

ADVANCED TECHNOLOGY IN PLANT HEALTH TOWARDS 2020

**Presentation to the 17th Meeting
of the Strategic Planning Group
of the CPM**

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We can't escape.....



Contents

- History
- Specific Achievements
- Recent Developments and Challenges
- Actions



History and Background

- Lots of terminology – plant health, plant quarantine and plant protection
- What is plant quarantine: *All activities* designed to prevent the introduction and/or spread of quarantine pests or to ensure their official control. (ISPM 5)



History and Background

- China – first reported use of biological controls.
- France – the first plant quarantine law (1660)
- Late 1800s – broad laws written for plant protection and first NPPOs begin to be organized responsible for exercising those laws.



History and Background

- The International Convention respecting measures to be taken against *Phylloxera vastatrix* of 3 November 1881, the additional Convention signed at Berne on 15 April 1889, the first international efforts against plant pests
- The International Institute of Agriculture (IIA, a precursor of the FAO) was established in Rome in 1905. One of the objectives of the Institute was the better control of plant diseases.

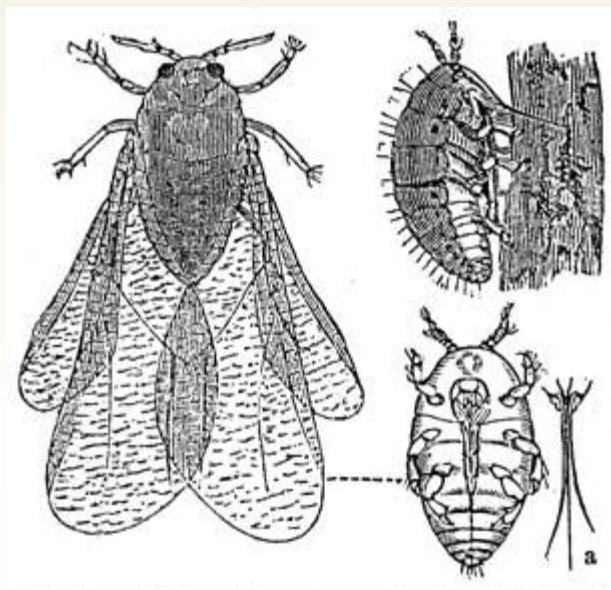


Past Achievements

- 1912 – Proposal at the IIA for establishing government plant protection services and use of a health certificate for nursery stock
- International Convention for the Protection of Plants, 1929.
- 1952 IPPC comes into force
- Convention revised in 1979 and 1997.

Past Achievements

- Grape phylloxera – resolved through international cooperation and basic research resulting in grafting resistant rootstock.



Past Achievements

- Seed potato certification – Germany, early 1900s, If less than 5% of plants showed symptoms, an official certificate of approval was awarded to the grower, who could then use it to sell the seed potatoes at an enhanced price.



Past Achievements

- Early 20th century saw the development of numerous cultivars resistant to one or more diseases



Past Achievements



- Fumigation, heat and cold treatments have been constantly updated or replaced
- Irradiation now approved for use in some commodities as a plant health safeguard

Past Achievements

- Integrated pest management (IPM) techniques or their precursors (relying on knowledge of pest biology and cultural practices to produce multi-tactical control strategies) have been a successful part of plant health efforts



Past Achievements

- Pheromone traps to detect the presence of pests have also contributed significantly to plant health efforts



Recent developments and challenges

- The following offers only a small picture of new technologies in plant health.
- Advances in biotechnology (genetic markers for diseases as an example) should not be overlooked.
- In the near future, we'll see crops that will be resistant to environmental stresses like drought, and crops that use soil nutrients more efficiently – healthier plants.



Recent developments and challenges

- Diagnostics
 - Field-ready serological tests such as lateral flow devices (LFDs) are commonly used as diagnostic tools to aid disease management decision making, to back up diagnoses based on symptoms, and as a triage tool to prescreen plants for specified target diseases. BUT - Tools developed commercially for use in developed countries are generally too expensive for the same crops in poorer countries.



