BOTANIC GARDENS CONSERVATION INTERNATIONAL

IPSN International Plant Sentinel Network

MANUAL

Submitting Physical Samples for Diagnostic Purposes

© Nicolas Rakotopare

defra Department for Environment Food and Rural Affairs

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CONTENTS

INTRODUCTION

Accurate diagnosis is the foundation of effective plant health management. While photographs can often provide sufficient information for an initial assessment, some plant health issues require physical samples to confirm the presence of pests, pathogens, or physiological disorders.

In living collections, timely and accurate diagnosis is essential to safeguard valuable plant material, support evidence-based management decisions, and contribute to wider surveillance efforts.

The quality of a diagnostic result depends heavily on the quality of the sample submitted. Poorly selected, damaged, contaminated, or degraded material may delay diagnosis or result in inconclusive outcomes.

This manual has been developed to guide horticultural staff, volunteers, students, and practitioners working in botanic gardens and arboreta through the process of collecting, packaging, and submitting physical samples for diagnostic purposes.

Think of each sample as a snapshot in time. A diagnostician relies on the material you provide to reconstruct what is happening in the field. Selecting representative material, preserving its condition during transport, and providing sufficient contextual information will greatly improve diagnostic accuracy.

By adopting the practices outlined in this manual, you will improve communication with diagnostic laboratories, enhance the quality of submissions, and support more effective plant health management.

I. Before collecting a sample

Before collecting any material, contact your chosen diagnostic laboratory or relevant plant health authority.

Different laboratories may have specific requirements regarding:

- Sample types and quantities
- Packaging requirements
- Submission forms
- Courier arrangements
- Testing costs and turnaround times
- Biosecurity restrictions

In many cases, diagnosticians may request photographs before asking for a physical sample (see our “Manual on Taking photographs for diagnostic purposes”).

Always seek guidance before sending material if:

- A regulated or quarantine pest or pathogen is suspected
- Samples will cross regional or international borders
- You are unsure what material to collect
- The host plant is rare, valuable, or conservation significant

Biosecurity Considerations

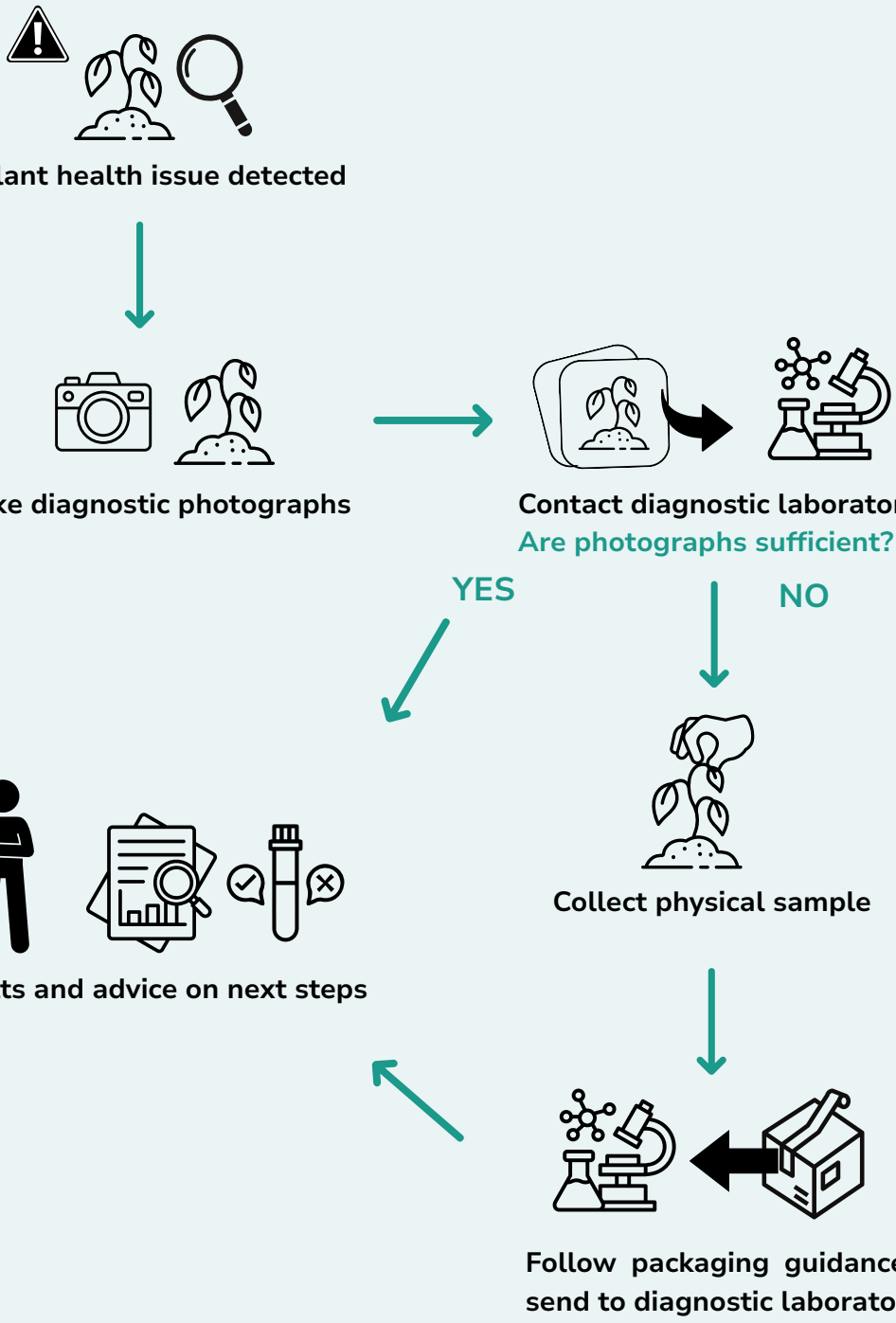
When collecting samples:

- Clean and disinfect tools before and after use
- Wear disposable gloves where appropriate
- Avoid moving potentially contaminated material around the site
- Collect only the amount of material required
- Prevent cross-contamination between samples

Use separate tools, bags, and labels for each specimen.

