Responding to Pest Risks-Industry

Samantha Thomas

February 2019

NAPPO Workshop

Overview of the Seed Industry

The vegetable seed industry goal: generate and deliver a product that meets customer needs

- Timing: delivered when its needed
- Cost: delivered at the right cost
- Quality: germination, vigor, hybridity, healthy seed

Failure to do so may result in a loss of sales or customer…

Great efforts made by many companies in the vegetable seed industry to safeguard seed supply and deliver the right quality

- Establish reliable production locations
- Apply field management practices (BMPs)
- Apply standard operational practices (sorting, sanitation, treating, etc.)
- Apply standard quality tests developed and implemented
- Train to assure consistency in processes
- Leverage quality testing for phyto-declarations via PPO certifications
- Root cause identification and corrective actions

QMS

Disease Examples

Production and Delivery Steps

Plant stage

What is plant disease?

The greatest opportunity for pathogen detection/observation is in the host plants

Fundamental Questions for Disease Diagnosis

Who

What and what then?

How

- **To respond**
- **To track and trace**
- **To share**

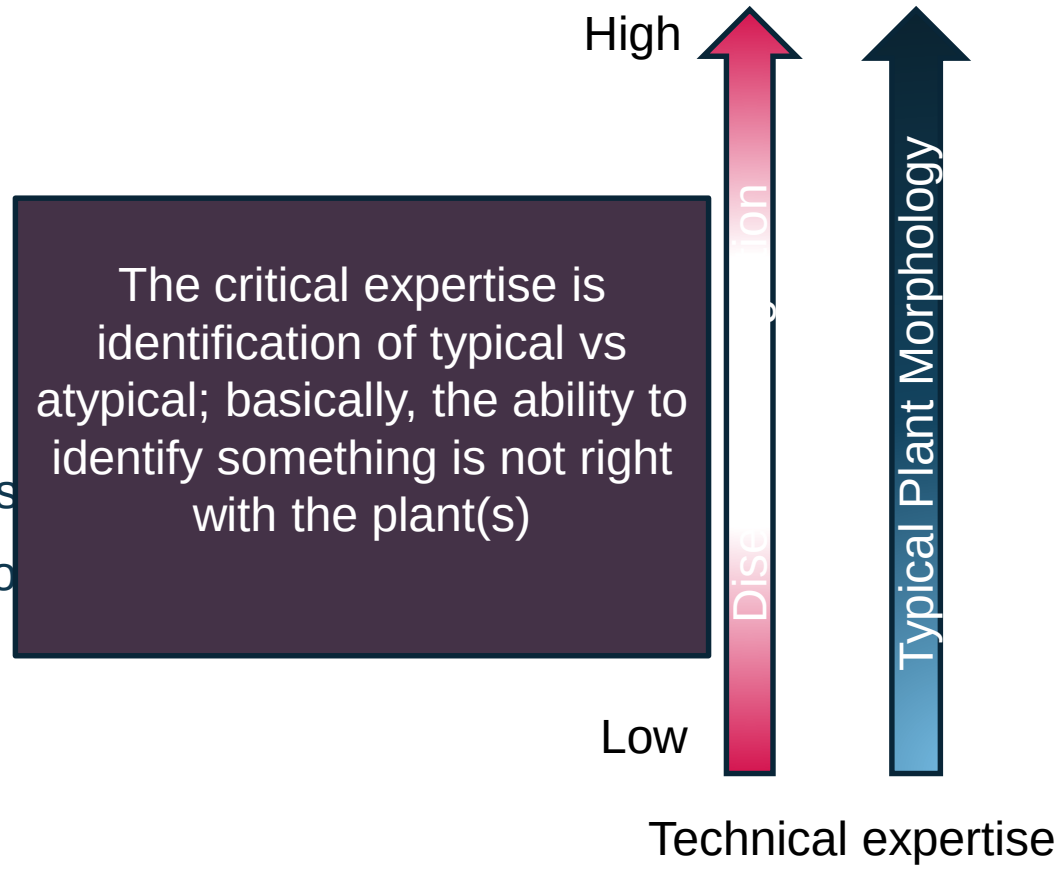
Who is looking at the plants? what do they know?

