figure 2).

Figure 2. Scarred and curved fruit calyx is not desired for export.

Grade standards for the export market require the fruit to be uniform in size, shape, and colour. They must be clean, well shaped, firm, and free from decay, insect damage, scars, and mechanical injury.

Waxing

A thin coating of wax can be applied to boulanger to enhance the appearance and shine of the skin surface and to reduce postharvest shriveling (Figure 3). Waxing also reduces chafing and abrasion injury from the rubbing of adjacent fruit during transport. Application of a liquid carnauba-based food grade wax is recommended. It can be applied by manually rubbing it over the surface of the skin or by using a soft bristled brush.

Packing

Boulanger should be handled and packed carefully to avoid damage to the skin. Strong, well-ventilated fiberboard cartons should be used for export, with a minimum carton bursting strength of 275 lb/in². Package weight is typically 9 to 11 kg (20 to 23 lb), containing 18 to 24 fruit per carton. The fruit should be laid flat and oriented horizontally along the same plane inside the carton (Figure 4). This will prevent the stem from puncturing adjacent fruit.

Figure 3. Waxing the surface adds shine to the fruit.

Figure 4. Packing the fruit parallel in the same container will avoid fruit puncture.

Boulanger can also be individually wrapped in paper, and carefully packed into containers to prevent stems from puncturing adjacent fruits.

Boulanger is packed in different sized containers, depending on the export market destination. North American markets generally require boulanger to be packed in 1 1/9-bushel (16 kg or 35 lb) or 5/9-bushel cartons (8 kg or 18 lb). A 1 1/9-bushel carton will typically contain 18, 24, or 30-count sized boulanger.

Temperature Management

Boulanger does not have a long storage life and should be marketed immediately after harvest. For maximum postharvest life, boulanger should be held at 10°C (50°F). At this temperature, boulanger will typically have a 10 day market life. Boulanger stored for too long or at too high a temperature will have a dull and shriveled skin along with a dry and brown calyx (Figure 5). Once the colour of the skin begins to dull, the seeds darken and the flesh becomes spongy and bitter.

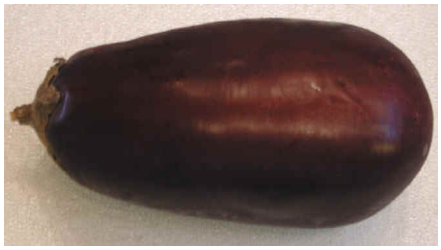

Figure 5. Brown calyx and shriveled skin of eggplant stored for 2 weeks.

Relative Humidity Management

Boulanger is very susceptible to water loss and shriveling. Symptoms may become evident with as little as 3%water loss. Visible signs of water loss are reduction of surface sheen, skin wrinkling, spongy flesh, and browning of the calyx. In order to prevent fruit shrivel, boulanger should be held at the optimal relative humidity (RH) of 90% to 95%. Wrapping boulanger with plastic film or putting the fruit in perforated polyethylene bags will reduce weight loss and maintain firmness due to a high RH inside the wrap. However, wrapped boulanger decay rapidly if the film is not perforated. Water loss can also be minimized by packing boulanger in cartons having moisture-retentive liners.

Principal Postharvest Diseases

Boulanger is susceptible to several postharvest diseases that usually require mechanical damage or weakening of the tissue before they can enter the fruit. However, pathogens in contaminated water may enter through natural openings around the calyx. Proper handling, grading, and temperature management will minimize occurrence of these diseases. In addition, a preventive spray program prior to harvest with copper compounds or maneb fungicides will reduce the amount of postharvest disease inoculum.

The most common fungal diseases of boulanger are alternaria rot, phomopsis, rhizopus rot, and gray mould. Bacterial soft rot is the most common bacterial disease.

