Boulanger (Eggplant) Production In Guyana

BOULANGER

INTRODUCTION

Boulanger (*Solanum melongena*) belongs to family Solanacea. It is one of the leading vegetable crops grown in Guyana and is used mainly as a cooked vegetable.

VARIETIES

The most popular cultivars in Guyana are long – fruited, purple skinned, and are egg- shaped to elongate, (i.e. Black Beauty, Suriname Long). Pink, white, and green skinned types are also produced with miniature size fruit. All the varieties are open pollinated. A brief description of the common varieties grow in Guyana is shown below:

Pink & White

May be 2-3 types: fruit are long or short and fat. Pink & white in colour. Colouation varies from more pink than white to more white than pink.

Long Purple

May be 2 types: fruit is long and smooth, and segmented. Deep purple in colour.

Black Beauty

Three types: short with large diameter located at ¼ (type 1), ½ (type 2) or 1/3 (types 3) the fruit length. Segmented at the base.

Black Boulanger

Similar to Black Beauty; no segmented base; short shelf-life

Corentyne Purple

Fruit long, segmented, skin rough; light purple in colour. Short shelf-life.

CULTIVATION

The seed is initially sown in seed trays or seedbeds, and then transplanted four weeks after germination. It is grown on a wide range of soil types, but preferably suited to clay soil rich in organic matter. It grows well within a pH range of 5.5 – 6.5. If the pH is lower then appropriate quantities of limestone should be applied four – six weeks before transplanting (based on soil test recommendations).

Transplanting is best carried out in the afternoon or anytime during a cool day so as to resist transplanting shock. The recommended spacing should be 90cm between rows and 60cm along rows (a plant population of 18,500 plants/hectare).

After transplanting, irrigation should be done once daily. Appropriate irrigation systems should be then practiced.

FERTILIZER USE

A soil test should be done to determine the fertilizer requirements. In the absence of a soil test, the following recommendation is provided as a guide:

Urea	- 272 kg/ha		- 30% at transplanting (4.4g/plant) - 40% at flowering (5.9g/plant) - 30% at Fruit set (4.4g/plant)
TSP	- 108 kg/ha	-	All at transplanting (5.8g/plant)
MoP	- 136kg/ha	-	50% at transplanting (3.7g/plant) - 50% at flowering (3.7g/plant)

If organic manure is to applied as well, then the synthetic fertilizer rate should be lowered appropriately.

Major Pests of Boulanger *(Solanum melongena L.)* and Management Strategies

Vegetable production occurs within a relatively short time frame and as such yield losses due to pests may be substantial if the problem is not identified early, and remedial action implemented in a timely manner. Correct identification of the pests and an understanding of their behaviour, including their most vulnerable stages would provide insights into management strategies.

The early maturity of vegetables and short intervals between harvests during the cropping season impose constraints on the pest control strategy option. Care must be then taken if pesticide application is contemplated, since there is the likelihood of high residual levels remaining in the product after harvest if an inappropriate formulation is used.

One of the most common vegetable crops widely cultivated throughout Guyana (Boulanger) is subjected to attack from many insect pests and diseases. The following provides a detailed description of nature of the damage caused by major pests and the appropriate management strategies that may be employed.

1. Cricket

Gryllotalpa spp. (Orthoptera: Gryllotalpidae)
Acheta spp. (Orthoptera: Gryllidae)

Cricket attacks seedlings of all vegetables. Fully grown crickets are brown in colour and are about 2.5 – 3.5 cm long (Figure 1). The various species of these insects usually live either in the soil, bushes and under decaying crop residues and vegetation.

Mole crickets, which have heavily sclerotised front legs that are adapted for digging, are usually common in sandy soils.

Fig 1. Fully grown cricket

All crickets are nocturnal, feeding at night and secluded by day, under the soil. They feed at or slightly below the soil surface, and can cause considerable damage before being discovered. Seedlings may be denuded of leaves or cut below the soil surface without any trace of insects on them.

Crickets spend their entire life cycle below the soil, which may be for a period of approximately 28 -35 days. They are termed soil insects.

CONTROL:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Cultural control:

- The areas where vegetables are grown should receive full sunlight, kept clean of weeds and all crop residues should be removed and burnt.
- Proper land preparation serves to control weeds, diseases, and soil insects, and also helps in the destruction of large soil clods, which act as hiding places for crickets.

Chemical control:

- Any approved soil insecticide at the recommended rate may be applied, such as Basudin 60% E.C (Diazinon) or Vydate L 40%E.C at the rate of 10 mls to 4500 mls water to seed beds and cultivated areas of cropping.