I. Before collecting a sample

DO I NEED A SAMPLE?



I. Before collecting a sample

A word on plant diagnostic laboratories

Plant diagnostic laboratories provide four major services:

1. Plant samples are examined for disease, insect, nutrient, and herbicide problems.
2. Soil samples are analysed for plant parasitic nematodes.
3. Insect and other invertebrate samples are identified.
4. Provide plant and fungal identifications.

Once samples are examined, tested, analysed, or identified, specialists produce the diagnosis or identification and control recommendations. While responses sent by phone, email, fax, or letter are circulated rapidly, some tests and analyses require more time.

© https://extension.unh.edu/

For further investigation, you may be asked, or wish to submit a physical sample to a diagnostic laboratory. For rigorous testing to be completed on samples, they must arrive at the diagnostic laboratory in good condition. How samples are stored and packaged will directly affect the likelihood that they arrive in good condition.

II. Choosing the right sample

Selecting representative material is one of the most important steps in the diagnostic process.

A good sample should clearly demonstrate the issue while remaining fresh and intact.
Ask yourself:

- What symptoms am I investigating?
- Which part of the plant shows the earliest symptoms?
- Are symptoms localised or widespread?
- Could environmental factors be involved?

Foliage with symptomatic and healthy tissue.
© https://soillab.tennessee.edu/

General Principles

Choose samples that are:

- Fresh and recently affected
- Representative of the problem
- Free from unnecessary damage
- Large enough to show symptom development
- Clearly linked to the host plant
- Representative of a range of symptom severity, from early to advanced stages (where possible).

Avoid sending:

- Dead or completely decomposed material
- Dried-out specimens
- Material contaminated with unrelated debris
- Samples stored for prolonged periods

II. Choosing the right sample

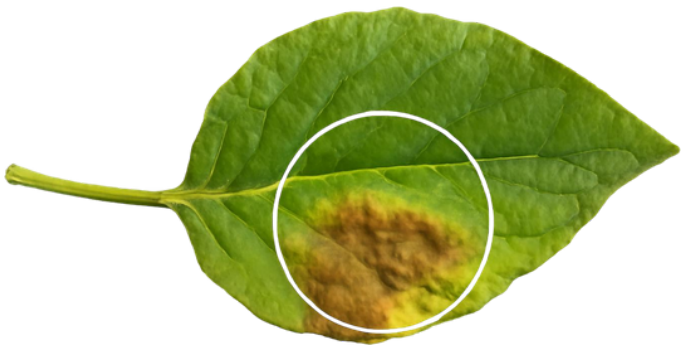
The Importance of the Leading Edge

For suspected diseases, include the transition zone between healthy and affected tissue, often referred to as the "leading edge".

This area frequently contains the highest concentration of active pathogens and provides valuable information for diagnosis.

Include healthy tissue alongside symptomatic material whenever possible.

Department of Extension Plant Sciences, New Mexico State University.



II. Choosing the right sample

Sample types - WHOLE PLANTS

Submit entire plants whenever practical, particularly for:

- Herbaceous plants
- Seedlings
- Young shrubs
- Container-grown plants

Include:

- Roots
- Growing media
- Stems and foliage
- Flowers or fruit where relevant

Sample types - LEAVES AND SHOOTS

For symptoms such as:

- Leaf spots
- Discolouration
- Distortion
- Dieback
- Defoliation

Collect multiple samples representing different symptom stages. Photograph both upper and lower leaf surfaces before collection.

II. Choosing the right sample

Sample types - STEMS, BRANCHES & BARK

Include material showing:

- Cankers
- Cracking
- Exudates
- Galleries
- Dieback

Include both healthy and symptomatic sections where possible.

Sample types - ROOTS AND SOIL

Include roots and surrounding soil when symptoms include:

- Wilting
- General decline
- Stunting
- Chlorosis
- Dieback

II. Choosing the right sample

Sample types - INVERTEBRATE PESTS

Where possible, collect multiple specimens, preferably adults, together with examples of the associated plant damage.

Adult specimens are generally the most useful for morphological identification. However, immature stages such as larvae, caterpillars, nymphs or grubs are often the ones found actively feeding and causing damage. These specimens may also be useful for diagnosis and, where appropriate, can be reared to adulthood or used for molecular identification.

Sometimes plant damage may be present even when the pest is no longer visible. Invertebrates may have completed feeding or moved away before symptoms become obvious. For example, aphids may feed on developing buds and young leaves, while the resulting distortion or crinkling only becomes apparent after the leaves expand.

If no specimens can be found, different collection methods can be used to investigate further. The most appropriate method will depend on the suspected pest, host plant, available equipment and local conditions.

In most botanic garden situations, visual inspection using a **10× hand lens** is a useful first step.