Company

// Company: Breeders, breeder's assistants, field reps, production assistants
// Vendors: production assistants
// Field specialists/field pathologists
// Government field inspectors

Customer Fields (Commercial fruit/veg growers)

// Seed Company: Sales reps, field specialists/pathologis
// Commercial grower company: owner, production perso
// Consultants: academic, independent
// Government inspectors

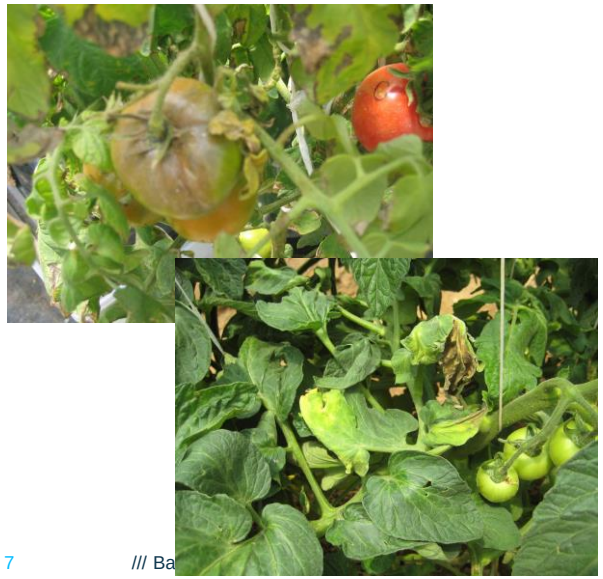


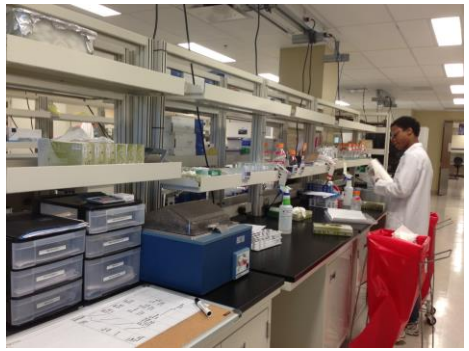
What is done? Diagnostics

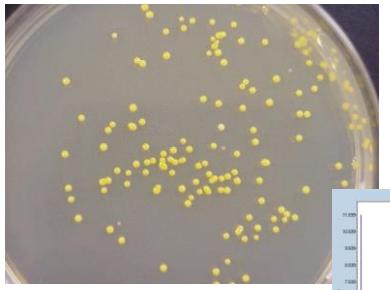
Once plants are flagged due to unhealthy status, diagnosis of the causal agent is key

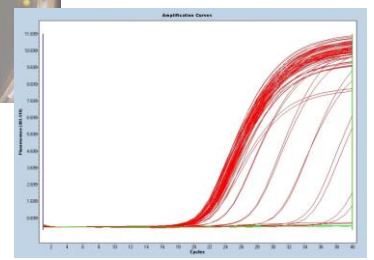
Technical expertise is *very important*

- Triage→ Confirmatory diagnosis
  - Perfect world: The diagnostic process will generate enough data to confirm pathogen presence, viability, and pathogenicity