2. Cut worm

Agrotis spp. (Lepidoptera: Noctuidae)

These are the caterpillars of various species of moth (Figure 2 & 3). They have a greasy appearance, are grey to brown in colour with faint lighter-colored strips, and when fully grown are usually the colour of the soil in which they live.

They can be found on the soil surface, beneath leaves and under large soil clods.

Cutworms are surface feeders, and cut seedlings at or slightly above the soil surface. Evidence of cutworm presence will be greenish-black excreta pellets below the seedling. Most of its lifecycle is spent below the soil which lasts for a period of approximately 21-28 days.

Fig 2. Cutworm in the early stages

CONTROL

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Fig 3. Adult cutworm

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3. Aphids

Aphis gossypii: (Homoptera: Aphididae)

These pests attack all vegetables. They are commonly known as "plant lice" or "nit" and are small, yellow, green or black pinhead-size insects (Figure 4). They are soft bodied, slow moving and multiply rapidly within a short time span.

These insects attack plants at all stages of growth and are usually found in dense clusters on the under surface of the young leaves and also on young tender stems and growing points. They suck plant sap and make the plant weak; some also act as vectors of plant diseases. Seedlings are weakened and killed when the infestation is high, and growth of older infested plants is retarded. Infested leaves curl, shrivel and may turn brown and die.

Fig 4. Nymph and adult aphids

Aphids secrete a sweet substance known as "honey dew" while they feed. This substance attracts ants and serves as a substrate for sooty mould (black fungus), thus impairing photosynthesis. The lifecycle is between 21-28 days.

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Biological control:

- The natural predator lady bird beetle frequently feeds on aphids. When the aphid population is low and lady bird beetles are present, there is no need for chemical control.

Chemical control:

- This may be applied when the population is high. A contact or stomach insecticide may be used such as Fastac, Decis or Karate at 6mls to 4500mls water, Sevin 85% W.P. (Carbaryl) at 6grms to 4500 mls water, Malathion 57% E.C. at 15 mls to 4500 mls water.

N.B. Sprays should be directed to underside/surfaces of leaves. When Sevin or Malathion is used crops must not be harvest until 7 -10 days after application of these chemicals. In the case of Fastac, Decis or Karate, crops can be harvested within 3-5 days after chemical application.

4. Flea beetle

Epitrix pilosa: (Coleoptera: Chrysomelidae)

These are small black beetles about 1.5 – 2.0 mm in size (Figure 5) that cause severe damage mostly to the leaves or Boulanger plants. They make numerous round or irregular tiny holes on the leaves giving them a strainer like appearance, thus reducing photosynthesis.

Fig 5. Flea beetle

These insects (adults) can be observed on the uppermost portion of the plant, usually on the young tender leaves during the early morning and late afternoon hours. They hide during the hot part of the day.

Eggs are laid in the soil near the roots of the plant. These hatch in 5-7 days and the slender white larvae feed on the roots for 14-21 days. Because of the small sizes, feeding does not interfere with plant growth and development. Adult beetles emerge approximately 28 days from the soil. During a severe adult infestation, leaves appear scorched. Such an infestation can result in substantial yield loss and plants may be killed in one to three days.

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Chemical control:

- When the infestation level is high chemical control is recommended. Insecticides such as Decis, Fastac or Karate (6 mls to 4500 mls water), Sevin (85% W.P at 10gms to 4500 mls water), Sumithion (50% E.C. at 5mls to 4500 mls water) are recommended.

5. Lace wing bugs

Croythaica cyathicollis: (Hemiptera: Tingidae)

Lace wing bugs are usually found in clusters on the under surface of leaves. Adults are about 1.5 -3 mm in length and have characteristic lacy patterned wings (Figure 6). Their sucking action results in leaf mottling. The mottled areas eventually become necrotic and this leads to premature abscission of leaves. The life cycle lasts for approximately 28-35 days.

Fig 6. Lace wing bugs

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Chemical control:

- Decis, Karate or Fastac at 6 mls to 4500 mls water Sevin or Padan at 5gms to 4500 water are recommended.

6. Pin worm

Keiferia lycopersicella: (Lepidoptera: Gelechiidae)

Pin worm is a common pest of Boulanger. It is the caterpillar of a moth, which feeds on leaf surfaces, making blotch mines in the leaves. Leaves are often rolled or folded, such that the larvae are protected from natural enemies.

