

# Infrastructure Standards for “ideal” Plant Disease Diagnostic Labs

Sue Tolin

International Plant Diagnostic  
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# Plant Disease Diagnosis

- Biotic Agents
  - Nematodes
  - Fungi
    - Oomycetes
  - Bacteria
    - Phytoplasma
  - Viruses
    - Virioids
- Abiotic Stresses
  - Drought
  - Heat
  - Cold
  - Nutrient excess or deficiency
  - Chemical damage

# Needed for diagnosis are:

- Knowledge of pathogens
- Methods and references
  - Classical observation to modern tests
- Physical infrastructure
  - Equipment, preparation and storage of reagents, electrical power
- Trained people
- Diagnostic literature resources; access to current publications
- A means of storing and disseminating data

# Minimum infrastructure standards –

Suggested by SPDN: draft, April 2006

## *General equipment*

1. Microscopes – trinocular compound and stereo, with illuminators
2. Digital imaging capacity – macro and microscopic
3. Autoclave for sterilization and sample destruction

## Suggested minimum infrastructure standards – SPDN draft, April 2006

### *Equipment for specific tests*

4. Culturing capability for bacterial and fungi, including laminar flow hood, incubators
5. Capability to perform routine ELISA from kits, using plate reader for consistent and objective analysis
6. Biolog<sup>TM</sup> carbon utilization system or gas chromatography for bacterial identification

## Suggested minimum infrastructure standards – SPDN draft, April 2006

### *People and data*

7. Sufficient personnel to perform timely and accurate diagnostic service
8. Ability to travel to training and meetings where diagnostic information is presented
9. Capability to collect diagnostic data and upload to regional or other center

# Basic Equipment List

- Refrigerated (4° C) storage
- Freezer (-20°C) storage, manual defrost
- Distilled or deionized water
- Balance, pH meter, vacuum pump, heat/stir plates, shakers
- Computer, printer, high speed internet connection

# 'Second tier' infrastructure list (SPDN draft)

- Physical separation of sample receiving area – 'dirty' area
  - If performing PCR, contamination is reduced by using separate areas
- Activities that should be in 'clean' area
  - Preparing tissue for extraction
  - DNA extraction (bead-beater, other)
  - Adding reagents to tubes
  - Analyzing PCR products
  - ELISA

# Additional items for Tier 2 labs

- - 80° C ultra-low freezer
- Biosafety cabinet
- High temperature incubator
- Lyophilizer
- Pipettes dedicated for PCR use only
- Fume hood
- Hazardous chemical storage cabinets

## Additional needs for molecular diagnosis

- Centrifuge for DNA extraction
- Thermocycler for PCR, RT-PCR
- Electrophoresis equipment
- Transilluminator to view PCR products
- Gel documentation system
  
- Real-time PCR systems

# 'Ideal' labs should maintain 'best operating practices'

- Document standard operating practices for receiving samples, performing assays
- Use standard protocols for media and stock solution preparation
- Document reagent source, storage conditions, and shelf life
- Schedule regular maintenance checks on equipment – balances, pH meters, pipets, biosafety cabinets

# Status of Infrastructure Standards

- These were presented as a draft of needs for establishing or upgrading a diagnostic laboratory
- To be used as guidance at this time
- Flexibility is needed to meet local needs and capabilities
- Having standards will upgrade capacity and enhance consistency and accuracy