



## REFERENCE

# Plant exports guide—sampling horticulture

## Purpose of this document

This document provides authorised officers (AOs) conducting horticulture export inspections with guidance on how to:

- determine the required number of packages to sample
- select samples using an approved sampling technique.

## Sampling

As it is often not practical to inspect entire consignments, a phytosanitary inspection is performed on samples obtained from the consignment.

Phytosanitary inspection is performed according to the International Standards for Phytosanitary Measures No. 31 Methodologies for sampling of consignments.

## Why is sampling necessary?

Sampling of consignments is undertaken for inspection in order to:

- detect regulated pests
- provide assurance that the number of regulated pests or infested units in a consignment does not exceed the specified tolerance level for the pest
- provide assurance of the general phytosanitary condition of a consignment
- verify compliance with phytosanitary requirements.

**Note:** A regulated pest can be a quarantine pest or a regulated non-quarantine pest:

- **A quarantine pest** is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.
- **A regulated non-quarantine pest's** presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and is therefore regulated by the importing country.

## Why is approved sampling rate used?

Using an approved sampling rate ensures an adequate number of units are inspected. An approved sampling technique ensures the sample is representative of the consignment.

The approved sampling rates (600 units and two per cent) that are used for horticulture exports are statistically determined to provide 95 per cent confidence that a 0.5 per cent level of infestation in the consignment will be detected during inspection.

### For example

For a consignment of 1,000 oranges that has five infested oranges, there is a 95 per cent chance of finding one of those infested pieces of fruit if using the 600 unit or two per cent sampling rate.

Sampling and inspection is based on the assumption that the consignment is homogenous. Therefore, when a pest is found, it represents a level of pest distribution within the entire consignment. That is why the whole consignment is rejected if the pest tolerance is exceeded.

### **Calculating the number of packages to sample**

Packages are drawn from a consignment as samples, and individual units are inspected from the sampled packages. The following section describes how the number of packages to sample is calculated using the 600 unit and two per cent sampling rates.

#### **600 unit inspection**

The inspection AO calculates how many packages to draw to reach 600 units. To determine the number of sample packages the AO determines how many units are in each package.

#### **For example**

For a consignment of citrus, the cartons may indicate there are 80 counts in each box. Alternatively the AO asks the client or counts the number of units in one package.

If there are 80 oranges in each package, 600 units is divided by 80 units to determine the number of cartons required.

$$600 \div 80 = 7.5 \text{ cartons}$$

7.5 is rounded up to 8 cartons to ensure 600 units is reached.

If the 600 unit target is reached halfway through the eighth carton, the inspection AO stops inspecting. The remaining contents within the carton are removed to allow for the inspection of the empty carton and any internal lining.

#### **Number of packages to sample**

A minimum of three packages are inspected.

If the consignment is made up of less than three packages, all packages are selected.

Where three packages or less are selected, the AO inspects proportionately from each package.

If the three packages contain greater than 600 units, a proportionate amount from each package is sampled to reach 600 units, that is, a maximum of 200 units from each package is sampled and inspected.

#### **Two per cent inspection**

Where a two per cent inspection rate is selected, two per cent of the packages in the consignment are wholly inspected.

To undertake this method the inspection AO determines how many packages make up the consignment. This information should be available on the request for permit (RFP). The AO verifies the number of packages by counting the entire consignment.

#### **For example**

For a consignment of apples packed into 536 cartons, the AO calculates two per cent of 536 cartons.

$$536 \times 0.02 = 10.72 \text{ cartons}$$

10.72 is rounded up to 11 cartons and all cartons are wholly inspected.

## What sampling techniques are used

Once the number of packages to sample is known the AO selects which packages to sample using an approved sampling technique. This ensures that the sample taken is representative of the consignment.

The four approved sampling techniques are random sampling, systematic sampling, haphazard sampling and selective or targeted sampling.

The following section explains each sampling technique.

### Random sampling

Random sampling results in all sample packages/units having equal probability of being selected based on a pre-determined randomisation process, such as a random number generator.