Diagnostic Considerations

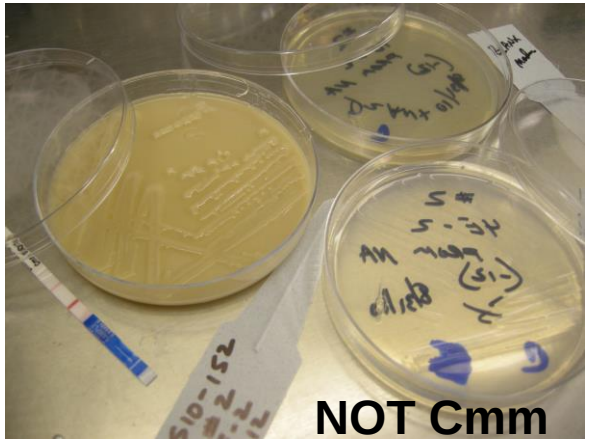
Not all diagnostic resources are equal

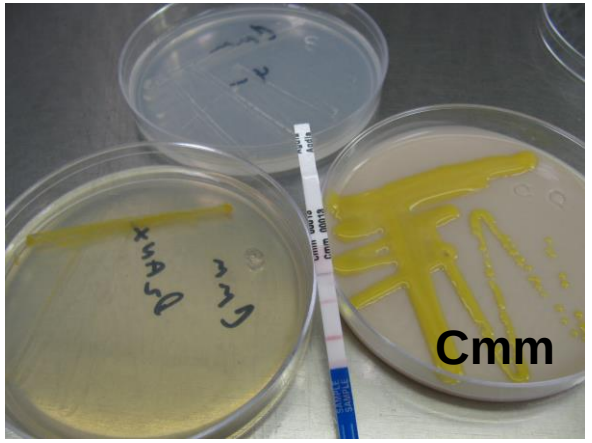
- Technical expertise on the crop and its associated diseases
- Equipment/Resources for culturing, ELISAs, PCR, pathogenicity
- For a given pathogen, there needs to be a robust set of validation data to support whichever diagnostic assay(s) may be used

Therefore, conclusions need to be made *cautiously*

Diagnosticians will vary in their expertise; many companies have a lead person and the ability to ship samples to that person from anywhere in the world or they have established relationships with 3rd party or govt labs

- Confirmation of pathogenicity is desired





Both isolates are positive by LFD

So you find something, then what?

If it’s a known pathogen, proceed with response plan

- Current season: Plan may include rogueing plants, applying pesticide sprays, or destroying the field
- Future production season: Plan may include modifications to production plan, preventative sprays, or moving the production to a new area

Record in files, systems (build historical data)

Internal and external reporting as applicable

What if it’s something new?

Background

This is a much more complicated situation…

How would it be found?

- It takes on average about 8 years for a new variety/hybrid to be developed and launched;

  Fast track: maybe as few as 5

  - There are 2-3 productions per year
  - There are minimally 10+ productions *PRIOR* to variety/hybrid launch; these will span different production locations across/within countries
  - Every production will be inspected in similar ways (production assistants, field inspectors)
  - If there is a disease, it will likely be observed

It is CRITICAL for a seed supplier to understand what is going on; any disease may impact reliability of supply, customer experience, reputation as a seed supplier

What if it's something new?

WHAT would be done?

A lot of questions are asked and there is a great deal of work to answer them

- Key questions are:
  - *What is the pathogen causing disease?*
    - Is it a pathogen we know or is it related to something we already know?
    - Is it a new host for a known pathogen? (consult ISF pest lists; literature)
      - If yes for either, leverage info. May also infer behavior/characteristics (e.g., it's a new potyvirus; potyviruses are aphid-borne…need vector control, not generally seed-borne)
  - *How can we manage it?* Are there vectors? Is this impacted by weather events (e.g., rains)?
  - *Is seed a pathway?* Is it seed-borne and will it seed transmit? Has this been seen elsewhere?
  - Longer term: what appears to be the global distribution?

What if it’s something new?

Partnerships are key

Industry has limitations on the degree of characterization work it can do

The industry will leverage independent expertise to assist and support with the characterization work

- Recent example:
  - Kai Shu Ling (USDA-ARS): investigated new tobamoviruses on tomato; resistant breaking strain and a new virus found (Tomato Mottle Mosaic Virus)
    - Info is shared with industry to permit resistance-breaking to be investigated
    - Info was shared about the diagnostics of ToMMV
- There is a great desire to enable sharing of information (publications)

Conclusions

Everyone has the same interest…to understand what is happening and to provide information to enable successful fruit and vegetable productions

- Seed producers, vendors, regulators, academics, fruit growers…
- If this does not happen, can have very negative impacts
  - Loss of production, reputation, producibility
  - Increased regulations

Many of our actions as seed producers and seed users are working towards identifying and understanding what causes the atypical