Holopothrips claritibialis sp. .8, Egg; 9, Larva I; 10, Larva II; 11, Pupa; 12, Adult female,13, Damaged leaves of *Mollinedia schottiana (Cavalleri & Kaminski, 2007).*

Different hand lenses use in visual inspections

II. Choosing the right sample

Methods to collect samples - INVERTEBRATE PESTS

1. **Visual inspection**

- Examine the plant carefully for invertebrates and signs of their activity.
- Check all relevant plant parts, particularly leaf undersides, buds, stems and areas showing damage.
- Particularly useful for relatively slow-moving or stationary pests such as aphids, scale insects and caterpillars.

Visual inspection of foliage with hand lenses

2. **Beating tray**

- Place a tray or light-coloured cloth beneath branches or foliage.
- Tap or shake the vegetation to dislodge insects onto the collecting surface.
- Particularly useful for insects associated with trees and shrubs, including beetles, bugs and caterpillars.

Positioning of beating tray and catch

II. Choosing the right sample

3. **Sweep netting**

- Sweep a strong net through low-growing vegetation and foliage.
- Collects active and mobile insects that may be difficult to observe directly.
- Particularly useful for insects such as leafhoppers, bugs and grasshoppers.

Sweep net and catch

4. **Sticky traps**

- Place coloured, adhesive-coated cards close to the plants being monitored.
- Flying insects are captured when they land on the adhesive surface.
- Particularly useful for monitoring pests such as whiteflies, thrips and fungus gnats.

Different sticky trap models and colours

II. Choosing the right sample

5. **Vacuum sampling**

- Use a suction device to collect small insects from foliage or vegetation.
- Useful for collecting small, mobile or well-camouflaged specimens.
- Particularly useful for insects such as plant bugs and leafhoppers, especially in dense vegetation.


Suction devices used ito collect small insects directly from vegetation or nets

6. **Light traps**

- Use an electric or UV light source at night to attract flying insects.
- Attracted insects are directed into a collection container or funnel.
- Particularly useful for nocturnal flying insects, including moths and some beetles.



Electric and UV light traps

II. Choosing the right sample

7. **Malaise traps**
    - Use a tent-like mesh trap to intercept flying insects.
    - Insects move upwards through the trap and into a collection container, which may contain a preservative such as alcohol.
    - Particularly useful for monitoring flying insects and sampling insect diversity over time.

Malaise traps

Collecting your sample - INVERTEBRATES

Whenever possible:

- Collect multiple specimens rather than a single individual.
- Include adult specimens, where available, as these are generally the most useful for morphological identification.
- Collect different life stages where present, including eggs, larvae or nymphs, pupae and adults.
- Include examples of the associated plant damage or affected plant material where practical.
- Keep specimens clearly linked to the host plant from which they were collected.
- Photograph the pest and associated damage before collection, particularly if specimens are small, delicate or difficult to remove.

TOP TIP : Keep the pest linked to its host plant and associated damage. Record where on the plant the specimen was found and photograph both the pest and symptoms before collection.

II. Choosing the right sample

OBSERVED SYMPTOMS	RECOMMENDED SAMPLE	ADDITIONAL NOTES
Leaf spots, blotches or lesions	Symptomatic leaves showing early and advance symptoms plus healthy leaves from the same plant. Attached shoot is possible	Include the **leading edge** between healthy and affected tissue. Photograph upper and lower leaf surfaces before collection
Leaf yellowing (Chlorosis)	Leaves showing different stages of symptoms. Roots & root collar and surounding soil if practical.	Yellowing can be associated with below-ground problems- include roots whenever possible
Leaf distortion, curling or blistering	Distorted leaves, young shoots and any insects/mites present	Collect insects separately if observed. avoid crushing delicate tissues
Premature leaf drop	Recently fallen leaves, symptomatic leaves still attached, small branches , roots and soil	Collect freshly fallen leaves as dried up material are generally not useful
Wilting	Whole plant (if small), symptomatic leaves still attached, small branches, roots and soil	Keep root moist but not waterlogged. Include healthy roots if present too.
Shoot or branch dieback	Branches showing both healthy and dying tissue, bark, leaves and any insect galleries	Include the transition between healthy and dead wood

II. Choosing the right sample

OBSERVED SYMPTOMS	RECOMMENDED SAMPLE	ADDITIONAL NOTES
Stem cankers or bark lesions	Sections of stem or branch containing healthy bark, lesion margins and affected tissue	Do not remove loose bark covering lesions unless instructed by the lab
Sap bleeding or resin exudation	Stem or branch with affected area, bark, associated insects if present	Photograph exudates before sampling
Root or root decay	Entire root system (if small plant), root collar and approximately 500gr of surrounding soil	Avoid washing roots before submission unless specifically requsted
General decline or poor growth	Root, lower stem, leaves, surrounding soil and photograph of the entire plant	Include details of irrigation, fertilisation and recent management
Fruit root or lesions	Several fruits representing early and advanced symptoms; attached stem if possible	Wrap fruits individually in dry paper to avoid cross-contamination
Flower blight or distortion	Flowers, buds nearby leaves and shoots	Keep delicate tiddues cool and avoid crushing
Galls or abnormal swellings	Entire gall attached to the plant, surrounding tissue and associated insects if present	Do not cut open galls unless instructed by the lab

