

# PINEAPPLE



**GUIDELINE  
TO FACILITATE INTRA-REGIONAL  
TRADE IN THE CARIBBEAN**

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# GUIDELINE TO FACILITATE INTRA- REGIONAL TRADE IN PINEAPPLE

Produced by the Caribbean Agricultural  
Health and Food Safety Agency (RPPO)  
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## Adoption

This guideline was adopted by the Council of Trade and Economic Development (COTED) in June 2022.

# INTRODUCTION

## Scope

This guideline provides guidance to national plant protection organisations (NPPOs) within the Caribbean region for management of the risk of introduction of specific pests associated with cross-border movement of pineapple fruit intended for consumption or processing. Clear guidance and protocols for intra-regional trade of the commodity in the Caribbean region are provided. The guideline applies to all varieties of pineapple with or without the crown and produced in the region.

The major pests of pineapple as well as the pests of regional priority and pests regulated by countries in the Caribbean region - and phytosanitary measures to manage these pests - are included in this guideline. Recommended measures include those that have been adopted as International Standards for Phytosanitary Measures (ISPMs) as well as those that are used in trade amongst Caribbean countries.

This guideline does not address issues related to living modified organisms, climate change, quality of the commodity, or diversion from intended use. Trade in the whole plant, flowers, cuttings, leaves, roots or other plant parts is not covered in this document.

## Definitions

Definitions of phytosanitary terms used in the present guideline can be found in ISPM 5 (*Glossary of phytosanitary terms*).

# OUTLINE OF REQUIREMENTS

The issue of pest risk varies within and between countries. It is therefore important for importing NPPOs to apply pest risk analysis (PRA) (see ISPM 2: *Framework for pest risk analysis* and ISPM 11: *Pest risk analysis for quarantine pests*) in the process of identifying quarantine

pests and providing the technical justification for the imposition of phytosanitary import requirements. The importing country should consider equivalence of phytosanitary measures if the country of export is unable to conduct specific requests for phytosanitary measures. Such a process should be in keeping with ISPM 24 (*Guidelines for the determination of equivalence of phytosanitary measures*).

Phytosanitary certification and import regulatory systems should be in accordance with ISPM 7 (*Phytosanitary Certification System*), ISPM 12 (*Guidelines for Phytosanitary Certificates*) and ISPM 20 (*Guidelines for a phytosanitary import regulatory system*). Inspections and sampling of consignments should be in keeping with ISPM 23 (*Guidelines for inspection*) and ISPM 31 (*Methodologies for sampling of consignments*), respectively. Wood packaging materials, including pallets, used for consignments must be in conformance with ISPM 15 (*Regulation of Wood packaging material in international trade*).

This document seeks to provide guidance on procedures to establish phytosanitary import requirements. It also identifies and describes specific phytosanitary measures that may be used to reduce pest risk and it provides guidance on sampling, inspection and phytosanitary certification of fresh pineapple fruit for export.

## BACKGROUND

### Description of pineapple

The pineapple (*Ananas comosus*), a tropical plant with an edible fruit, is the most economically important plant in the Bromeliaceae family. *A. comosus* is indigenous to South America and is the third most important tropical fruit in world production. The pineapple plant grows as a small shrub; it is an herbaceous perennial that grows up to 1.0-1.5m in height. The plant has a short, stocky stem and tough, waxy leaves. The individual berry-like fruits of the approximately 200 flowers join together to produce a multiple fruit. The fruit is topped by a rosette of short, stiff, spirally arranged leaves known as the crown. After the fruit is formed, side shoots or suckers are produced in the leaf axils of the main stem, and these are usually removed and used for propagation or left on the plant to produce additional fruits on the parent plant. The fleshy, trough-shaped leaves of the pineapple plant have sharp spines along the margins.



Pineapple is mostly grown at low elevations in areas with a temperature range of 15 - 30°C and is tolerant to drought due to the special water storage cells. An annual rainfall range of 600 - 2,500mm is tolerated, with the optimum rainfall being in the range 1,000-1,500mm annually. *A. comosus* can be grown in a wide range of soil types but prefers a well-drained sandy loam with a high organic matter content and a pH range of 4.5-6.5; the plant does not tolerate waterlogging and plants quickly succumb to root rot.

