DSI in Plant Pathogen Research

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Plant pathogen interactions

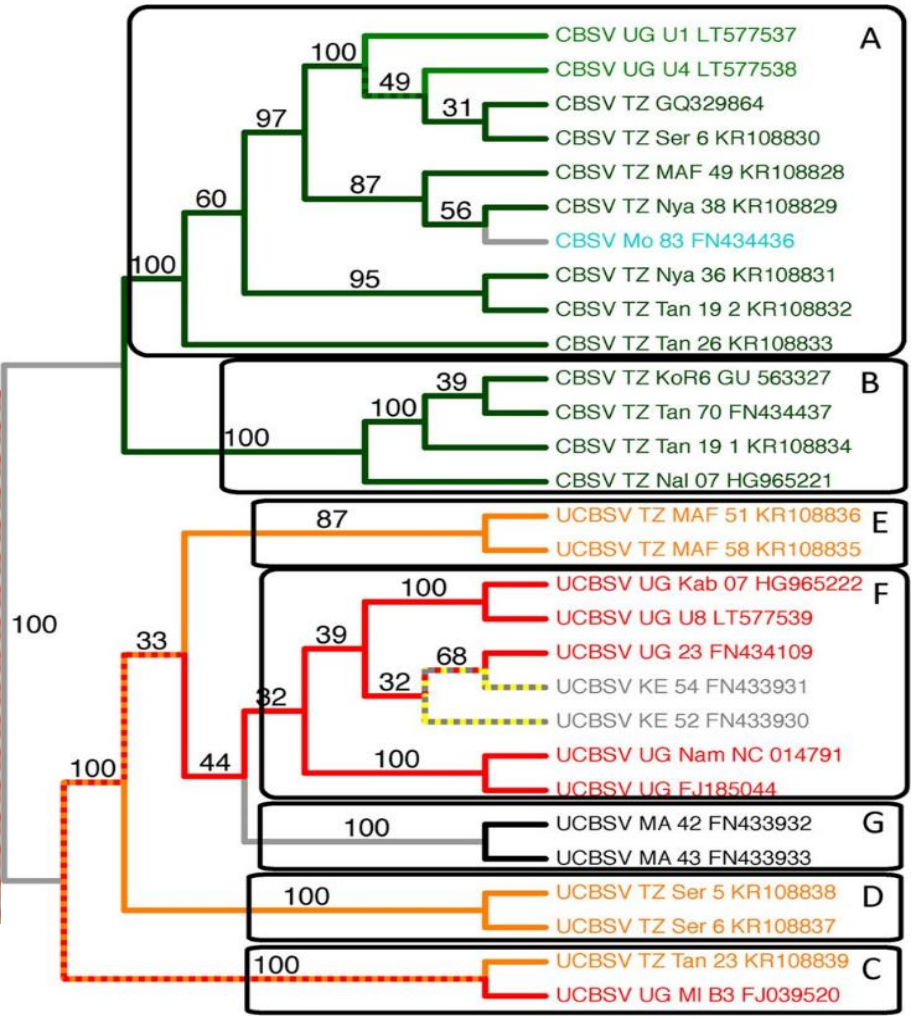
- Plants are interact with different microorganisms in the soil or above ground
- Plants offer nutrition for microbial growth while plants may also benefit in different ways
- Microbes may be on the surface of the plants (epiphytes) or internally (endophtes)
- Interactions with microorganisms may be
  - positive (mutualistic) – e.g. rhizobium in root nodules
  - neutral (commensalitic) – protection or feeding
  - or deleterious (pathogenic) – result in plant disease (bacteria, fungi, viruses, nematodes)

Use of DSI in plant pathogen research

- Diversity studies
- Interaction studies
- Discovery and evolutionary research
- Crop improvement
  - ➢disease and pest resistant
  - ➢nutritional enhancement