Fig 7. Pinworm

In severe infestations, leaf surfaces are destroyed causing leaves to wither and die. The larvae can also mine in stems and feed on flowers, thus reducing yields. The larvae can also invade fruits and destroy them.

The adult is a grey moth about 5mm long (Figure 7). The larvae, which at first are light-orange in colour become purplish-black at maturity and are about 5mm long. Eggs are laid primarily on the underside of leaves and hatch within 5-7 days. Pupation may occur in the soil, or in folded leaves. The lifecycle may be completed in 21-35 days.

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Chemical control:

- Decis; Fastac; Karate or Ambush at 6 mls to 4500 mls water are recommended.

7. White flies

Bemisia tabaci (Homoptera: Aleyrodidae)

These insects are in fact bugs. The adults are white, moth-like insects (Figure 8) that fly upwards from plant when disturbed. They are about 2 mm in length and their wings are covered with a white waxy powder.

The pinhead size nymphs are oval and flattened, and are attached to the leaf surface until maturity. All stages of this pest can be found on the underside of leaves. Nymphs and adults feed by sucking plant sap, resulting in leaves becoming mottled, yellow and brown before dying. Feeding whiteflies excrete honey dew on leaf surface which encourages the growth of sooty mould, thus hampering photosynthesis. Ants are also attracted to the honey due. This pest is also a vector for viral diseases. The life cycle may be completed in about 28-35 days.

Fig 8. Whiteflies

Control

Cultural practices:

- Do not plant a new crop next to one which is mature: The common practice of having mature crops adjacent to newly planted ones makes management of the pest very difficult since the cycle of the pest is never broken.
- An integrated control strategy is necessary for the effective management of this pest.
- Good farm sanitation, many weed species around the cultivation are excellent hosts for white flies.

Chemical control:

- Several new generation insecticides are now available for the effective control of white flies. Targeting both nymphs and adults with **soap based products**, should be applied very early in the morning or late in the evening. Other chemicals which may be used include Admire, Pegasus and or Basudin/ Vydate L at 10 mls to 4500 mls water.

8. Mites

Tetranychus spp. (Acarina: Tetranychidae)

Mites are arachnids and are not insects. (Adults have four pairs of legs and two pairs of eyes.) They are extremely tiny and appear as dust- like particles on the underside of leaves (Figure 9). Their colour ranges from red, translucent fawn to green. Eggs are laid on the underside of leaves and hatch beneath a web, which is spun by the adults. Both immature and mature stages suck plant sap, resulting in leaves becoming yellow and eventually turning reddish. Fruits may also be affected, especially by the rust mite.

Fig 9. Adult mite

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Chemical control:

- During severe infestations chemical control may become necessary. Any miticide may be used for their control such as Abamectin, Newmectinor, Vertimec at 5mls to 4500mls water.

9. Thrips

Frankiniella sp. (Thysanoptera: Thripidae)

Thrips are yellow, tiny, elongated insects (Figure 10) about 1mm in length and can be found on the upper and lower surfaces of leaves. Infestations are more severe in the dry season.
Both young and adult suck the sap from leaves and cause them to loose their colour. If attack occurs early the young leaves becomes distorted (Figure 11). Older tissues become blotched and appear silvery or leathery in affected areas thus hindering photosynthesis. Flowers and fruits are also affected, thus yields are reduced. Infected fruits are discoloured, distorted and hardened. Thrips are also vectors for major viral disease. The lifecycle may be completed in about 14-21 days.

Fig 10. Adult thrips

Control:

- **Good field sanitation-** rid the field of weeds and residue of all previous crops.

Cultural control:

- **Crop rotation**- cultivation of crops (vegetables) which is not a host to the pest. e.g. Cabbage can followed by Boulanger.
- Overhead irrigation will help in reducing populations of thrips during the dry season.
- An integrated approach is recommended for the management of thrips.

Fig 11. Damage caused by thrips

Chemical control:

Among the insecticides which may be used are Regent (Fipronil), Admire, Abamectin and Vydate L at 5 mls to 4500 mls water, to both surfaces of leaves for effective control

N.B. Spray should be directed to both surfaces of leaves for effective control.

10. Stem borer

Alcidion deletum: (Coleoptera: Cerambycidae)

This insect usually attacks old Boulanger plants where a particular shoot of the plant is observed to wither and dry out.
The adult is cream to light fawn in colour and about 1-2 cm long (Figure 12. Damage is usually done by the larva (Grub) which is white in colour, with a hard brown head and is about 3.5 – 5 cm in length (Figure 13). Removal and stripping of dead shoots will reveal the larvae inside a tunnel. The insects continue to live in dead plant tissues/residues and thus become a source of infestation for new uninfested fields. Stem borer can cause death in as much as 50% of plant population, because when larvae tunnel into the main stem, the entire plant dies.
The life cycle ranges from 35-70 days.

