



Government of India

Ministry of Agriculture

(Department of Agriculture & Cooperation)

Directorate of Plant Protection, Quarantine & Storage

N.H.IV., Faridabad-121001

**Standard Operating Procedures for
Mango Pest detection and identification**

<p>Document Approved by _____</p> <p>(Signature/Name/Stamp/ Date)</p>	<p>Document Issued by: _____</p> <p>(Signature/Name/Stamp/ Date)</p>
---	--

Table of Contents

Section	Topic
1.	Introduction
2.	Requirement
3.	Resources
4.	Pests of Quarantine Significance
5	Pest Identification manual
6.	Inspection, Sampling and Specimen forwardal
7.	Identification Report
Annex.A	Specimen Forwardal to RPQS / Laboratory for identification
Annex B	Laboratory Test Report

1. Introduction

1.1 Scope / Purpose

This document provides guidance for inspection, detection and identification of the pests intercepted during preclearance inspection and describes the procedures for forwarding unidentified pests to Regional Plant Quarantine Station or any Laboratory approved by the Dte. of Plant protection ,Quarantine and Storage for identification.

The purpose of this document is to facilitate pest free export of Mango fruits to USA through adoption of standard operating procedures by the Production Supervisors, Quality supervisors employed with Packinghouse as well as PQ officers for detection and identification of pests associated with Mango fruits.

1.2 References

Glossary of Phytosanitary Terms, ISPM 5 (2006), FAO, Rome.

Guidelines for Inspection, ISPM 23 (2005), FAO, Rome.

International Plant Protection Convention, 1997, FAO, Rome.

Irradiation Operational work plan between India and United States of America, September 2006

Standard Operating Procedures-Packing House Facilities for export of Indian Mangoes to USA, Directorate of PPQS, Faridabad

Standard Operating Procedures: Irradiation Treatment of Indian Mangoes for export to USA

KRUSHAK Irradiator Lasalgaon-422306, Nashik Dist., Maharashtra State

2. Requirement

The Directorate of Plant Protection Quarantine & Storage, Faridabad (NPPO), has responsibility vide clause 3.2.6 of Irradiation Operational Work Plan, to provide pest identification services for the pests likely to be associated with the mango fruits.

3. Resources

3.1 Trained & Qualified staff

The Regional Plant Quarantine Stations shall have adequate, skilled and trained manpower to carry out the inspection, detection and identification of the pests associated with mango fruits. The Regional Plant Quarantine Station will identify the training requirements of PQ Inspectors, Production Supervisor, Quality Supervisors and shall organize training in the area of pest detection and identification of mango during the production as well as processing period.

3.2 Inspection Equipments.

The production supervisor, quality supervisor and the PQ inspector must have the following equipments for performing the inspection to detect and identify the pests and to forward the unidentified pests to the Regional Plant quarantine Station or any recognized Laboratory for further identification.

- Field lense
- Illuminated magnifier
- Sterio binocular microscope
- Pen knife
- Secatuer / pruning shears
- Camel hair brush/aspirator
- Specimen vials, 70% alcohol and /or 3% formalin
- Plastic bags (self-sealing type)
- Stapler with pins
- Marking pens
- Labels/Tags
- A role of surgical cotton
- Paper towels/tissue napkins

4. Pests associated with mango and found in India which are expected to follow the pathway:

As per Pest Risk Analysis (PRA) conducted by USDA for import of Indian mangoes to USA, there are about 541 pests (insects, diseases and nematodes) associated with mango and found in India. Out of these pests, 20 (14 insects, 5 fungi and one bacteria) are of quarantine significance to USDA and are expected to follow the pathway of mango fruits during export.

5. Pest Identification manual

The Regional Plant Quarantine Station shall develop a pest diagnostic manual for the identified 20 pests likely to follow the pathway. The diagnostic manual shall include the photographs and key diagnostic features for each pest. The PQ officer, Quality supervisors and the Field supervisors shall undergo orientation training on the detection and identification of pests likely to be associated with mango fruits.