II. Choosing the right sample

OBSERVED SYMPTOMS	RECOMMENDED SAMPLE	ADDITIONAL NOTES
Holes in stems or trunks	Section of affected wood (where practical and possible), frass, larvae or adult insects if present	Photograph exit holes and surrounding symptoms before collecting samples
Chewed leaves or defoliation	Damaged leaves together with the pest if present (larvae, adults or eggs)	Collect multiple life stages where possible
Leaf mining	Leaves containing active mines, larvae or pupae	Collect multiple life stages where possible
Powdery or rusty growth on leaves	Several fruits representing early and advanced symptoms; attached stem if possible	Wrap fruits individually to avoid cross-contamination
Mould or fungal growth on stems or fruit	Symptomatic tissue showing active fungal structures, with healthy tissue attached	Package carefully to prevent excessive moisture and secondary decay
Presence of insects or mites	Adults and other stages (where possible), damaged plant material and host information	Place specimens in leak-proof containers with 70-95% ethanol, or follow lab guidance
Suspicious viral diseases (mosaic, ringspots, mottling)	Young symptomatic leaves, shoots and healthy comparison tissue	Do not wrap in damp paper; place directly into a clean plastic bag and keep cool

III. Packaging samples

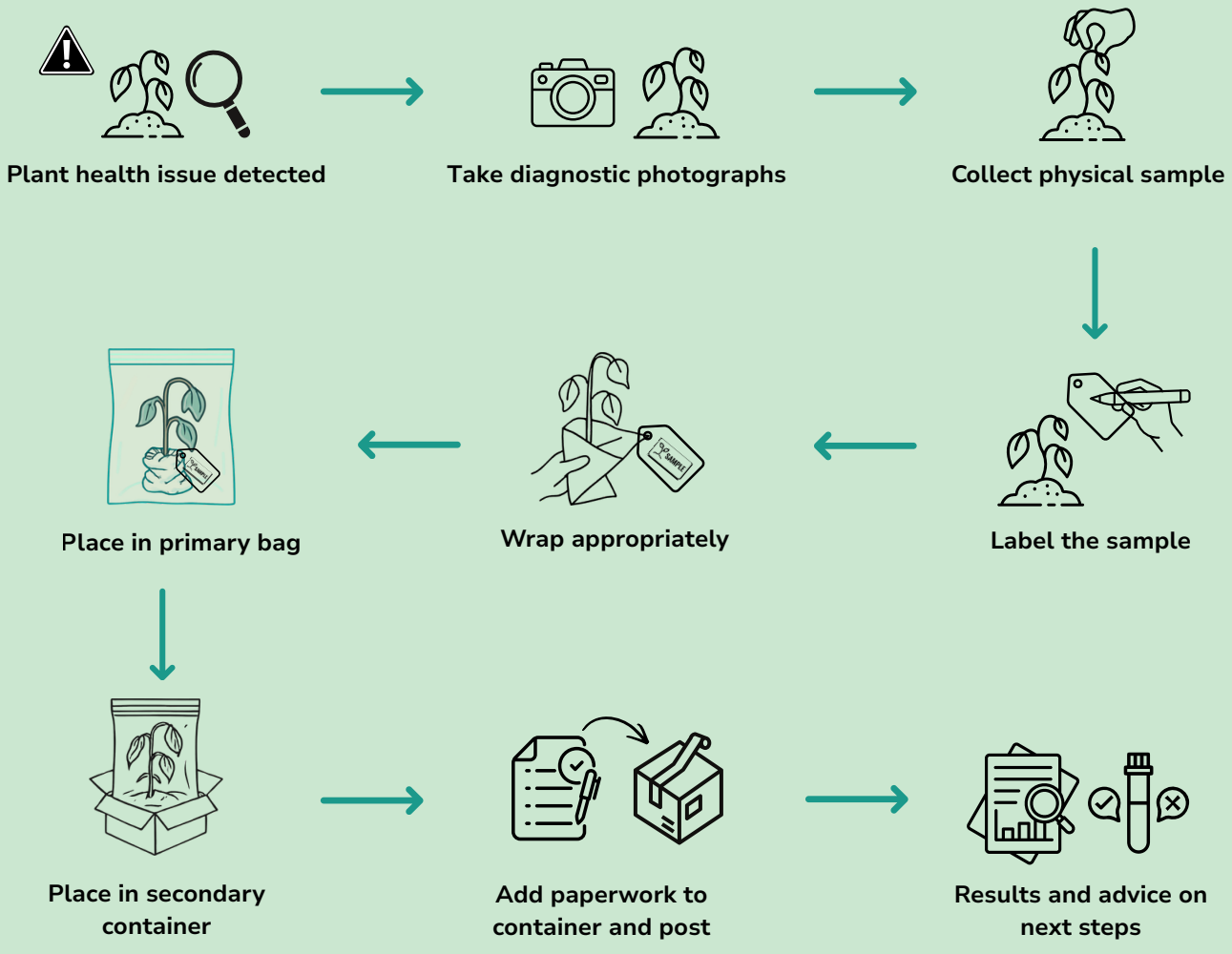
Proper packaging is essential for maintaining sample integrity and quality, preventing contamination during transport and ensuring accurate diagnosis. Each sample type requires specific packaging methods to preserve the material during transit.

General Principles

- Keep samples cool
- Avoid crushing
- Prevent moisture loss
- Prevent contamination
- Package each sample separately

Never mix samples from different plants.

PACKAGING WORKFLOW



III. Packaging samples

Packaging samples - WHOLE PLANTS

1. Cover roots and growing media with a sealed plastic bag or aluminium paper. These will help keep moist soil on roots separate from the plant material, as growing media can contaminate samples.
2. Secure the bag/paper around the stem base.
3. Place the entire plant loosely in its own plastic bag and seal. Inflate the secondary outer bag slightly before sealing.
4. Place the doubled bagged sample into a crush-proof/ rigid packaging to prevent shipping damage.

- Pack immediately after collection to prevent drying and,
- Avoid excessive moisture that may encourage secondary decay.