This guideline will focus on measures to facilitate intra-regional trade of fresh pineapple fruit in the Caribbean.

### Identity

Preferred Scientific Name

*Ananas comosus*

Preferred Common Name

Pineapple

Other Scientific Names

*Ananas sativus*

*Bromelia sativus* (LINDL.) SCHULT.

### Taxonomic Tree

Domain: Eukaryota

Kingdom: Plantae

Phylum: Spermatophyta

Subphylum: Angiospermae

Class: Monocotyledonae

Order: Bromeliales

Family: Bromeliaceae

Genus: *Ananas*

Species: *Ananas comosus*

### Intended Use

The guideline covers fresh pineapple fruit for the intended purpose of consumption or for processing.

## REQUIREMENTS

### Pest risk analysis

The NPPO of the importing country should conduct PRA associated with pineapples in accordance with ISPM 2, *Framework for pest risk analysis* and ISPM 11, *Pest risk analysis for*

quarantine pests, to determine the regulatory status of the pests for the area from which the commodity originates.

### Pests of phytosanitary significance affecting trade in pineapples

Pineapples are subject to a variety of diseases, the most serious of which is wilt disease vectored by mealybugs typically found on the surface of pineapples. Other diseases include citrus pink disease (pink disease of pineapple), bacterial heart rot, anthracnose, fungal heart rot, root rot, black rot, butt rot, fruitlet core rot, and yellow spot virus. Some pests that commonly affect pineapple plants are scales, thrips, mites, mealybugs, ants and symphylids. Heart-rot is the most serious disease affecting pineapple plants. The disease is caused by *Phytophthora cinnamoni* and *P. parasitica*, fungi that often affect pineapples grown in wet conditions.

The Mediterranean fruitfly (*Ceratitis capitata*) is a regional pest of priority which is listed as being of unknown importance to *Ananas comosus*. Appendices 1 and 2, respectively provide combined lists of general pests and regulated pests found on pineapples grown in the Caribbean region.

Table 1 is a list of pests associated with pineapples that may be identified as regulated pests requiring phytosanitary measures by the PRA process. Measures in Table 3 are recommended for the management of these quarantine pests. These measures may be substituted where technically justified.

In the conduct of the pest risk assessment, significant uncertainty may be identified, making it difficult to evaluate phytosanitary measures. Cases of uncertainty do not mandate the application of measures unless it is determined that a pest is likely to be introduced and result in negative economic impacts in the PRA area. In Table 2, included is a list of pests for which there is uncertainty in the Caribbean as to association with pineapples in trade and a description of the uncertainty.

**Table 1. Pest groups associated with pineapples.**

Pest Group	Family	Example species
Mealybugs	Pseudococcidae	<i>Geococcus coffeae</i> Green
Mites	Tarsonemidae	<i>Steneotarsonemus ananas</i> (Tryon)

Table 2. Pests with uncertain association with pineapples.

Pest Group	Family	Pest	Description
Fruitfly	Tephritidae	<i>Ceratitis capitata</i> (Weidermann)	The species is listed as of unknown importance to <i>Ananas comosus</i> . (Thomas <i>et al.</i> , University of Florida, 2019); thus, in the absence of definitive information on whether pineapples would serve as a host in the region, specific phytosanitary measures cannot be definitively determined.

## General Procedures

Once technically justified, general procedures include the following:

### Production:

- Registration of producers, farms and exporters and maintenance of a registry of these entities by the NPPO of the exporting country
- Application of good agricultural practices (GAP) (e.g., site and land selection, use of agrochemicals in as recommended by the manufacturer, use of pest resistant or tolerant varieties where available, farm sanitation, weed management)
- Monitoring for pests and their vectors where applicable

### Packaging and grading:

- Registration of packing houses
- Development of, and compliance with, packing house requirements
- Pest management in the packing house
- Packing in new and clean material (including protective material, where required)
- Labelling of packaging
- Storage prior to export and transportation in a secure manner to prevent contamination and infestation (e.g., use of insect-proof packaging)
- Grading (guided by CODEX standards<sup>1</sup>) to ensure suitability of pineapples for export, including freedom from damage and/or rot, symptoms of pests and contamination with soil, plant debris and extraneous materials.