6. Inspection, Sampling and Specimen forwardal for identification

- 6.1 The Production Supervisor shall record incidence of pests on mango fruits before harvest. If the production supervisor cannot able to identify the pest or organism, then he shall forward the specimen(s) along with specimen identification request form (Annexure-A) to the Regional Plant Quarantine Station or any laboratory recognized by the Dte of PPQS (NPPO).
- 6.2 The quality supervisor shall ensure that, during the process of cleaning, washing, sorting and grading of the fruits at the pack house, all surface bound insects such as scale insect and mealy bugs are removed (eliminated) from the fruits
- 6.3 The PQ officer of Dte of PPQS shall verify the fruits transported from the packinghouse to the treatment facility and shall inspect the fruits in association with inspector of APHIS and draw samples as per the operational work plan. Also further examine each fruit of sampled cartons under the illuminated magnifier for the non-targeted quarantine pests viz., *Cytosphaera mangiferae*, *Macrophoma mangiferae* & *Xanthomonas campestris pv. mangiferaeindicae* (Reference: Rule 7 CFR Parts 305 and 519 [Docket No. APHIS-2006-0121] RIN 0579-AC 19 published in Federal Register, Vol.72, No., 47: 10902-10903). Any suspected fruit is cut and further examined for internal pests.

- 6.4 PQ officer shall record the results of each inspection in inspection report. The lots found to be infected with the non-target pest shall not be permitted for irradiation treatment. The inspector shall record the common name and the scientific name of the pest in the report. In case of non-target quarantine pest presence, the number of infested articles is recorded. The entire lot is refused for treatment and rejected for phytosanitary certification. The reports of action taken are intimated to PPA, Dte of PPQS (NPPO) and inspector of APHIS.
- 6.5 If the PQ officer cannot identify the pest, then such specimens must be forwarded to the Regional Plant Quarantine Station or any other Laboratory recognized by the Dte. Of Plant protection, Quarantine & Storage, along with specimen identification request form (Annex-A).
- 6.6 The specimens of Insects (belonging to the order: Coleoptera, Diptera, Homoptera Hymenoptera, Orthoptera (immature ones), Thysanoptera) and mite (Acarina) collected should be killed by placing in 70% of alcohol in screw-capped vials and labeled. The larvae of Lepidoptera should be killed by placing in boiled water and gradually cooled and later placed in 70% alcohol in screw-capped vials. The adult insects of Lepidoptera, Orthoptera & Homoptera (white flies) will be killed by placing in insect killing bottle containing cyanide or ethyl acetate and are pinned on Styrofoam pinning blocks, which are pinned to the bottom of pinning box. The Homopteran insects such as scales/mealy bugs/psyllids will be killed and preserved along with host material as dry mounts. In case of diseased specimens, the affected fruits will be wrapped in tissue paper and kept in self sealing plastic bags, which are sealed air-tight to maintain freshness and turgidity of specimen and the entire specimen shall be forwarded to the concerned Laboratory for identification.
- 6.7 The specimen forwarded for laboratory testing and identification shall be appropriately packed in a thermo-cool box, sealed and labeled. The specimen identification request form (Annex-A) will provide detailed information viz., Reference/ collection number, Plant parts affected, PUC, PHC No., Category of pest, Date of collection, Name/Signature of sender. The specimen must be sent to RPQS /Laboratory through van carrying mangoes, speed post or special messenger immediately after inspection and detection. The specimen identification request form may be sent to RPQS through **Fax : 022-23748548** for advance information and preparedness for quick identification

6.8 Sampling for inspection

Sample Size:

- Lot size of 1 to 4 cartons - inspect all cartons; minimum fruit to cut – 10 fruit
- Lot size of 5 to 99 cartons - inspect 5 cartons; minimum fruit to cut – 20 fruit
- Lot size of 100 to 240 cartons - inspect 7 cartons; minimum fruit to cut – 30 fruit
- Lot size of 241 or more cartons - inspect 14 cartons; minimum fruit to cut – 30 fruit

Select the cartons systematically from the lot. Inspect the exterior fruit and the cartons thoroughly for target and non-target quarantine pests. Cut all suspect fruit and inspect for internal feeders or cut and inspect the minimum fruit number listed above if there are less suspect fruit. A "lot" is defined as the shipment of articles sent from a single grower or production area (with a single production unit code) to a packinghouse in one day.

