



Africa Phytosanitary Programme

(APP) Phase 2 · Train-the-Trainer workshop
23–27 June 2025 · Mpumalanga, South Africa

Methods for screening, identification, and diagnostic of plant pests

Session Objectives

- Understands the importance of early pest detection
- Understand the difference between screening, identification, and diagnostic confirmation
- Learn methods for pest detection in the field and laboratory
- Understand the importance of correct sample collection and record-keeping



Why Early Detection Matters

- Reduces potential for widespread outbreaks and economic loss
- Helps safeguard trade and international market access
- Supports biosecurity
- Enables rapid response to minimize pest impact – targeted interventions
- Protects biodiversity

Key Terms: Definitions

- Screening:

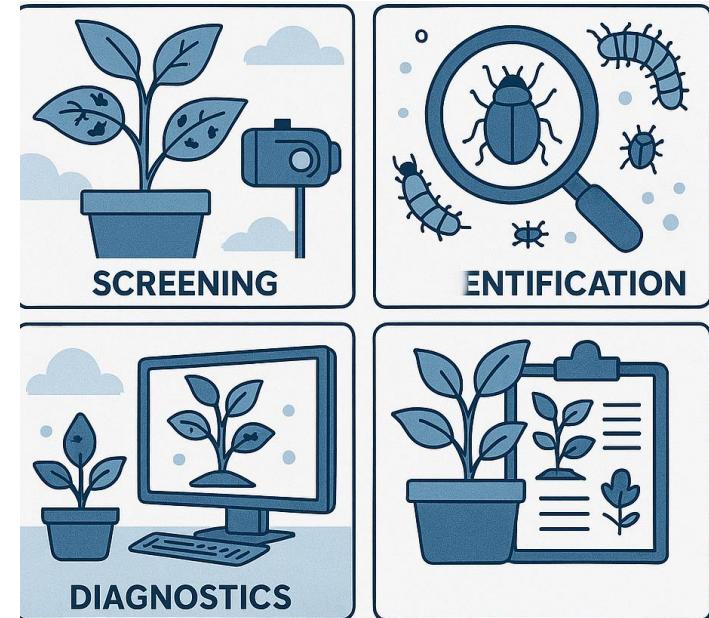
Rapid broad surveillance to check for presence of pests before symptoms are obvious

- Identification:

Determining the pest species

- Diagnostics:

Confirmatory testing using standard protocols



Pest Screening

1. Visual Inspection



Systematic inspection of plant parts. Focus on symptoms: leaves (spots, curling, yellowing), stems (cankers, boring), fruits (scarring, spots, rot), and roots (galls, decay)

2. Trapping

Sticky traps or pheromone lures - Monitoring flying or mobile pests like fruit flies, psyllids & false codling moths

3. Remote Sensing & Imaging

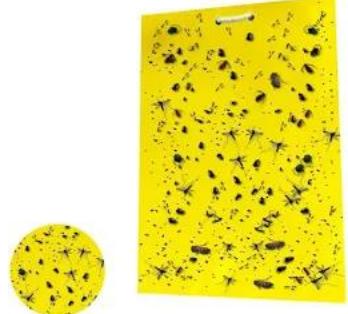
Drones or satellite images - Aerial detection of stress patterns, canopy loss or discoloration (advanced screening tool)

4. Indicator or Sentinel Plants

Planting susceptible plant species to attract and detect early pest activity

5. Field Surveys

Systematic sampling in different areas



Identification Methods

Morphological Tools: Hand lenses or stereo microscopes to examine insects, fungal spores, larval features

Field Guides: Illustrated pest guides or dichotomous keys to narrow down possible species

Reference Collections: Compare with known specimens from entomological or plant pathology collections

Expert Support: Engage national or international experts when encountering unfamiliar pests

Diagnostics - Morphological

Microscopy

- Key method for insects, mites, thrips, fungal spores
- Relies on dichotomous keys and taxonomic expertise

Cultures

- For fungi and bacteria – grown on selective media
- Identification based on colony morphology, growth pattern, pigmentation

Limitations

- Time-consuming
- Expert-dependent
- Some pests are indistinguishable morphologically

Diagnostics - Molecular

PCR-based Techniques

- **Conventional PCR:** Detect specific DNA sequences
- **Real-time PCR (qPCR):** Quantifies DNA, more sensitive

DNA Barcoding

- Compares target DNA to reference databases (e.g. GenBank)

Next-Generation Sequencing (NGS)

- Metabarcoding or whole-genome sequencing - useful for complex samples or new pest discovery

Advantages: High sensitivity and specificity

Sample Collection Best Practices

When to collect: Early morning or late afternoon to reduce pest escape or deterioration

How to collect: Use sterilized tools; take both symptomatic and asymptomatic samples

Packaging: Use clean, sealed containers or bags with minimal moisture; label all samples accurately

Transport: Ensure timely delivery to the laboratory for diagnostic processing

Documentation: Include sample data form with host plant, location (GPS), date, and observed symptoms

Avoiding cross-contamination

Diagnostic Protocols and Standards

- **International Standards for Phytosanitary Matters – ISPM 27:** Diagnostic protocols for regulated pests
- **EPPO Standards:** European protocols for regulated pests
- **National Protocols:** Industry specific or National Plant Protection Organisation (NPPO) - validated for local pests

Importance: Standardized methods ensure consistency and international acceptance.

When to Escalate or Report

- **Unknown Pest:** Found pest does not match known species or symptoms are unusual
- **Quarantine/Regulated Pest:** Pest is listed in permit conditions or market access protocol
- **Multiple Crops Affected:** Suggests an emerging threat

Procedure: Immediately report to supervisor or National Plant Protection Organisation (NPPO)

Challenges in Pest Diagnostics

Lack of validated protocols for emerging pests

Limited diagnostic capacity in some regions

Data gaps in reference databases

Summary

- **Screening** helps identify potential threats early - first alert
- **Identification** ensures the correct species is known - understanding the pest
- **Diagnosis** confirms and validates presence of pests/pathogens - confirming with tools
- **Protocols and tools** must be used correctly and consistently
- Always follow **proper sampling and protocols**

Conclusion

- Early, accurate pest detection is critical for plant health, international trade and biosecurity
- Effective surveillance supports plant health, trade, and food security
- Integrated methods combining field and lab tools are essential
- Need for ongoing harmonized protocols and skilled diagnostics workforce

Questions

- . What pests have you struggled to identify?
- . What tools or support do you need for diagnostics?



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Thank you

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