<sup>1</sup> CODEX Alimentarius “Fresh Fruits and Vegetables” <https://www.fao.org/3/a1389e/a1389e00.htm>

### Treatment facilities:

- Registration and approval of export treatment facilities (where different to packing house) in accordance with established procedures
- Secure management to prevent contamination and infestation.

### Sanitary (Food Safety) Measures

Food contamination can be caused in several ways, the main types of which are biological, chemical, physical and allergenic. Some such contamination could be due to naturally occurring contaminants in the environment or artificially introduced by certain agricultural practices.

Food contamination is a matter of serious food safety concern because high concentration of chemicals and contaminants present in food can pose serious health risks. The handling, packaging, transporting and storage of commodities intended for consumption are significant contributors to food contamination. It is therefore important that good agricultural practices and good hygiene practices are maintained from the point of production to the point of export to reduce or eliminate contamination of pineapples. Use of chemical treatments must be approved for use on commodities for consumption and should be applied strictly in accordance with the manufacturer's recommendations on the label and in keeping with maximum residue levels (MRLs) as prescribed by the suitable authority.

Persons handling pineapples in production and after harvest processes should be (made) aware of proper personal hygiene and apply good hygienic practices at all times.

### Phytosanitary Measures

Of the priority regional pests of quarantine significance in the Caribbean region, only *Ceratitidis capitata* has been mentioned as possibly being a pest of concern for trade in fresh pineapple fruit. The specific significance has yet to be determined as such information is not currently available and so this would have to be determined through PRA. Table 3 below provides information on pests associated with pineapples along with measures considered to be effective in managing each pest group previously identified in Table 1. Additionally, the Caribbean Pineapple Production and Post-Harvest Manual (CARDI, FAO, 2011) provides detailed guidance on the best practices in production and post-harvest handling of pineapple in the Caribbean.

NPOs of importing countries in the region should recognize the effectiveness of treatments to manage the target pests or provide technical justification in support of alternative measures. Phytosanitary measures applied to manage the risk(s) from one pest could likely also manage the risks posed by other pests of the commodity.

In the case of phytosanitary import requirements, such should be required solely for pests that countries have identified as regulated pests that require the application of phytosanitary measures thus determined by PRA for the endangered area. In cases where the association of the pest or pest group to the pathway is uncertain, phytosanitary measures should be justified through PRA.

**Table 3. Phytosanitary measures considered to be effective in managing the risk from specified pest groups**

Pest Group	Phytosanitary Measure(s)
Mealybugs	Systems approach, visual inspection, IPM
Mites	PFPP <sup>2</sup> , ALPP <sup>3</sup> , exclusion of leaf material & debris from consignment

### Pest Free Areas (PFA)

Guidance on pest free areas may be sourced in ISPM 4 (*Requirements for the establishment of pest free areas*) and ISPM 8 (*Determination of pest status in an area*).

### Pest Free Places of Production (PFPP) and Areas of Low Pest Prevalence (ALPP)

Guidance on pest free places of production and areas of low pest prevalence is found in ISPM 10 (*Requirements for the establishment of pest free places of production and pest free production sites*) and ISPM 22 (*Requirements for the establishment of areas of low pest prevalence*). The utility of these phytosanitary measures may be limited by some characteristics of pests.

## Pre-Harvest and Harvest Management

### Pre-harvest management

Production of pineapple crops should be maximized through the use of good quality, disease-free planting material as well as the use of optimal production locations with the preferred soil

<sup>2</sup> Pest Free Places of Production

<sup>3</sup> Area of Low Pest Prevalence

types, pH and environmental conditions. The application of good agricultural practices, including an integrated system of pest management, is expected to support good crop yields. Water used for irrigation, fertigation, pesticide application, or other production activities should be free from contamination by microbial and/or biological agents and heavy metals. Pest management systems should include crop monitoring, inspection, chemical and/or biological control as appropriate, and weed management. An official trapping and/or surveillance program for pests of concern is recommended where required.