In large lots (240 cartons or more), the 14 cartons will contain about 150 or more fruit. A 150 fruit sample will give a 95% confidence level of finding a 2% infestation using a hypergeometric distribution.

Selecting the Sample:

Given below is one method of selecting the cartons systematically from throughout the lot. The sample cartons should be **numbered** as each one is selected. The number should reflect the sample interval. In the example (below) the cartons would be numbered 10, 44, 78, etc. There is no numbering required for the non-sampled cartons from the consignment. At the time when cartons are selected for the sample, the process should be supervised by APHIS, the NPPO or an NPPO approved third party. The sample can be selected at the packing house (under supervision) and the inspection can take place at another location (i.e. treatment facility).

- a. Establish or estimate the lot size e.g. 240 cartons.
- b. Divide the inspection unit size by the sample size: $240/7 = 34.28$ (round down to 34, this is the sampling interval).
- c. Randomly select a number between 1 and 34 (sampling interval), e.g. 10. This is the number of the **first carton** to be selected for inspection.
- d. To determine the **second carton**, add the sampling interval (34 to the first carton number (10): $34 + 10 = 44$ is then the number of the second carton.
- e. To determine the **third carton**, add the sampling interval (34) to the second carton number (44): $34 + 44 = 78$; 78 is then the number of the third carton.
- f. Continue this process until the sample size (in this case 7 cartons) is achieved.

Five ways to obtain one or more random numbers:

- i. Many statistics and research books contain random number tables and directions on how to use them.
- ii. Random number tables can be obtained on the WEB and directions on how to use them. One site is <http://www.gifted.uconn.edu/siegle/research/Samples/random.htm>
- iii. Microsoft Excel has a function to produce random numbers. The site given above gives directions on how to use it.

- iv. Random number generators are available on the WEB. One site is <http://www.random.org/nform.html>
- v. Open a large book (ex. telephone book). Look at page number on the right hand page. Take the last two digits of that page number. If the number is between 1 and your interval number use that number as your random number. If that number is greater than your interval number then divide that number by your interval number and use the remainder as your random number. If the remainder is “0” then the random number is the same as your interval number.

7. Identification Report and its forwardal

The Regional Plant Quarantine Station or the recognized Laboratory shall identify the specimen forwarded and communicate the identification report to the concerned PQ Inspector / Quality supervisor / Production supervisor in prescribed form (Annexure. B) through fastest means of communication viz. special messenger/speed post/e-mail/fax etc. The PQ officer posted at Irradiation treatment facility shall provide a copy of the identification report to APHIS inspector for information.

Specimen Forwardal to RPQS / Laboratory for identification

1. Collection Number:	
2. Date of Collection:	
3. Address of Production unit/Pack house	
4. Production Unit/Pack house code. No	
5. Plant Parts affected:	Fruits/stem/leaves
6. Category of pest specimen/organism submitted	* <input type="checkbox"/> insects; <input type="checkbox"/> mites; <input type="checkbox"/> fungi; <input type="checkbox"/> bacteria;
7. Life stage of the pest (Applicable to Insects)	* <input type="checkbox"/> egg; <input type="checkbox"/> larvae; <input type="checkbox"/> pupae; <input type="checkbox"/> adult; <input type="checkbox"/> nymphs;
8. Type of pest specimen/organism submitted	* <input type="checkbox"/> preserved specimen; <input type="checkbox"/> pinned/card board mounted specimen; <input type="checkbox"/> dry specimen with host; <input type="checkbox"/> disease specimen (fresh)* tick out in appropriate box
9. Name & Signature of the Sender with date:	

Laboratory Test Report

1. Test Report No:			
2. Date of Reporting			
3 Specimen/ collection Reference Number			
4. Date of Reference			
5. Name of Laboratory/Organisation			
6. Name of Technical Expert			
7. Plant parts examined			
9. No of samples tested			
10. Details of Diagnosis			
Sl. No	Name of pest/organism detected		Description Notes, if any
	Scientific Name	Common name	

11. Remarks, if any:

(Signature/Designation of Expert)

(Office Seal)