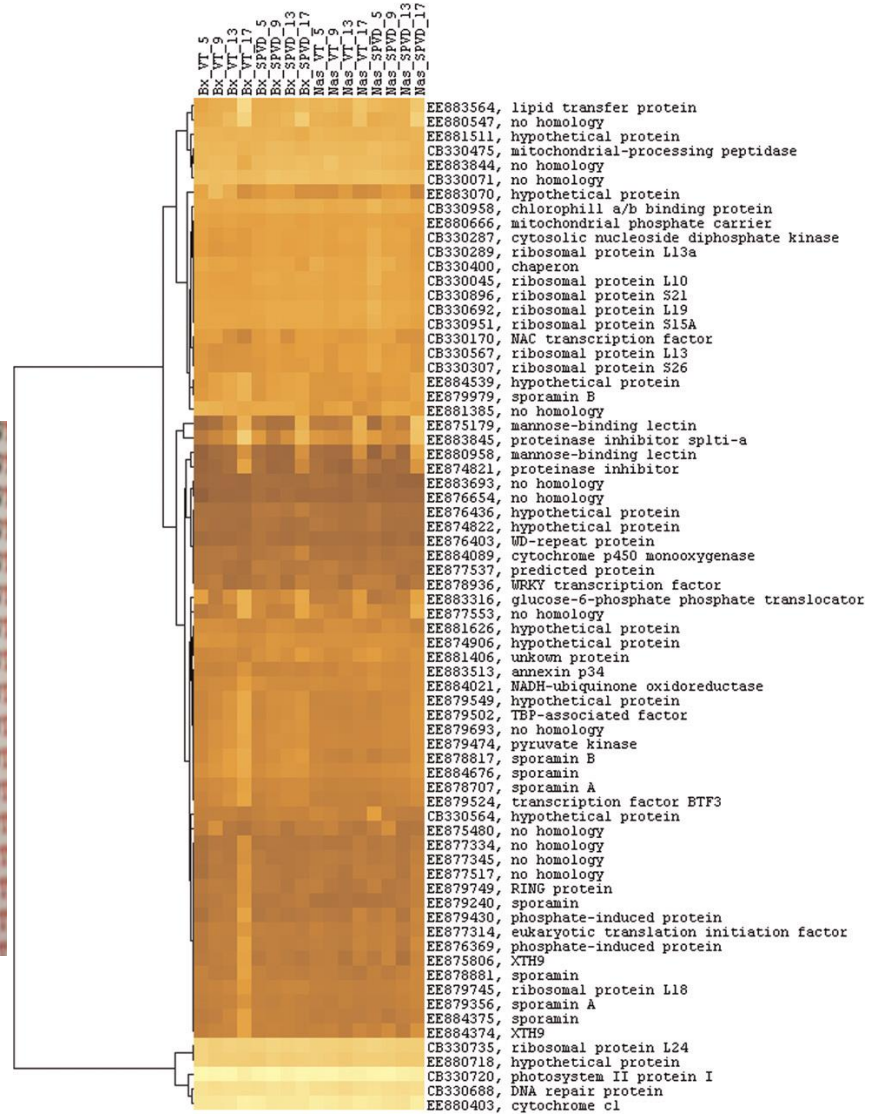
Diversity studies

- Genetic diversity (variability) of a pathogen
- Important in determining interaction with plants and therefore coming up with management strategies



Interaction studies

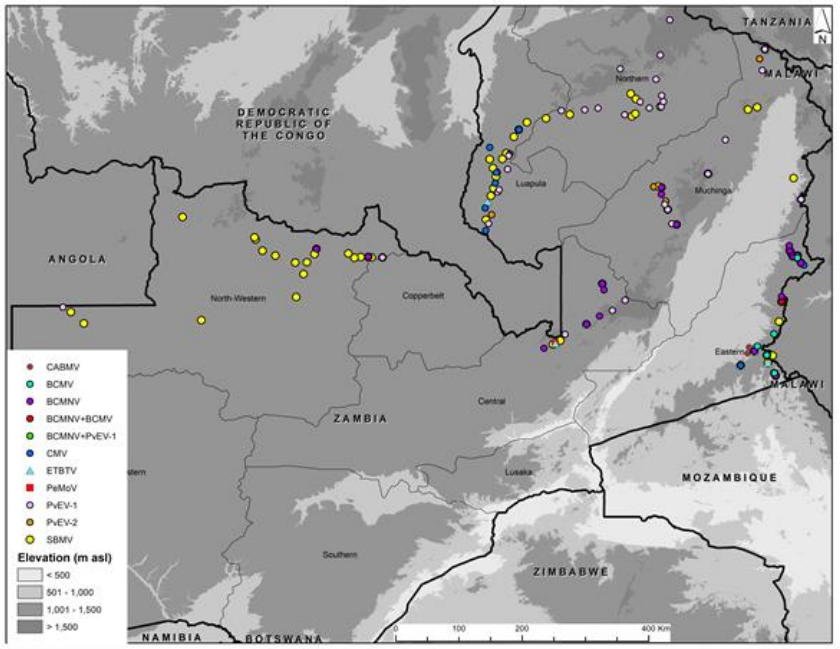
- Gene interactions
  - ➢Differential gene expression studies
  - ➢Identify genes responsible for trait expression