The AO selects a method of numbering the packages in the consignment. They then use a random number generator to determine which packages to select.

This technique is likely to be more practical for smaller consignments.

#### For example

For a 1,000 carton consignment in which 10 cartons are required for sampling, a random number generator is used to generate 10 numbers between 1 and 1,000 inclusive. The AO will draw the sample cartons that correspond to the numbers generated.

#### Using Excel to generate random numbers for 1,000 carton consignment

The RANDBETWEEN function in Excel can be used to generate random numbers between 1 and 1,000.

= RANDBETWEEN (Bottom, Top)

Bottom: the lowest number the function is to use.

Top: the highest number the function is to use.

1. Click on cell A1 in a blank spreadsheet—the location where the result will be displayed.
2. Click on the **Formulas** tab of the ribbon menu.
3. Choose **Math & Trig** from the ribbon to open the function drop down list.
4. Click on **RANDBETWEEN** in the list to bring up the function's dialog box.
5. Click on the **Bottom** line in the dialog box.
6. Type the number 1 on this line.
7. Click on the **Top** line in the dialog box.
8. Type the number 1,000 on this line.
9. Click **OK**.
10. A random number between 1 and 1,000 will appear in cell A1.
11. Click in cell A1 and drag the box down till you reach the total number of random numbers required, that is 10.

	A	B	C	D	E	F
1	132					
2	477					
3	50					
4	126					
5	771					
6	243					
7	317					
8	861					
9	878					
10	157					

Once the AO has their 10 random numbers they will go through and locate the corresponding carton based on how they have numbered the consignment.

### Systematic sampling

Systematic sampling involves drawing a sample from a consignment at a fixed pre-determined interval. The first selection will be made at random.

#### For example

For a 1,000 carton consignment in which 10 cartons are required for sampling, 1 in every 100 cartons is sampled. The AO randomly chooses a number between 1 and 100 to commence the sampling, for example, 83. The 83rd carton is selected as the starting point and then every 100th carton thereafter is selected (83, 183, 283...).

### Haphazard sampling

Haphazard sampling is the selection of arbitrary packages without a true randomisation process.

#### For example

For a 1,000 carton consignment in which 10 cartons are required for sampling, the AO selects any 10 cartons across the consignment without reference to any sampling system.

This will likely be the most practical sampling technique for AOs.

**Note:** The cartons cannot be chosen based on convenience.

### Selective or targeted sampling (for mixed consignments only)

Selective sampling involves deliberately selecting samples from parts of the consignment most likely to be infested, in order to increase the chance of detecting a regulated pest. This method may rely on AOs who are experienced with the commodity and familiar with the higher risk commodities.

Selective or targeted sampling is used for mixed consignments where an AO can identify or has knowledge of higher risk groups or treatment pathways and deliberately targets those commodities or pathways in order to increase the probability of finding a pest.

Where an AO chooses this method, the risk categories have been pre-determined in the Plant Export Operations Manual Guideline: *Inspection of horticulture for export*.

### Convenience sampling

Convenience sampling is **not** an approved method of sampling. It involves selecting the most convenient packages. For example, the most accessible or fastest to inspect from the consignment, without selecting packages in a random or systematic manner.

## Related information

- *Export Control Act 1982*
- Export Control (Orders) Regulations 1982
- Export Control (Plants and Plant Products) Order 2011
- International Standards for Phytosanitary Measures No. 31 Methodologies for sampling of consignments
- [Manual of Importing Country Requirements \(MICO – Plants\)](#)
- [Plant Exports Operations Manual \(PEOM\)](#):
  - Guideline: *Inspection of horticulture for export*
  - Work instruction: *Inspecting horticulture for export using end-point sampling*
  - Work instruction: *Inspecting horticulture for export using in-line sampling*
  - Reference: *Plant exports guide—equipment*
  - Reference: *Plant exports guide—horticulture inspection techniques*
  - Reference: *Plant exports guide—specimen collection*

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