### Harvesting

Pineapple is hand-harvested and should be harvested at the stage of fruit maturity required by the country of import. Picking early in the morning or late afternoon when temperatures are cooler, along with protection from the sun after harvest can help reduce the heat load of harvested pineapples which should be cooled after harvesting. A sharp knife should be used for harvesting the fruit, giving a smooth cut; no more than 2 cm of the peduncle should be left on the fruit. Fruit should be visually inspected at this stage and diseased, damaged and infested goods removed and isolated. Pineapple fruit should be preferably field packed (placed in the field bin crown down by hand) to significantly reduce fruit bruising and crown injury.

### Post-harvest handling and treatments

#### Handling and sorting

On arrival at the packhouse, harvested pineapple fruit may be unloaded by hand by submerging the bin in water or allowed to slide out of the field bin into water. The fruits should be washed and any additional sorting and grading done at this stage. Damaged fruit should be removed as well as crowns (whenever required by the destination market) and basal leaves. Stem material should be trimmed in accordance with the requirements of the destination market. Basal areas of the pineapple fruit should be examined for signs of deterioration. All fruit showing any sign of rotting should be removed.

During handling, care should be taken to avoid damage to the crown leaves (if permitted) and bruising of the fruit.

## Transportation

Once harvested, fruits should be immediately transported to the packhouse. As far as possible, jerks and bumps during transportation should be avoided to prevent bruising of the fruit. The vehicle used for transporting the fruit must be clean and every effort should be made not to transport other products along with the pineapples. Records should be kept of all vehicular cleaning activities.

## Cleaning

After trimming and sorting, the fruits should be subjected to clean, soft water washing.

Pineapple fruits may be washed by immersion in a soap solution (2 tablespoons per gallon of water OR 30ml to 3.8 litres of water) for a period of three (3) minutes. The surface of the pineapples should be scrubbed with a soft brush to remove debris and live insects. Careful attention should be paid to the areas around the base and just below the base of the crown. An approved postharvest fungicide should be added to the washing solution to reduce any incidence of fruit tissue deterioration.

A disinfectant such as sodium hypochlorite should be added to the water in the dump tank at a rate of 100-200 ppm free chlorine and maintained at a pH of 6.5-7.0. After chlorine disinfection of the fruit, it is essential that the fruit are rinsed in water.

The washing solution or water should be replaced frequently to prevent a build-up of pests, extraneous material and contaminants. Water used in the cleaning process should be of a potable quality.

The structure of the pineapple fruit, mainly the leafy crown, provides an ideal environment for pests to hide. The importing country may require that the crowns be removed to address this risk. All other foliage, arthropods and extraneous materials should be removed, and fruit should be visually inspected for signs of damage or infestation.

## Storage

Temperatures in the range of 7.5-12°C are recommended for storage of fresh pineapple fruit, with relative humidity of 90-95%.

## Treatments

Treatments include a range of processes that are targeted at the control or eradication of pests and contaminants from approved commodities, empty containers and export vessels.

Treatments can include - but are not limited to - fumigation; irradiation; use of controlled atmosphere or temperature; application of a chemical substance; dismantling, repairing or cleaning; repacking; or blending. The choice of the treatment applied is the responsibility of the importing country, unless otherwise determined by legislation or international standards.

Specific treatments for fresh pineapple fruits may be selected and mutually agreed upon between the countries of import and export in accordance with approved international standards and treatments or where bilaterally agreed.

#### *Irradiation*

Treatments for the use of ionizing radiation (irradiation) may be used for pest risk management. Phytosanitary irradiation is a treatment which uses ionizing radiation on commodities such as fruits and vegetables to inactivate pests. The method is used for international food trade as a means to prevent spread of non-native organisms. NPPOs should be assured that the efficacy of the treatment is scientifically demonstrated for the regulated pest(s) of concern and the required response. The application of irradiation as a phytosanitary treatment should be in accordance with ISPM 18 (*Guidelines for the use of irradiation as a phytosanitary measure*).

#### *Fumigation treatment*

Fumigation is the treatment with a chemical agent that reaches the commodity and target pest(s) in a gaseous state. The fumigant may be effective against all pest groups or used to target a particular pest group and may address all or most life stages. The application of fumigation as a phytosanitary treatment should be in accordance with ISPM 43 (*Requirements for the use of fumigation as a phytosanitary measure*).