Packing a whole plant sample.
© https://soillab.tennessee.edu/

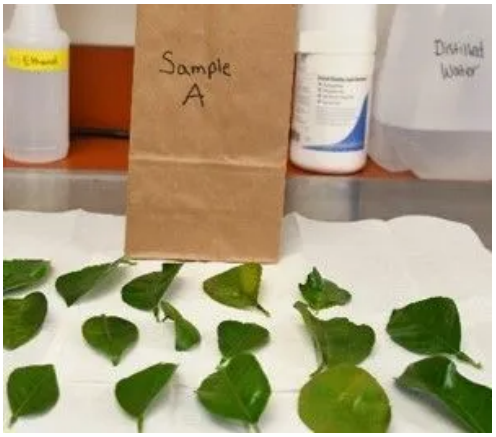
III. Packaging samples

Packaging samples - LEAVES, SHOOTS AND BRANCHES

1. Wrap material in slightly damp absorbent paper.
2. Place inside a sealed plastic bag.
3. Inflate the bag slightly before sealing.
4. Place inside a rigid container.

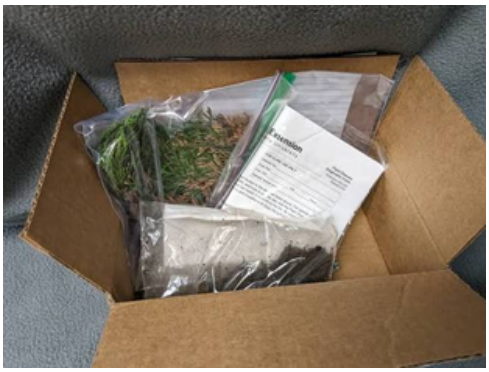
- Do not add moisture.
- Place samples directly into a sealed plastic bag.
- Do not put loose manterial in envelope
- Do not crush the samples

Splitting a plant into roots, stems, and leaves for packing.
© https://soillab.tennessee.edu/



Citrus leaves sampling © https://ask.ifas.ufl.edu/publication/HS1355

Packing plant samples with roots (left) and foliage (right) in separate plastic bags.
© https://soillab.tennessee.edu/



Submitting samples.
©https://spes.vt.edu/affiliated/plant-disease-clinic/submitting-samples.html

III. Packaging samples

Packaging samples - FRUITS, BULBS AND FLESHY MATERIAL

1. Wrap material in dry absorbent paper.
2. Package each item separately if rotting is present.
3. Place inside a sealed plastic bag.
4. Use rigid packaging.

- Include “avoid cross-contamination” icon / note.

Packing fruit samples.
© https://soillab.tennessee.edu/

Packing bulb samples.
© https://extension.umaine.edu/ipm/how-to-send-a-plant-sample/

III. Packaging samples

Packaging samples - SOIL SAMPLES

1. Collect approximately 500 g of soil.
2. Place in a strong plastic bag.
3. Seal securely.
4. Keep cool during transport.

- Avoid dropping or compressing samples as if nematodes are suspected these could kill them and prevent identification

Collecting nematode soil sample.
© https://www.aces.edu/

Packing soil samples.
© https://www.aces.edu/

III. Packaging samples

Packaging samples - INVERTEBRATE SPECIMENS

Depending on laboratory requirements:

1. If samples are larvae or other soft tissue speciemens, preserve them in alcohol (typically 70–95% ethanol)
2. Use rigid, shatterproof containers for insect samples to prevent crushing.
3. Seal containers inside secondary packaging

- Never send loose insects inside envelopes.
- If possible, submit samples together with the plant material where they were found

Packing insect samples.
© https://ag.purdue.edu/department/btny/ppdl/submit-samples/physical-submission.html

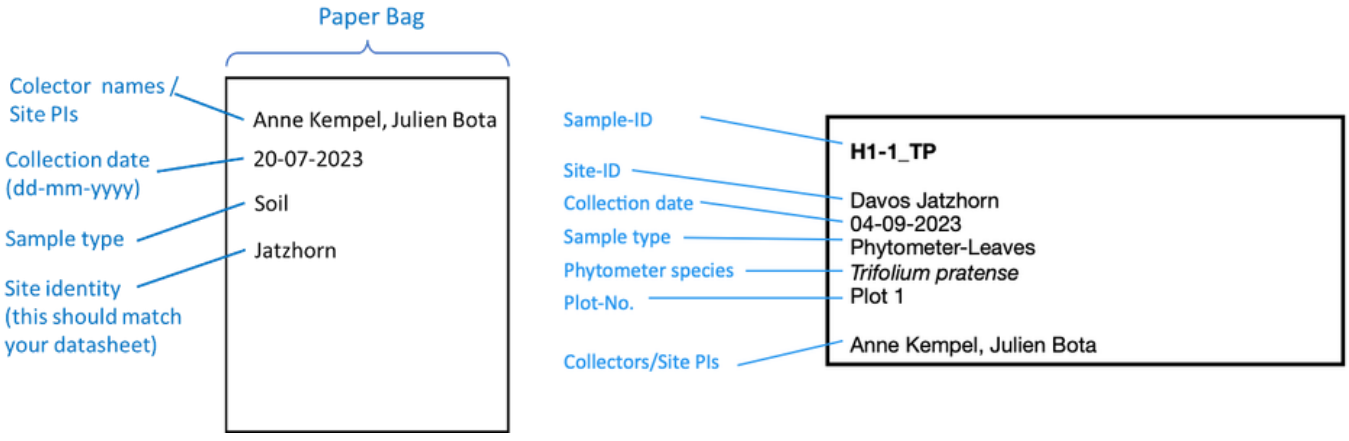
IV. Labelling samples

Clear and accurate labelling is essential to ensure that each sample can be correctly identified and linked to the accompanying submission form. Poorly labelled or unlabelled samples may delay diagnosis, lead to confusion if multiple samples are submitted together, or, in some cases, prevent the laboratory from processing the sample altogether.