Recent developments and challenges

- Diagnostics
 - DNA-based assays, particularly PCR and real-time/quantitative PCR (qPCR), are being adopted in diagnostic laboratories; ordinary PCR testing for many pathogens is now routine and affordable....*in the developed world.*

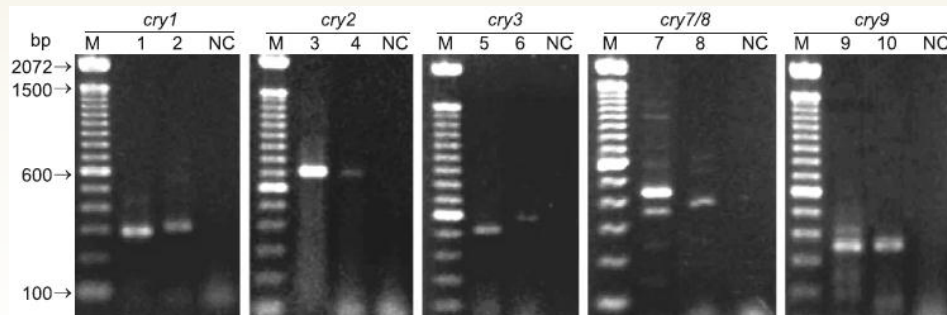


Figure 1. Presence of *cry* genes in *Bt* isolates. (M) Molecular Weight Marker (100bp, Gibco BRL), arrows indicated the molecular weight; (NC) Negative Controls; (1) *Bt aizawai*; (2) *Bt* 2023-10; (3) *Bt aizawai*; (4) *Bt* 2023-10; (5) *Bt tenebrionis*; (6) *Bt* 2017-9; (7) *Bt aizawai*; (8) *Bt* 1489-3; (9) *Bt aizawai*; (10) *Bt* 3420-12.

Recent developments and challenges

- In addition to digital systems widely available for distance diagnosis, several free forms of software can be used to map and share the presence of diseases, these include apps:
 - RustMapper - being tested to map the distribution of wheat stem rust race UG99
 - University of Florida's Digital Diagnostic and Identification System (DDIS)
 - Farmer's Friend aims to provide advice on treating common pests and diseases

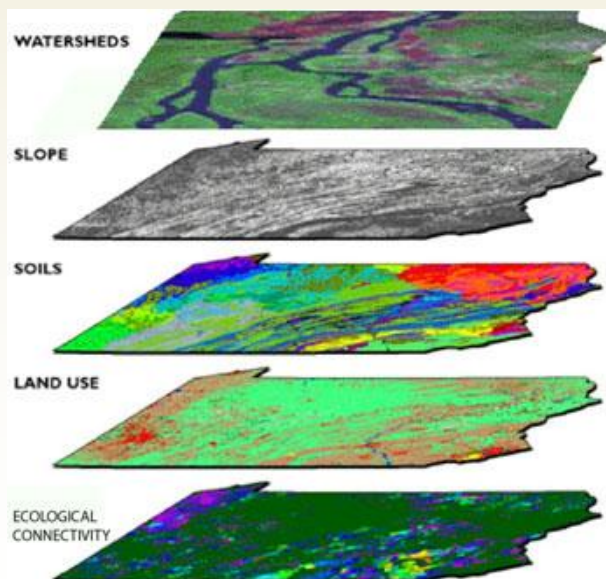
Recent developments and challenges

- Surveillance
 - The use of drones and remote sensing techniques coupled with spectroscopy-based methods - these techniques may be very useful as a rapid preliminary identification of primary infection