Storage facilities, both on- and off-farm, should be approved and outfitted with the required cool stores and warehousing facilities linked to postharvest crop management. Fumigation should only be done when necessary and only by a licensed or trained operator. All fumigation instances, chemical agents used, and dates of application should be documented.

#### *Chemical treatment*

Chemical treatments are used on a wide range of agricultural products from pre-planting through to post-harvest stages. These treatments are intended to destroy, repel and control pests of agricultural commodities. The chemicals are commonly applied by **dipping** (i.e., fully immersing the commodity into a solution) or spraying at a specific concentration for a specified period, to reduce the risk of a broad range of pests in the target area or on the target



commodity. Chemical treatments may also be used to destroy pests within empty holds of a vessel or container.

If required, fungicidal treatments may be applied (usually 1,000 ppm thiobendazole) to disinfect pineapple fruits from pathogens associated with the fruits at the pre-harvest stage. The fruits should be dipped for 3-5 minutes depending on the fruit size.

### *Temperature treatment*

Temperature treatments may be used as a phytosanitary treatment option. The application of heat treatments and systems to support the treatments should be in accordance with ISPM 42 (*Requirements for the use of temperature treatments as phytosanitary measures*) and technically justified by PRA.

**Vapour Heat Treatment (VHT)** is the process in which water vapours are used to heat a commodity until it reaches a minimum temperature for a specified period of time to effectively control live infestations of certain pests. It is an option generally used for commodities that are resistant to high moisture and vulnerable to drying out.

To kill mealybugs, scale insects, thrips, mites and prevent storage rots, the pineapple fruits should be subjected to 53°C temperature for 5-7 minutes.

**Cold treatment** involves the use of refrigerated air to lower the temperature of a product to, or below, a specific temperature for a specific period to mitigate the risks of infestations of target pests. This treatment is used primarily for fresh fruits and vegetables that are hosts of internally feeding pests. The treatment is generally commodity and pest specific.

### *Packing, packaging and labelling*

Pineapple fruits should be packaged using clean or new containers. It is recommended that the packaging should consist of corrugated boxes that are capable of withstanding the stresses of handling and transport while resisting contamination by foreign substances and restricting pest access. The weight of the carton should not exceed 14-18 kg (30-40 pounds).

Plant material (e.g., wood shavings) must not be used as packaging material; materials such as paper shavings, sleeves, bubble wrap and other materials are, however, permitted.

A label to be affixed to each container should clearly detail the name of the commodity and other relevant information, including but not limited to: the variety, the farmer's registration number, the name and address of the exporter, the harvest date, the packing date, the gross

weight or net weight, the number of fruits per carton, and the names of the grower and the processor/exporter. Any other quantitative information should be also included on the label in keeping with the importing country's requirements.

### Transportation

In the transportation of fresh pineapples for consumption, all applicable handling, packaging and storage procedures must serve to prevent damage and proliferation of pests during the process.

### Systems Approaches

Guidance for the use in development and evaluation of integrated measures in a systems approach can be found in ISPM 14 (*The use of integrated measures in a systems approach for pest risk management*). At least two measures which are independent of each other may be used to manage specific quarantine pests and any uncertainty.

### Verification of compliance

Sampling and inspection should be carried out by the NPPO to verify compliance of pineapple consignments with phytosanitary import requirements.

The NPPO may authorize entities to conduct specific phytosanitary activities (e.g., sampling, inspection and testing in accordance with the ISPM 45 (*Requirements for national plant protection organizations if authorizing entities to perform phytosanitary actions*)).

### Sampling and phytosanitary inspection

ISPM 31 (*Methodologies for sampling of consignments*) and ISPM 23 (*Guidelines for Inspection*) may be used for official guidance on sampling and phytosanitary inspection.

In accordance with official procedures, the NPPO of the exporting country should sample and inspect each consignment of fresh pineapples to verify conformance with importing requirements and freedom from quarantine pests. If infield controls require the registration of the production area or farm(s), sampling and inspection should be conducted in each homogenous grower lot. In instances where live pests are found, the exporting country NPPO should determine whether additional actions are required to meet the conditions of the importing country NPPO.

