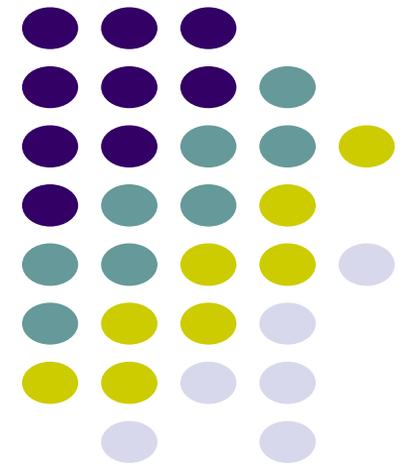
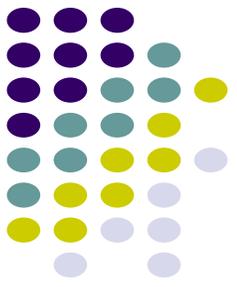
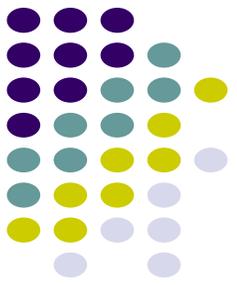


# Disease diagnostic kits



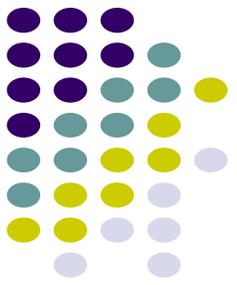


- Biotechnology has allowed the development of diagnostics which has assisted farmers worldwide in managing different diseases affecting their crops.
- New diagnostic techniques require minimal processing time and are more accurate in identifying pathogens. These diagnostics are based on rapid detection of proteins or DNA that are specific to each pathogen, disease or condition. Some procedures require laboratory equipment and training, while other procedures can be performed on site by a person with no special training.

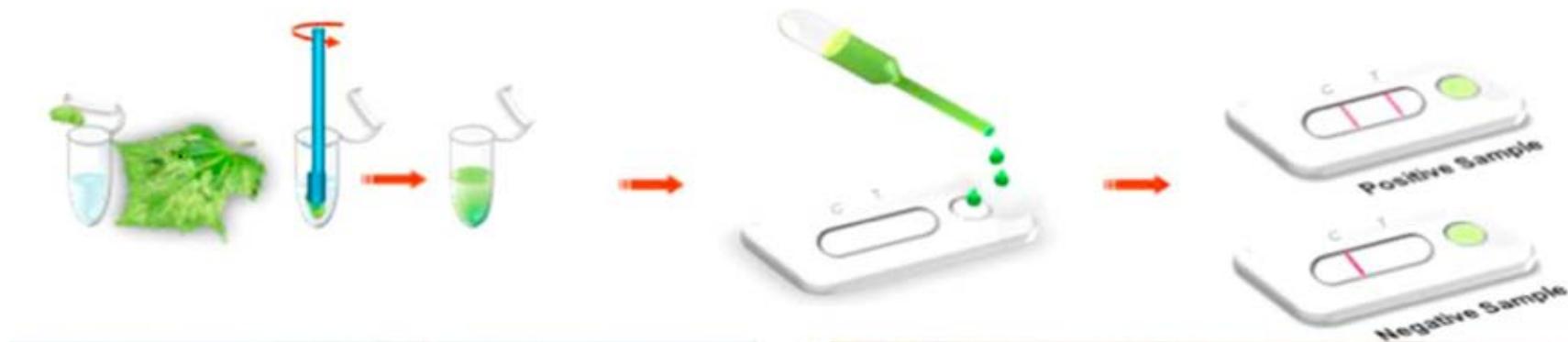


- Diagnostics kits offers a broad range of ELISA kits for plant pathogen detections with high test performance characteristics to allow accurate, rapid, simple and high-throughput identification of the organism(s) that cause plant disease. The immunological techniques based on ELISA kits offer considerable advantages over traditional diagnostic methods and PCR-based techniques.
- In addition, a wide range of ELISA-based rapid test strips are also available with visible color change signal by using lateral flow devices (LFD), which are designed for on-site, robust and fast detection of plant pathogens by unskilled personnel.