As a minimum, each label should include:

- **Sample identification code or reference number** (matching the submission form)
- **Host plant name** (scientific name where possible)
- **Collection date**
- **Collector's name or initials**

Where space allows, you may also include additional information such as the collection location, accession number, or plant identifier.



Examples of sample labels.
© https://www.bug-net.org/soil-and-plant-biomass-processing-labeling-and-sending-protocol/

IV. Labelling samples

General labelling principles

- Each sample should be labelled immediately after collection using a waterproof label and permanent marker.
- Labels should remain securely attached throughout transport and should be easy to read, even if the sample becomes damp or refrigerated.
- Where multiple samples are collected from different plants, locations or symptoms, **each sample must be packaged and labelled separately** to prevent cross-contamination and ensure the laboratory can accurately interpret the results.

Top Tip: Assign a unique sample number to every specimen (e.g. IPSN-2026-001) and use the same reference on the sample label, submission form, photographs, and any field notes. Keeping all records linked to a single identifier helps ensure that photographs, laboratory results, and observations can be accurately matched throughout the diagnostic process.

- Waterproof label
- Permanent marker
- Unique sample ID
- Label attached to each sample bag
- Label matches submission form

- Handwritten note on loose paper
- Pencil or water-soluble markers
- No identification information
- One label for multiple samples
- Different IDs on sample and submission form

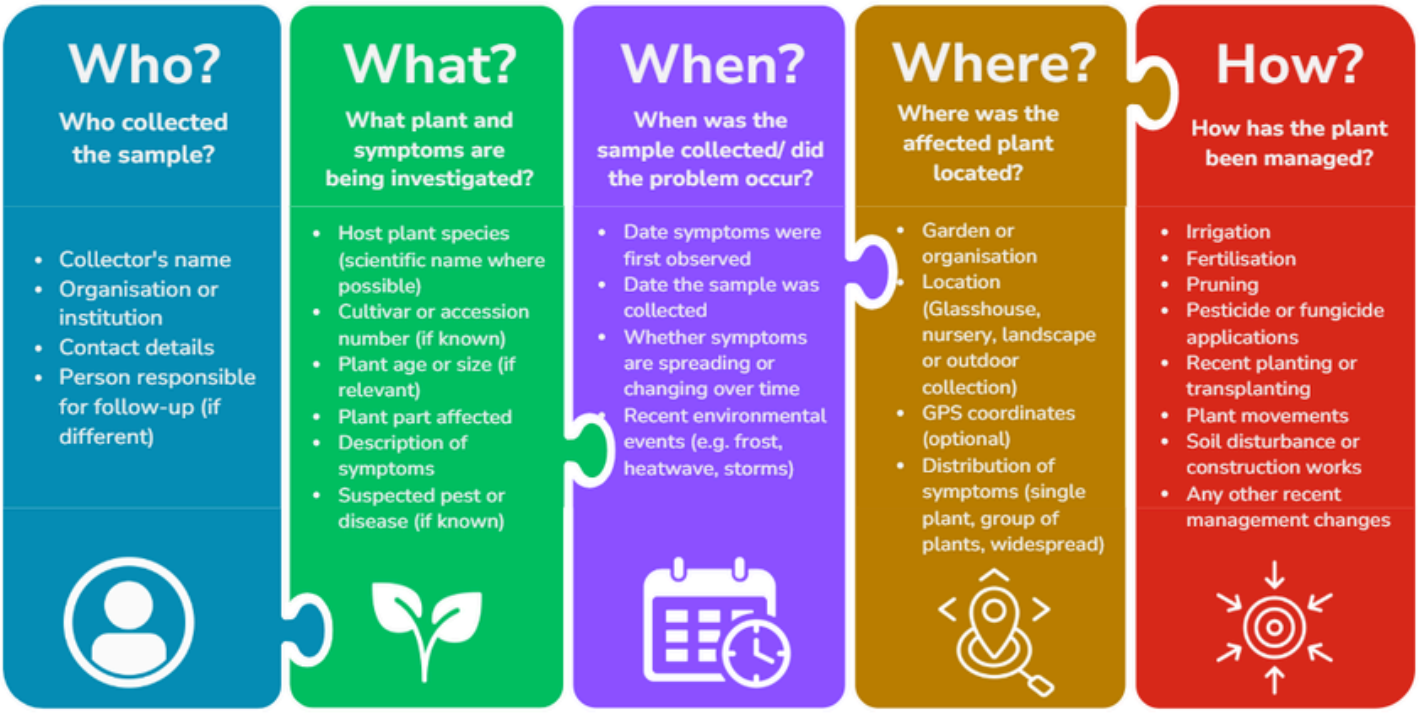
V. Submitting samples

The information accompanying a sample is often just as important as the sample itself. While laboratory testing can identify a pest, pathogen or disorder, the accompanying contextual information helps diagnosticians interpret the results, understand the circumstances surrounding the problem, and provide the most accurate diagnosis and management recommendations.