The number of packages presented for inspection should be consistent with documentation for the consignment. The documentation should certify that basic measures have been applied and that any required traceability labelling is complete. Initial inspection of the consignment should also verify that the phytosanitary security is maintained for the consignment.

Minimum sample size for inspection should be based on a 95% confidence level as set out in ISPM 31 (*Methodologies for sampling of consignments*), or as specified by the NPPO of the importing country with technical justification.

### Phytosanitary certification

All commodities intended for export attain a phytosanitary status when they are produced in a PFA or PFPP; after harvest, for commodities from certified farms required to eliminate, manage or monitor specific pests; after a phytosanitary treatment, and after export inspection. A phytosanitary certificate should only be issued when the requirements of the importing country, as set out in an Import Permit issued by its NPPO, have been verified as being met as confirmed in the certifying statement. Phytosanitary certification (for export and re-export) should be in keeping with ISPM 12 (*Phytosanitary certificates*).

An addition declaration may be required by the country of import to verify compliance with the import requirements as specified by the importing country's NPPO.

For consignments of fresh pineapples for consumption to receive phytosanitary certification, the consignments must:

- Meet the specific requirements as indicated in the Import Permit issued by the importing country
- Originate only from officially approved places of production
- Be clean (i.e., practically free from viable regulated pests, and associated tissue damage, soil, chemical contaminants, or any other extraneous material and substances)
- Be treated in a manner consistent with the application standard and treatment certificate presented
- Be accompanied by pest free area declaration, where required
- Be packaged in clean and new material (including packaging material used to prevent damage during transport)
- Be exported in a secure manner to prevent contamination.

Pineapples must be intact and clean, and free from rot, visible foreign matter and damage caused by pests. If viable regulated pests are detected, a phytosanitary certificate should not be issued unless appropriate phytosanitary measures have been applied.

If a consignment of fresh pineapples is opened, split up or packaging changed prior to arriving in the country of import, a phytosanitary certificate for re-export is required from the re-exporting country. Re-exported consignments must be accompanied by (a copy of) the original phytosanitary certificate.

Phytosanitary certificates, and Phytosanitary Certificates for Re-export should be in accordance with ISPM 12 (*Phytosanitary certificates*).

### Phytosanitary security

Once commodities have received phytosanitary certification, and until such commodities are exported, the phytosanitary security of the commodities must be maintained at all times. As such, the commodities must be adequately protected to prevent infestation or contamination and labelled (in keeping with the legislation and importing country requirements) to prevent substitution. Breaches of security during transport or storage disqualifies the phytosanitary status of the commodities.

Phytosanitary security is maintained:

1. when secure packaging (cartons, pallets) is used and/or
2. the consignment is isolated by physical barriers, distance or insect-proof space), AND
3. appropriate measures are taken while loading export containers.

### Secure packaging

Secure packaging requirements could comprise of the following:

#### *Container level security*

- The commodity is fully enclosed in a container with the lids tightly fixed to the base
- Ventilation holes or other openings are covered with insect-proof mesh that has no more than a 1.6mm diameter pore size diagonally; alternatively, ventilation holes are fully sealed.

- Vented containers having plastic liners or bags must be fully sealed. The overlapping folded edges of the plastic liner with the container lid on top would be considered fully sealed.

#### *Pallet level security*

For containers that are palletized, security would be achieved using one of the following options:

- Each pallet is fully shrink-wrapped, with the base and the top of the pallet sealed (e.g., using a sheet of cardboard), as well as all sides, to completely enclose the commodity consignment.
- Each pallet is secured with insect-proof mesh using a pallet net with no more than a 1.6 mm pore size diagonally, to include the surface area between the bottom row of the containers and the pallet.

#### *Isolation requirements*

Commodities that are not secure-packaged may be kept secure if they are isolated from all potential sources of infestation or contamination and from other goods of different or unknown phytosanitary status.

#### *Isolation by physical barriers*

Physical barriers (e.g., walls or solid structures) can be used to form a barrier to exclude pest access. This option can be applied when the commodities are stored and handled in insect-proof spaces, shipping containers, enclosed vans or cool rooms.