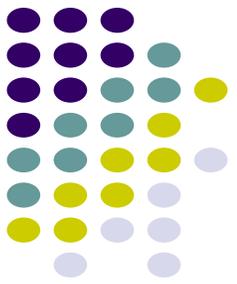
# Examples of existing diagnostic techniques



- **ELISA (enzyme-linked immunosorbent assay) kits**
- ELISA kits are based on the ability of an antibody to recognize a certain protein substance or antigen associated with a plant pathogen. The kits are very easy to use and can be used in the field to diagnose a disease in only 5 minutes. In addition, they do not require sophisticated laboratory equipment or training. There are already numerous ELISA test kits available in the market to detect diseases of root crops (e.g. cassava, beet, potato), ornamentals (e.g. lilies, orchids), fruits (e.g. banana, apple, grapes), grains (e.g. wheat, rice), and vegetables.



# Plant Disease Tests



Erwinia amylovora rapid test – Box of 4

Erwinia Pocket Diagnostic plant pathogen test is a quick in-field test designed to detect Erwinia amylovora. The test can be used on a wide range of plant material, including woody tissues, tough leaves, roots and soft material.



Phytophthora rapid test – Box of 50

The Pocket Diagnostic Phytophthora rapid test can be used on a wide range of plant material to detect Phytophthora spp. wherever you are.



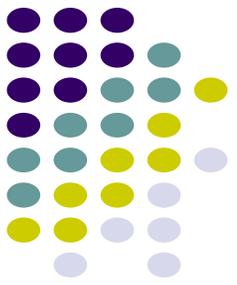
Phytophthora rapid test – Single

The Pocket Diagnostic Phytophthora test can be used on a wide range of plant material to detect Phytophthora spp. wherever you are.



Ralstonia solanacearum rapid test – Box of 4

Ralstonia solanacearum Pocket Diagnostic plant pathogen test is a quick in-field test designed to detect Ralstonia solanacearum. The test can be used on a wide range of plant material, including woody tissues, tough leaves, roots and soft material.

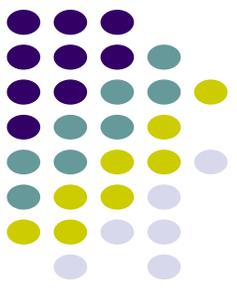


- The ImmunoComb® joins together the most requested Agdia tests for plant virus detection.

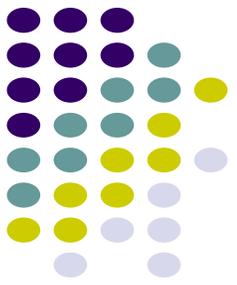
The grower can test for *Cucumber mosaic virus* (CMV), *Tomato spotted wilt virus* (TSWV), *Impatiens necrotic spot virus* (INSV) and *Tobacco mosaic virus* (TMV) all at one time.

Samples are ground in a special bag that allows for easy extraction. The comb of four test strips is then easily placed into the sample. The test takes just minutes to form clear yes or no results.

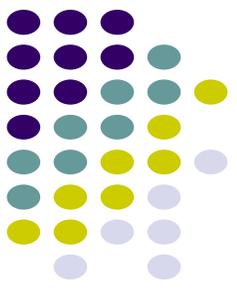




- **Direct tissue blotting**
- This technique also utilizes specific antibodies to detect the presence of plant pathogens. In this method, diseased tissue samples are pressed to draw out proteins onto a special paper and the antibodies are added to the sample. A color-inducing reagent is added afterwards to react with the antibody-pathogen complex. Color reaction indicates a positive result and pinpoints the location of the pathogen in the diseased tissue.
- **DNA/RNA probes**
- Another set of tools that can be used in plant disease diagnostics is nucleic acid (DNA/RNA) probes. These probes are fragments of nucleic acid arranged in a sequence complementary to that of the DNA or RNA of the pathogen. Because the sequences complement each other, the probes can be used to identify specific diseases.

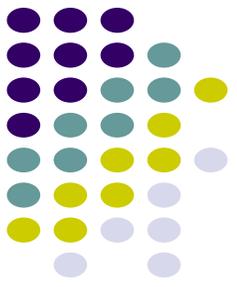


- **Squash blot method**
- In the squash blot method, tissue from a plant that is suspected to be diseased is “squashed” onto a special piece of paper, called a membrane. This membrane is then treated with a probe that can bind with the DNA or RNA of the plant pathogen suspected to be in the tissue. Binding will occur when complementary sequences are present. After adding several more substances to the membrane, a color reaction indicates that the probe and the pathogen DNA/RNA have bound to each other and the disease is present. No color reaction means the test for the disease is negative.