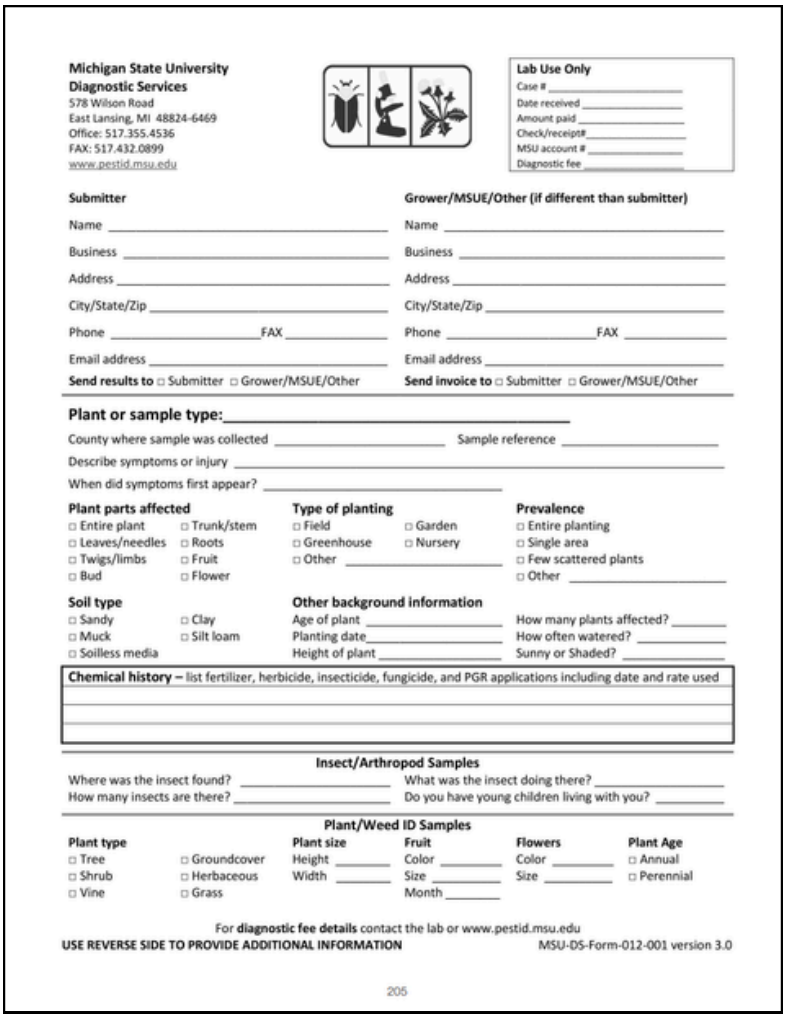
A well-completed submission form can reduce the need for follow-up questions, speed up the diagnostic process, and ensure that results are correctly linked to the plant, collection, and symptoms observed. It also provides valuable information that may support wider plant health surveillance, particularly where regulated or emerging pests and pathogens are involved.

Whenever possible, complete the laboratory's official submission form before sending your sample and ensure that the sample identification number matches the label attached to the sample and any photographs taken during collection.

If no form is provided, a useful way to remember they key information requires is **the Five Ws and One H**:



V. Submitting samples



Michigan State University
Diagnostic Services
578 Wilson Road
East Lansing, MI 48824-6469
Office: 517.355.4536
FAX: 517.432.0899
www.pestid.msu.edu

Lab Use Only
Case # _____
Date received _____
Amount paid _____
Check/receipt# _____
MSU account # _____
Diagnostic fee _____

Submitter
Name _____
Business _____
Address _____
City/State/Zip _____
Phone _____ FAX _____
Email address _____
Send results to □ Submitter □ Grower/MSUE/Other

Grower/MSUE/Other (if different than submitter)
Name _____
Business _____
Address _____
City/State/Zip _____
Phone _____ FAX _____
Email address _____
Send invoice to □ Submitter □ Grower/MSUE/Other

Plant or sample type: _____
County where sample was collected _____ Sample reference _____
Describe symptoms or injury _____
When did symptoms first appear? _____

Plant parts affected
□ Entire plant □ Trunk/stem
□ Leaves/needles □ Roots
□ Twigs/limbs □ Fruit
□ Bud □ Flower

Type of planting
□ Field □ Garden
□ Greenhouse □ Nursery
□ Other _____

Prevalence
□ Entire planting
□ Single area
□ Few scattered plants
□ Other _____

Soil type
□ Sandy □ Clay
□ Muck □ Silt loam
□ Soilless media

Other background information
Age of plant _____
Planting date _____
Height of plant _____
How many plants affected? _____
How often watered? _____
Sunny or Shaded? _____

Chemical history – list fertilizer, herbicide, insecticide, fungicide, and PGR applications including date and rate used

Insect/Arthropod Samples
Where was the insect found? _____
How many insects are there? _____
What was the insect doing there? _____
Do you have young children living with you? _____

Plant/Weed ID Samples

Plant type
□ Tree □ Groundcover
□ Shrub □ Herbaceous
□ Vine □ Grass

Plant size
Height _____
Width _____

Fruit
Color _____
Size _____
Month _____

Flowers
Color _____
Size _____

Plant Age
□ Annual
□ Perennial

For **diagnostic fee details** contact the lab or www.pestid.msu.edu
USE REVERSE SIDE TO PROVIDE ADDITIONAL INFORMATION MSU-DS-Form-012-001 version 3.0

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Examples of sample submission form.
©https://www.canr.msu.edu/weeds/extension/weed-control-guide/2018WG-diagnostic-service.pdf

Supporting Information

Whenever possible, include additional evidence to help the diagnostician interpret the sample:

- High-quality photographs of the whole plant and close-up symptoms
- Images showing the surrounding growing environment
- A simple map indicating the location of affected plants (for larger collections)
- Previous laboratory reports, if the issue has occurred before
- Notes on weather conditions or unusual environmental events

Providing this information alongside the physical sample creates a more complete picture of the problem and can significantly improve diagnostic confidence.