#### *Isolation by distance*

The phytosanitary status of consignments may be maintained by creating a minimal acceptable distance between goods of different or unknown phytosanitary status within insect-proof spaces. This can be achieved if goods are kept at optimal storage temperatures for the commodity with at least 1m separation from any other goods.

#### *Isolation by insect-proof spaces*

The phytosanitary security of a consignment can be maintained if, at all times, the goods are kept in insect-proof spaces and are kept isolated from all potential sources of infestation or contaminants, to include products of different or unknown phytosanitary status. Packhouses,

treatment facilities and cool room storage doors must be suitably insect-proof through the use of double doors, automatic doors, rubber curtains, air curtains or other approved mechanism.

### Loading procedures

During the loading process, it is important to maintain phytosanitary security of the consignment by ensuring the following occurs:

- Containers with vent holes and openings must be sealed, with openings no more than 1.6 mm pore size diagonally (e.g., drain holes or air intakes)
- Consignments must be loaded directly into the export container
- Commodities not securely packaged and not immediately loaded must be stored securely to prevent contamination or infestation
- Personnel loading export containers must ensure that the consignments are moved from the secured area into the export containers as quickly as possible
- Consignments must not be left unsecured and loading procedures must mitigate potential infestation.

One or more methods to safeguard fresh pineapples against infestation after the application of a phytosanitary measure should be applied. Such methods should take into account the biological characteristics of pests and the strength of the phytosanitary measures that have been applied.

### Consignments in transit

In the movement of regulated commodities within the Caribbean, such commodities may transit various countries *en route* to the country of import. Procedures to identify, assess and manage pest risks associated with consignments of these commodities which pass through a country without being imported, should be conducted in such a manner that any phytosanitary measures applied in the country of transit are technically justified and necessary to prevent the introduction into and/or spread of pests within that country. ISPM 25 (*Consignments in transit*) provides guidance for handling of consignments in transit.

## Audit and compliance of the export pathway

In keeping with ISPM 20 (*Guidelines for a phytosanitary import regulatory system*), the importing country's NPPO may request an audit of specific elements of the fresh pineapples export system. This could relate to entities registered/approved to export as well as the records relating to exported consignments. Verification of compliance of the consignment may be sought by the importing country in the country of export.

## REFERENCES

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## APPENDICES

### Appendix 1. List of pests found on pineapple in the Caribbean region

[source: National Plant Protection Organizations of Member States]

Pest Type	Scientific name	Common name(s)
Bacterium	<i>Ceratocystis paradoxa</i> (Dade)	black rot of pineapple
Bacterium	<i>Erwinia caratovora</i> (L.R. Jones) Holland	Bacterial soft rot
Bacterium	<i>Pectobacterium carotovorum</i> (Jones) Waldee	Stem rot
Fungus	<i>Athelia rolfsii</i>	sclerotium rot
Fungus	<i>Botryodiplodia theobromae</i> Pat.	Basal rot
Fungus	<i>Ceratocystis paradoxa</i> (Dade) Moreau	Black or Base rot of pineapple
Fungus	<i>Colletotrichum</i> sp.	Anthraco-nose
Fungus	<i>Corticium rolfsii</i> (Sacc.)	Sclerotium rot
Fungus	<i>Fuligo septica</i>	Slime mould
Fungus	<i>Fusarium oxysporum</i>	basal rot
Fungus	<i>Lasioidiplodia theobromae</i>	diplodia pod rot of cocoa
Fungus	<i>Phomopsis</i> sp.	Basal rot
Fungus	<i>Phytophthora nicotianae</i> var. <i>parasitica</i>	Heart rot
Insect	-	Thrips
Insect	-	Pineapple mealybug
Insect	-	Scale insects
Insect	-	Fruit flies
Insect	-	White grub
Insect	-	Termites
Insect	-	Pineapple weevil
Insect	<i>Aleurocanthus woglumi</i> Ashby	Blackfly
Insect	<i>Cholus spinipes</i> (F.)	Pineapple weevil
Insect	<i>Cholus zonatus</i> Swed.	Curculionid weevil
Insect	<i>Coccus viridis</i>	soft green scale
Insect	<i>Diaspis boisduvali</i> Ckll.	Boisduval (pineapple) scale
Insect	<i>Diaspis bromeliae</i> Kern.	Pineapple scale
Insect	<i>Dysmicoccus brevipes</i> (Cockerell)	pineapple mealybug
Insect	<i>Dysmicoccus neobrevipes</i>	grey pineapple mealybug
Insect	<i>Exophthalmus</i> sp.	Fiddler beetle
Insect	<i>Ferrisia virgata</i> (Cockerell)	Striped mealybug
Insect	<i>Maconellicoccus hirsutus</i>	pink hibiscus mealybug
Insect	<i>Metamasius hemipterus</i> (Olivier)	West Indian cane weevil
Insect	<i>Metamasius ritchei</i> Mshll.	Pineapple weevil
Insect	<i>Opogona sacchari</i>	banana moth
Insect	<i>Paracoccus marginatus</i> (Williams and Granara de Willink)	papaya mealybug
Insect	<i>Parasaissetia nigra</i>	pomegranate scale
Insect	<i>Phenacoccus madeirensis</i>	Madeira (cassava) mealybug
Insect	<i>Planococcus citri</i>	Citrus mealybug
Insect	<i>Protaetia fusca</i>	mango flower beetle
Insect	<i>Pseudococcus jackbeardsleyi</i> Gimpel and Miller	Jack Beardsley mealybug
Insect	<i>Pseudococcus longispinus</i>	Long-tailed mealybug
Insect	<i>Saccharicoccus sacchari</i>	grey sugarcane mealybug