Fig 12. Adult stem borer

Fig 13. Larva stem borer

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Cultural practices:

- **Crop rotation-** cultivation of vegetables that are not hosts to the pest.

11. Fruit sucking bugs

Nezara viridula: (Hemiptera: Pentatomidae)
Phthia picta: (Hemiptera: Coreidae)

There are various species of plants bugs. They actually do the same type of damage by puncturing and sucking the sap from leaves, flowers and fruits.Affected fruits become discolored, hardened and deformed, thus the market value of the fruits is reduced. Nezara commonly known as **"stink bug"** is green in colour and about 1.5 – 2 cm is recognized by its shield shape body (Figure 14), and awful protective odors emitted when molested. The Phthia are brownish – black bugs with a red band across the back of the thorax and are about 2-2.5 cm in length. Both the adult and nymphs of this pest do incur economic losses. The life cycle ranges from 35-70 days.

Control:

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

Chemical control:
Among the insecticides which may be used are Fastac, Decis, Karate, Ambush at 6 mls to 4500 mls water and Sevin at 10 gms to 4500 mls water.

Fig 14. Adult stink bug

Major Diseases of Boulanger (Solanum melongena L.) and Management Strategies

1. FRUIT ROT

Fruit rot is a fungal diseases caused by *Phomopsis vexans*

Symptoms:

This fungus forms pycnidia on stems and diseased fruit. The fungus also causes blight in mature plants and damping off of seedlings. The fruits may show small, dull sunken spots, which enlarge in size and cover a major portion of the fruit, and rotting ensues (Figure 15). In severe cases, the entire fruit may be damaged.

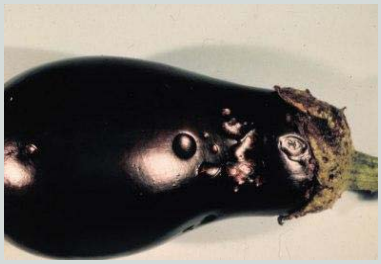

Fig 15. Fruit rot in boulanger

Control:

The use of resistant varieties or chemical treatment with Benomyl is recommended for control of fruit rot.

2. BACTERIAL WILT

The causal agent is *(Ralstonia solanacearum)*

This is a serious bacterial disease which affects solanaceous crops. Warm wet weather encourages the spreadof the disease.

Symptoms:

Pathogen exists in the soil and infects plants through the roots, invading the vascular system.
The xylem is discoloured and becomes only partially effective.

Results of Infection:

Affected plants are usually stunted and susceptible to water stress. They finally wilt and die (Figure 16).

Control:

Rotate with non-susceptible crops, or use resistant cultivars. Grafting onto resistant rootstocks is practiced with tomato and boulanger.

Fig 16. Symptoms of bacterial wilt

3. SOUTHERN BLIGHT/STEMROT

The causal agent is *(Sclerotium rolfsii)*

Symptoms:

At the soil level, stem and roots rot, and become covered in a white mycelium originating from soil-borne spores (Figure 17). Injuries from nematodes and insects encourage infection.

Fig 17. Symptoms of southern blight

Results of Infection:

Young plants damp-off and die; older plants become yellow, wilt and die.

Control:

Removal of diseased plants and deep cultivation will reduce the level of infection.

4. SEEDLING DAMPING-OFF

The causal agent is *(Pythium sp.)*

This pathogen affects a wide range of plants in the seedling stage.

Symptoms:

Pythium sp. occurs in most cultivated soils. Infected seedlings appear water soaked at the soil level (Figure 18). This disease is favoured by high humidity and overcrowding.

Fig 18. Typical symptom of daming off disease

Results of Infection:

Seedlings topple over, often when the leaves are still green.

Control:

The use of good quality seed and plants is recommended. Sowing or planting under optimum conditions is essential to reduce infection. Avoid overcrowding and over watering. Use seeds coated with Captan or Thiram. Soil sterilization also reduces infection.

5. ROOT KNOT DISEASE

The causal agent is *(Meloidogyne javanica)*

Symptoms:

The nematodes stimulate the formation of root galls (Figure 19), which interferewith the plant's water supply, resulting in stunted and chlorotic growth, poor fruit setting and yellowing. The females lay several hundred eggs which are released into the soil. They enter the plant tissues, such as the root tips and stimulate the formation of galls.