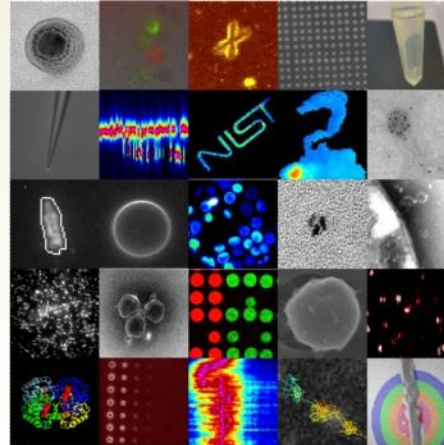
Recent developments and challenges

- Surveillance
 - Overlaying GIS disease distribution maps with other data could facilitate the possibility of predictive sensing of disease spread and risk, could be also used to determine the likely impact of climate change



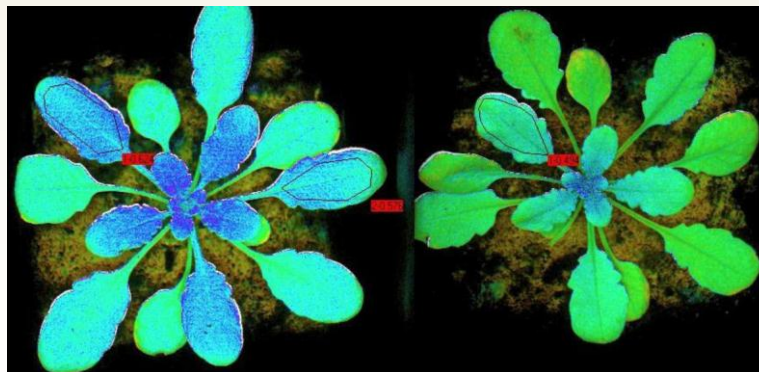
Recent developments and challenges

- Biosensors based on phage display and biophotonics can also instantaneously detect infections.



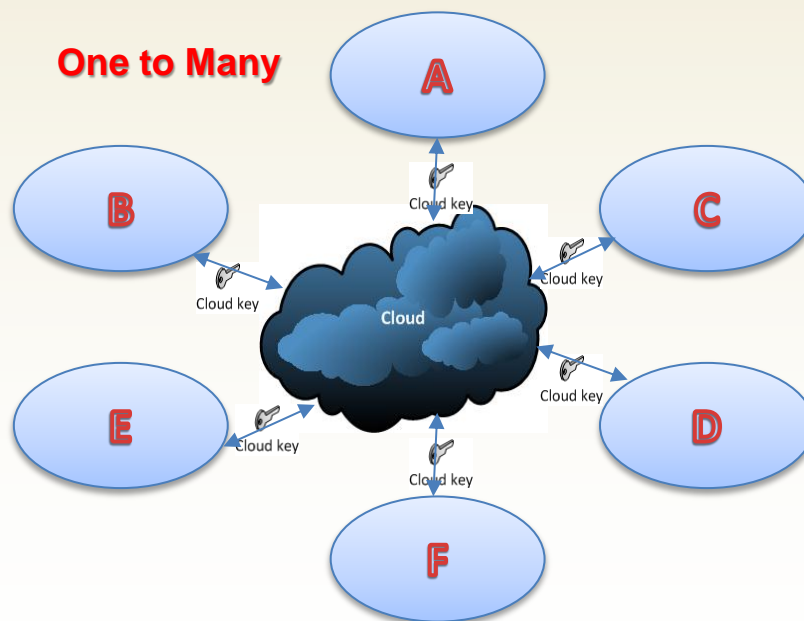
Recent developments and challenges

- New developments in novel sensors based on the analysis of host responses deliver instantaneous results and can effectively detect early infections directly in the field



Recent developments and challenges

- ePhyto also holds great potential to assist in plant health efforts by introducing technologies that will facilitate safe trade in plants and plant products



Challenges

- How much impact will new technologies have on the IPPC?
- How can the IPPC address these impacts?
- Should new technological developments be a priority for the IPPC?
- How can the IPPC facilitate the transfer of these new technologies to developing country contracting parties?