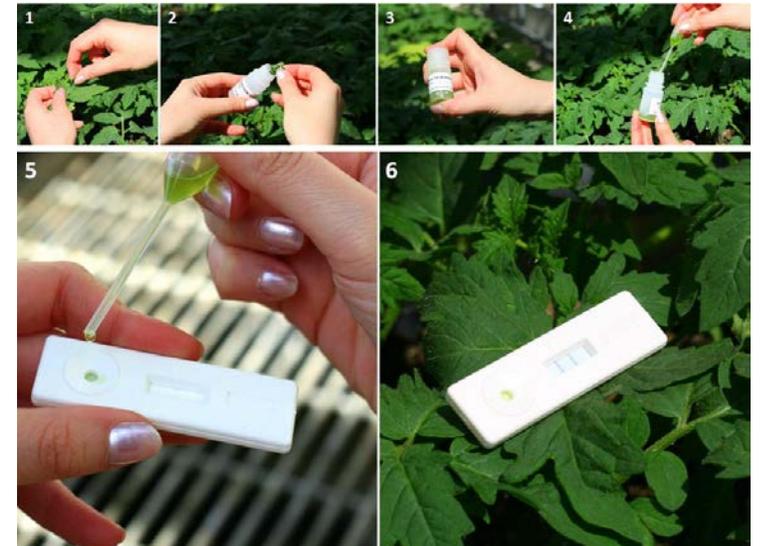
- **PCR (Polymerase Chain Reaction)**
- PCR also uses nucleic acid probes to detect the presence of a pathogen. This is a lot more sensitive compared to the other techniques as PCR can detect very small amounts of a pathogen's genetic material per sample and amplify certain sequences to a detectable level. PCR can be used to detect the presence of pathogens in the air, soil, and water. Spores, especially those produced by fungi, are the primary source of infection to initiate epidemics. Farmers can therefore keep track of the pathogen and apply the necessary control to prevent the spread of the disease.

# USE OF POCKET DIAGNOSTIC® RAPID TEST STRIPS FOR PLANT DISEASES

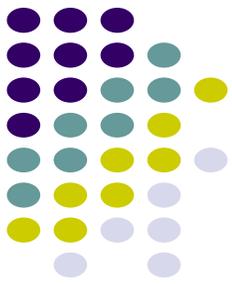


- The lateral flow rapid test strips range detects different plant pathogens
- Cut or tear sample into small pieces and put into bottle containing buffer and ball bearings
- Shake firmly for 30-60 seconds to break up the sample and allow the liquid to settle
- Draw liquid into the pipette – avoid sample debris and air bubbles
- Keeping the test device level, add 2 drops into the sample well of the device
- Valid results within 10 minutes

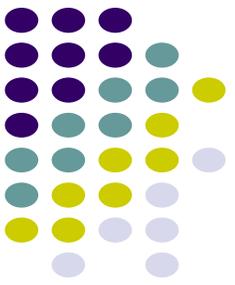
POCKET  
DIAGNOSTIC



## PCRD – Nucleic Acid Detection



- DNA agarose gel electrophoresis is the traditional method for confirming the presence of nucleic acid following DNA amplification in PCR. PCRD is a simple and rapid alternative to gel electrophoresis that can be performed in a matter of minutes without the need for expensive equipment or exposure to intercalating dye and UV light.
- PCRD is a nucleic acid lateral flow immunoassay (NALFIA) suitable for use with PCR, Loop-Mediated Isothermal Amplification (LAMP), Recombinase Polymerase Amplification (RPA) or Helicase Dependent Amplification (HDA).
- The format of PCRD is suitable for use in both high throughput laboratories and small field based laboratories.



# The Benefits of Diagnostic Kits

- **In-field decision making**

As rapid tests produce in-field within minutes, this then enables the commencement of management strategies quicker than if a sample was sent off to the Lab, which is an obvious benefit for yield.

- **Reduced cost per sample**

Because there is no need to send every sample off to the lab when using a rapid test it means the cost per sample can be reduced.