Fig 19. Typical symptoms of root knot disease

Control:

Resistant cultivars can limit the spread of the infection. Crop rotation is sometimes successful. Insects can be treated with hot water to kill the larvae. The residues of some plants, when buried in the soil, reduce the level of infection.

6. FUSARIUM WILT

The causal agent is *(Fusarium oxysporium)*

This pathogen infects many crops. Acid soils and high temperatures encourage the spread the disease.

Fig 20. Typical symptoms of fusarium wilt

Symptoms:

This is a soil-borne disease, often invading plants through roots or wounds. The vascular system is infected, toxins are produced and the xylem turns brown (Figure 20).

Results of Infection:

Seedlings may rot and the leaves turn yellow and wilt. Plants may eventually die.

Control:

The control measure recommended are crop rotation, planting in disease free soil and the use of clean planting material. Burning of crop debris and the planting of resistant cultivars are also recommended

7. PHYTOPHTHORA FRUIT ROT

The causal agent is *(Phytophthora parasitica)*

This is a wide spread disease of Solanaceous plants.

Symptoms:

Dark circular lesions, with a watery appearance, develop on the fruits and stems. In wet weather, white mycelial growth develops on the crop debris.

Results of Infection:

Mature fruits turn brown and often rot within a few days.

Control:

Provide adequate spacing to reduce humidity within the crop. Remove and burn infected fruits and crop debris and spray with copper fungicides.

8. ANTHRACNOSE

The causal agent is *(Colletotrichum gloeosporiodes)*

Symptoms:

Lesions appear on the fruits starting as small, water soaked, dark sunken areas, which increase in size rapidly. A black layer appears over the affected parts as fungal lesions on the fruits and leaves.Secondary fungus may follow. Spores can also be dispersed by rain splash from infected fruit. The spores can also be seed and soil borne.

Results of Infection:

Fruits are infected mainly through wounds. Fruits that are infected rot. This results in serious crop loss.

Control:

Rotate crops and remove and destroy all remnants of crop after final reaping. Diseased fruits should be removed and destroyed. Seeds from areas where the disease has occurred should not be used for planting, as the agent is seed borne.

The use of clean seeds, crop rotation and removal of infected plants to reduce damage are also recommended.

9. VIRAL DISEASE

A number of viral diseases affect Boulanger plants. The one caused by tobacco mosaic virus is the most common. The symptoms produced by the viral infection vary, depending on the age when the plant was infected, variety, climatic condition and several other inter-related factors.

Fig 21. Leaf affected by viral disease

Symptoms:

Virus - affected plants often have mottled leaves, with dark to light green and yellow colours intermingled (Figure 21) . The leaves may be crinkled and twisted or completely distorted and thread-like.

Tobacco mosaic virus is easily transmitted mechanically, and can be carried on the fingers, on contaminated clothing and on plant refuse in the soil.

Results of Infection:

Diseased plants are usually stunted and produce little or no crop. Flowers may fall off, but if they produce fruits they are usually mottled and ripen unevenly with a mixture of white and green spots on the mature fruits. Fruits are usually poor both in appearance and taste.

Control:

Direct seedling helps to prevent the spread of the virus. Plants need to be sprayed to eliminate the insects (vectors), but often the insects transmit the virus before they are killed. Select only strong healthy seedlings for planting and rouging yellow or sickly looking plants to help control the virus disease of Boulanger is the preferred method of control.

Weeds of Boulanger (Solanum melongena L.) and their Management Strategies

Competition with weeds causes significant reductions in Boulanger crop yields and quality. Weed - crop competition is effected by both, the critical period of weed interference, that is the period where it is essential to maintain a weed-free environment to prevent yield losses and secondly the weed thresholds, that is the weed density that causes unacceptable yield loss.

Weed management in Boulanger in Guyana currently relies on only a few herbicides along with cultural practices, such as hand weeding and hoeing. Since it is uneconomical to hire labour for hand weeding and hoeing, herbicides are widely used.

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, purpleblack 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 22) 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.

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

Fig 22. Straight bladed hand shears for harvesting boulanger

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 23). 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.

Fig 23. Scarred and curved fruit calyx is not desired for export.

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 24). 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 25). This will prevent the stem from puncturing adjacent fruit.

Fig 24. Waxing the surface adds shine to the ruit.

Fig 25. 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.

<u>Temperature Management</u>

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 26). Once the colour of the skin begins to dull, the seeds darken and the flesh becomes spongy and bitter.

Fig 26. 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.