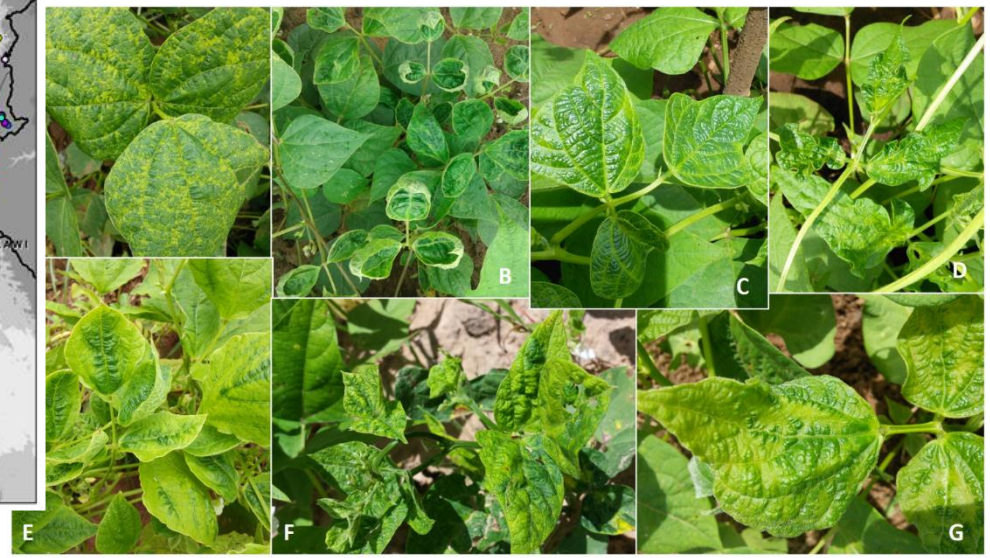


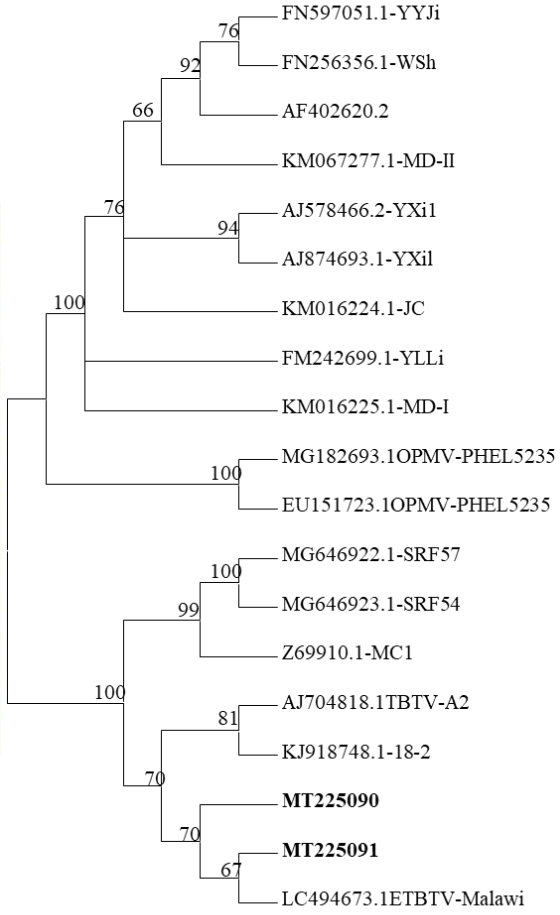
Differential gene expressions for resistance to SPVD in sweet potato (Mcgregor et al. 2009)

Pathogen discovery and evolutionary studies

- Deep sequencing
  - ➢Discover new pathogens infecting different crops
  - ➢Important in disease management



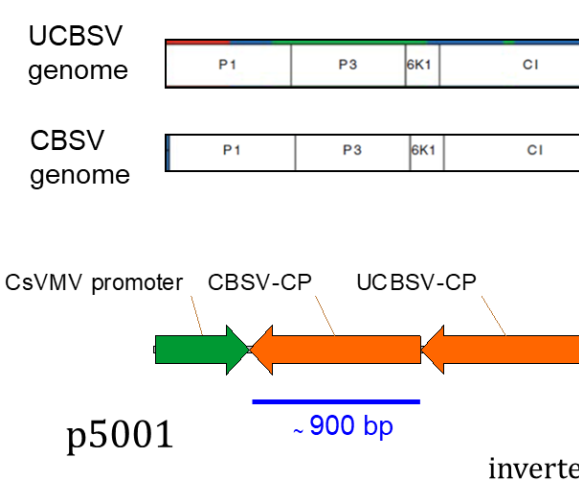




Studies on viruses infecting common beans in Zambia (Mulenga *et al*. 2022)