Alternaria Rot

The early stages of this disease include the formation of small tan spots, with irregular margins, scattered over the sides of the fruit or under the edge of the calyx. Infections that begin in injured areas of the fruit usually form large brown pockets of decay that penetrate the flesh half an inch or more. There is often a surface growth of gray mould on these lesions (Figure 6). Decay usually develops around the calyx and in wounded areas of the skin. Fruit that have been stored below 8°C are highly susceptible to alternaria rot.

Figure 6. Alternaria rot on boulanger.

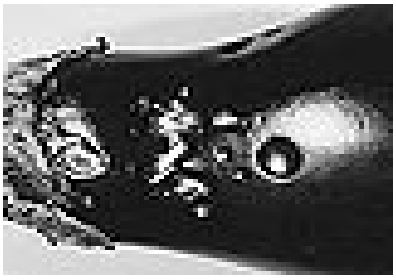

Figure 7. Symptoms of Phomopsis infection on boulanger fruit.

Phomopsis

Phomopsis is the most common and the most destructive postharvest decay of boulanger. The decay appears as small, circular, light-brown depressed spots (Figure 7). These may occur singly or in groups anywhere over the fruit, but frequently the decay originates under or at the edge of the calyx lobes. The decayed tissue is soft and spongy and penetrates throughout the tissues of the fruits, causing a light-brown discolouration of the flesh.

Rhizopus Rot

Occasionally, boulangers on the market are affected with rhizopus rot. The lesions are usually extensive, as the decay progresses rapidly at moderate temperatures. The affected area of the skin is brown. The brownish, soft, wet decay penetrates deeply into the fruit (Figure 8). This decay can be distinguished from phomopsis rot by the soft and watery nature of the diseased tissues.

Figure 8. Rhizopus rot of boulanger fruit.

Gray Mould

Gray mould is caused by the fungus botrytis cinerea. The decay appears as circular to oval-shaped light-brown spots with a clear line of demarcation between the healthy and

diseased tissue. The center of the spot is filled with a distinct gray-coloured fungal growth (Figure 9). The decayed tissue is soft and spongy.

Figure 9. Gray mould of boulanger fruit.

Bacterial Soft Rot

The first symptom of bacterial soft rot is the appearance of a slightly depressed, water-soaked spot on the fruit. The spot enlarges rapidly to affect much of the boulanger, and the affected tissues soon become very soft and watery. Water soaking is particularly prominent at the borders of the lesion. The decay penetrates deeply into the boulanger. Diseased tissues are sharply delimited from healthy tissues inside the fruit by their softness and water-soaked appearance. Decayed tissues usually have a foul odour.

Chilling Injury

Boulanger is susceptible to chilling injury when stored at temperatures below 10°C (50°F) for more than several days. Symptoms of chilling injury include pitting, surface bronzing, accelerated decay, and browning of the seeds and pulp. At 5°C (41°F) chilling injury symptoms will be visible in 6 to 8 days. Accelerated decay by alternaria rot is common in chilling stressed fruit. Waxing the fruit can reduce chilling injury.

ANNEX 1

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.
PH Bulletin No. 17	Eggplant (Boulanger): Postharvest Care and Market Preparation, January 2004.

OTHER PLANNED PUBLICATIONS

Avocado (Pear): Postharvest Care and Market Preparation.

Bitter Melon: Postharvest Care and Market Preparation.

Bora: Postharvest Care and Market Preparation.

Cassava: Postharvest Care and Market Preparation.

Eddoes: Postharvest Care and Market Preparation.

Ginger: Postharvest Care and Market Preparation.

Breadfruit: Postharvest Care and Market Preparation.

Cabbage: Postharvest Care and Market Preparation.

Calaloo: Postharvest Care and Market Preparation.

Coconut: Postharvest Care and Market Preparation.

Cucumber: Postharvest Care and Market Preparation.

Lemon: Postharvest Care and Market Preparation.

Starfruit: Postharvest Care and Market Preparation.

Tangerine: Postharvest Care and Market Preparation.

Yam: Postharvest Care and Market Preparation.