Pest Type	Scientific name	Common name(s)
Insect	<i>Solenopsis geminata</i> Fab.	Fire ant
Insect	<i>Solenopsis invicta</i> Buren	Red imported fireant
Insect	<i>Unaspis citri</i>	Citrus snow scale
Mite	<i>Tetranychus</i> spp.	Red Spider Mite
Nematode	<i>Aphelenchoides</i> sp.	Nematode
Nematode	<i>Aphelenchus</i> sp.	Nematode
Nematode	<i>Cacopaurus</i> sp.	Nematode
Nematode	<i>Criconemoides</i> sp.	Ring nematode
Nematode	<i>Ditylenchus</i> sp.	Nematode
Nematode	<i>Helicotylenchus erythrinae</i> (Zimm.)	Golden Spiral nematode
Nematode	<i>Helicotylenchus multincinctus</i> (Cobb)	Golden Spiral nematode
Nematode	<i>Helicotylenchus nannus</i> Steiner	Spiral nematode
Nematode	<i>Helicotylenchus</i> sp.	Spiral Nematodes
Nematode	<i>Hoplolaimus</i> sp.	Nematode
Nematode	<i>Longidorus</i> sp.	Nematode
Nematode	<i>Meloidogyne incognita</i>	root-knot nematode
Nematode	<i>Meloidogyne</i> sp.	Root-knot nematode
Nematode	<i>Pratylenchus</i> sp.	Nematode
Nematode	<i>Radopholus similis</i>	burrowing nematode
Nematode	<i>Rotylenchulus reniformis</i> Linford & Olivera	Reniform nematode
Nematode	<i>Scutellonema</i> sp.	Nematode
Nematode	<i>Tylenchorhynchus acutus</i> Allen	Stunt nematode
Nematode	<i>Tylenchus</i> sp.	Nematode
Nematode	<i>Xiphinema</i> sp.	Nematode
Oomycete	<i>Phytophthora cinnamomi</i>	Phytophthora dieback
Oomycete	<i>Phytophthora nicotianae</i> de Haan var. <i>parasitica</i> (Dastur) Waterh.	Basal rot
Oomycete	<i>Phytophthora palmivora</i> (Buttler)	Coconut budrot
Oomycete	<i>Phytophthora</i> spp.	Root rot
Oomycete	<i>Pythium</i> spp.	Root rot

## Appendix 2. List of pests of pineapple regulated by countries in the Caribbean region

[Source: National Plant Protection Organisations of Member States]

Pest Type	Scientific name	Common name(s)
Insect	<i>Geococcus coffeae</i> Green	Coffee root mealybug
Mite	<i>Steneotarsonemus ananas</i> (Tryon)	Pineapple tarsonemid, pineapple fruit mite, leathery pocket mite