V. Submitting samples

Transport and Shipping

Once a sample has been collected, packaged, labelled and documented, it should be dispatched to the diagnostic laboratory as quickly as possible. Even well-collected samples can deteriorate rapidly if they are exposed to excessive heat, freezing temperatures, physical damage or prolonged transit times, reducing their diagnostic value.

Careful planning of transport and shipping helps preserve sample quality, minimises delays, and ensures the material arrives at the laboratory in the best possible condition.

Whenever possible, discuss shipping arrangements with the receiving laboratory in advance and follow any specific instructions they provide regarding packaging, courier services or delivery times.

General Shipping Principles

- Send samples as soon as possible after collection
- Dispatch samples early in the week (Mon- Wed) to reduce the risk of delays over weekends and public holidays
- Use an overnight or tracked courier service whenever possible, particularly for perishable or high-priority samples
- Keep samples cool prior to transport and during if possible, bu avoid freezing unless specifically instructed by the lab
- Notify the lab when the sample has been dispatched, especially if dealing with regulated pests or pathogens or time-sensitive material.

- Send samples on Fridays or immediately before weekends or public holidays
- Leave samples in hot vehicules or direct sunlight before dispatch
- Use damaged or poorly sealed packaging
- Delay shipment after sample collection

VI. Summary

Collecting and submitting high-quality physical samples is a critical step in achieving an accurate plant health diagnosis. From selecting representative material and preventing contamination to providing complete supporting information and ensuring timely delivery, every stage of the sampling process contributes to the quality and reliability of the final diagnosis.

By following the good practice guidance outlined in this manual, horticultural staff, volunteers and students can help improve diagnostic success, support early detection of pests and diseases, and strengthen biosecurity across botanic gardens, arboreta and other living plant collections.

Before sending your sample, go through these seven key steps and review the checklist provided to ensure nothing has been overlooked.

1. Contact the laboratory

2. Take diagnostic photographs

3. Select representative material and collect sample(s)

4. Include healthy and symptomatic tissue

5. Package samples appropriately and securely

6. Complete all paperwork accurately and add to package

7. Contact the laboratory and ship promptly

VI. Summary

Final Sample Submission Checklist

□ Contacted the diagnostic laboratory before collecting the sample

□ Taken high-quality photographs of the plant and symptoms

□ Collected representative material showing a range of symptoms

□ Included healthy tissue and the leading edge where appropriate

□ Included roots and surrounding soil when below-ground problems are suspected

□ Collected associated signs such as insects, frass or fungal structures where present

□ Clearly labelled each sample with a unique identification code

□ Completed the submission form, including the Who, What, When, Where and How information

□ Placed paperwork in a separate waterproof plastic wallet

□ Packaged each sample appropriately and separately to prevent contamination

□ Used sturdy outer packaging to protect the sample during transport

□ Arranged prompt shipping, avoiding weekends and public holidays where possible

□ Notified the diagnostic laboratory that the sample has been dispatched (where appropriate)

Additional Resources & References

- ***Basic requirements for quality management in plant pest diagnostic laboratories – PM 7/84.*** European and Mediterranean Plant Protection Organization (EPPO). EPPO Bulletin. Provides guidance on quality management in plant pest diagnostic laboratories, including sample handling, traceability and diagnostic processes.
  EPPO – PM 7/84

- ***Collecting and Preserving Insects and Arachnids.*** International Plant Protection Convention (IPPC). Practical guidance on collecting and preserving insects and arachnids, including the use of sweep nets, beating sheets, sticky traps, light traps, Malaise traps and rearing methods.
  IPPC – Collecting and Preserving Insects and Arachnids

- ***Identifying Insects and Arthropods.*** Oregon State University Extension Service. Guidance on collecting specimens for identification, including the value of collecting multiple specimens and different life stages where possible.
  Oregon State University – Identifying Insects and Arthropods

- ***Plant Diagnostic Clinic: Guidelines for Collecting and Submitting Samples.*** University of Missouri Extension. Practical guidance for collecting and submitting plant and arthropod samples, including appropriate preservation and packaging of specimens.
  University of Missouri – Guidelines for Collecting and Submitting Samples

- ***Preparation of Insect Specimens for Identification (ENTFACT-001).*** Bessin, R. & Larson, J. University of Kentucky, Department of Entomology. Guidance on collecting and preparing insects for identification, including specimen quality, associated information and photographs of specimens, life stages and damage.
  University of Kentucky – Preparation of Insect Specimens for Identification

- ***Standards and Best Practices for Monitoring and Benchmarking Insects.*** Montgomery, G.A. et al. (2021). Frontiers in Ecology and Evolution, 8:579193. Overview of insect monitoring and sampling approaches, including visual surveys, beating, Malaise traps and light traps, and considerations when selecting and standardising monitoring methods.
  Standards and Best Practices for Monitoring and Benchmarking Insects

- ***Submitting Physical Specimens for Diagnosis.*** Purdue University Plant and Pest Diagnostic Laboratory, Department of Botany and Plant Pathology.Guidance on selecting, preparing, preserving and packaging plant and invertebrate specimens for diagnostic submission.
  Purdue University – Submitting Physical Specimens for Diagnosis

BOTANIC GARDENS CONSERVATION INTERNATIONAL

IPSN International Plant Sentinel Network

Learn more about the IPSN:

https://www.bgci.org/our-work/networks/ipsn/

Keep up to date with our work:

X: @IPSN_BGCI

Bluesky: @ipsn-bgci.bsky.social

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