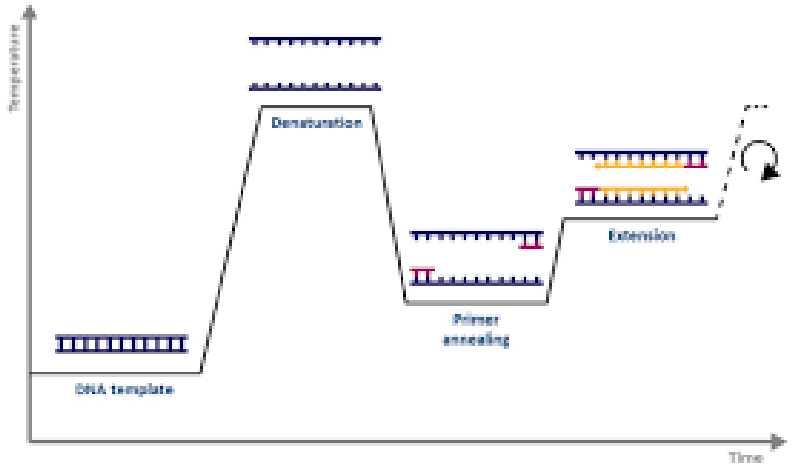
Crop improvement

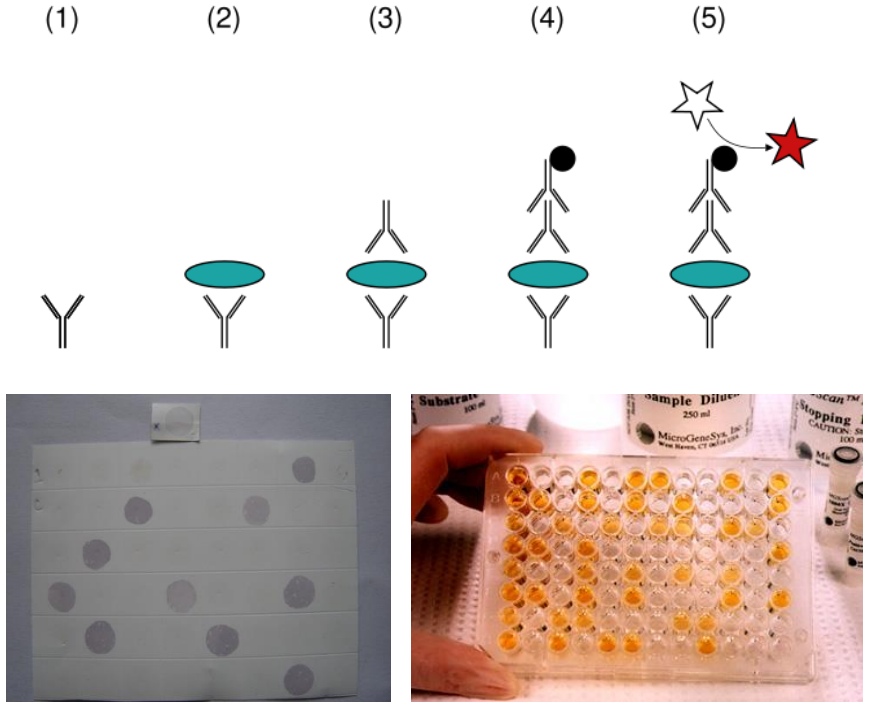
- Development of disease resistant plant
  - ➢marker assisted selection
  - ➢genetic engineering
  - ➢genome editing

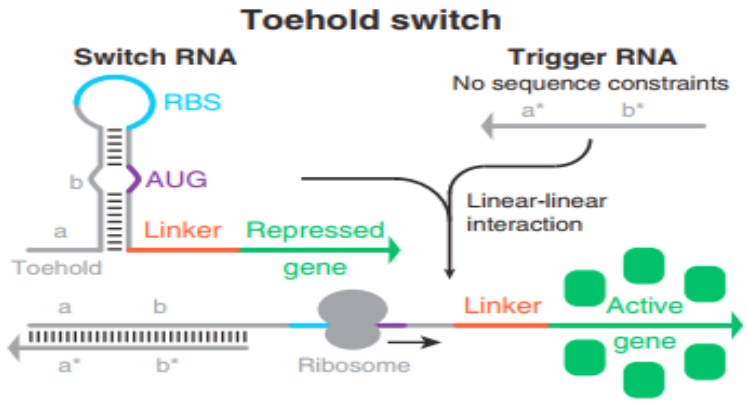


Development of diagnostic tools

- Molecular based diagnostic techniques - PCR, LAMP
- Serological techniques
- Biosensors
- Diagnostics by sequencing







Final thoughts

- Digital sequence information (nucleotide and amino acid sequences) of pathogens (and plants) is critical in plant – pathogen interactions' and research

- The genetic information is critical in plant disease management and to a large extent in enhancing food security

- Access to other genetic sequences is extremely important in comparative analysis

Thank you

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