VG16086 : Area Wide Management of Vegetable Diseases: viruses and bacteria

What did we learn?

Dr Cherie Gambley

Queensland Government

Project funding

- About $10 million in cash
  - 50:50 co-investment
  - Vegetable levy through Hort Innovation
  - Government agencies QLD, VIC, WA, NT and TAS
- $6 million, in-kind contributions
- 4 years
- Collaborative link to the NSW DPI project

Project team

Government Agriculture Agencies:

- DAF, QLD: Cherie Gambley, Paul Campbell, Rebecca Roach, Denis Persley, Lara Senior, Peter Nimmo, Flavia Bonora, Kara Pendavingh, Luke Halling, Fiona Giblin, Siva Subramaniam, Verni Subramaniam, Julia Cremer, Clinton McGrath and Andrew Mead
- Agriculture Victoria: Fiona Constable, Cliff Kinoti, Rachel Mann and Brendan Rodoni
- DPIRD, WA: Craig Webster, Monica Kehoe, Domine Wright and Brenda Coutts
- DITT, NT: Samantha Bond, Maxine Piggott and Lucy Tran-Nguyen
- UTAS: Calum Wilson and Robert Tegg

Private research providers:

- Anthony Rice, Granite Belt Integrated Pest Management; Len Tesoriero, CropDoc; John Fletcher Consultant; Chris Themsen, AgreCo Australia, Chris Monsour, ProspectAg and Stuart Grigg, Ag-Hort Consulting

PhD students:

- Latrobe University: Bianca Rodrigues Jardim, Noel Djitro and Jo Mackie
- UTAS: Muhammad Umar

Acknowledgements

Industry (growers & agronomists):

- Marco Amaya, Rocky Ponds Produce, Gumlu
- Dave Andreatta, Granite belt grower
- Ross Cannavo, Granite belt grower
- Tim Carnell, Granite belt grower
- Catherine Cookson and Tuo Deng, VJK Produce Bowen
- Mark Rogers, EE Muirs & Sons, Stanthorpe
- Maurice Schiavon, Rijk Zwaan
- Ramon Totorica, Gumlu grower
- Ray Taylor, Granite belt grower
- Carl Walker, Bowen grower
- Eilis Walker, Nutrien Ayr

AusVeg:

- Callum Fletcher, Maddy Quirk, Zali Mahoney and Danielle Park

Project scope

- Viruses, bacteria and phytoplasmas
- Insect vectors: aphids, thrips, leafhoppers, whiteflies
- Contingency planning for exotic viruses and bacteria : 6 in total
- Development of low tech and fast diagnostics
- Monitoring insect populations, weather and disease incidence
- Review of seed as an entry pathway: two workshops
- Capacity building:
  - Rebuild of pathology resource for the Vegetable industry
  - 4 PhD's: virology, bacteriology, phytoplasma
- Free diagnostics for industry

Resources for you

- Disease guides:
  - Guide to understanding and managing bacterial diseases of Australian Vegetable Crops: available now
  - Guide to understanding and managing virus diseases of Australian Vegetable Crops: available end of July
  - Register your interest in receiving a hard copy today
- Priority list of endemic and exotic pathogens
- Disease identification workshop notes and photos
  - Potential through Hort Innovation for ongoing specifically funded extension project – potentially vegetables, melons, potatoes and onions
- Fact sheets – nine on Hort Innovation website
  - Will send to other groups for hosting on their sites (e.g SoilWealth)
  - Have a few more to complete

Fact sheets

- Area wide management of viral and bacterial disease of vegetables
- Virus disease of lettuce in Australia
- Lettuce necrotic yellows virus in temperate cropping areas of Australia
- Lettuce necrotic yellows virus in the Lockyer Valley
- Cucumber mosaic virus in vegetable crops
- Virus diseases of cucurbits in Australia
- Viruses infecting brassicas
- Managing virus diseases on zucchini
- Aphids spreading virus in brassicas and lettuce in the Lockyer Valley
- *Management of aphid-borne viruses of pea and bean (in preparation by UTAS)*

Any suggested topics? Have a month to write up some more if needed.

Biosecurity preparedness: Exotic diseases

- Viruses:
  - Begomoviruses,
  - Tospoviruses
  - Tobamoviruses
- Bacteria:
  - Bacterial wilt of cucumber (*Erwinia tracheiphila*),
  - Bacterial blight of onion (*Xanthomonas axonopodis* pv. *allii*)
  - Stewart's wilt of corn (*Pantoea stewartii*)

Diagnostic assays

- 23 protocols circulated for ring-testing
- 16 for viruses and 7 for bacteria
- Range of technologies
  - Traditional end-point PCR
  - Real-time PCR
  - LAMP
- Improvements to MALDI-TOF and BIOLOG databases for alternative bacterial identification

PhD Students

- Bianca Jardin. *A genomics approach to understanding the diversity and biology of phytoplasmas threatening vegetable production in Australia.* Supervisors: Rodoni, B., Gambley, C., Tran-Nguyen, L., and Constable, F.
- Joanne Mackie. *Targeted surveillance strategies to support area wide management of viruses in vegetable crops.* Supervisors: Tran-Nguyen, L., Campbell, P., Rodoni, B. and Constable F.
- Umar Mohammad. *Poleroviruses of Legume Vegetable Crops: Diversity, impact, and control.* Supervisors: Tegg, R.S., Wilson, C.R. and Thangavel T.
- Noel Djitro *Elucidating the epidemiology of bacterial crown and fruit rot, an unusual Pseudomonas disease of zucchini.* Supervisors: Rodoni, B., Gambley, C., Roach, R., Campbell, P. and Mann, R.

What next?

- Further research is needed into:
  - **Virus diseases affecting lettuce and brassica crops**
    - Aphids and thrips transmitted viruses
    - Lockyer Valley QLD, Victoria regions – others also impacted
  - **New age bactericides**: protectants aren't effective under high pressure
    - Products to reduce bacterial numbers in the plant
    - A number identified in VG16086 which will probably work
  - **Pectobacterium disease management : zucchini and brassica**
    - Emerging problem seen through surveys in VG16086
    - Need info on infection processes, bacterial spread in crop
    - Development of management strategies.

What can you do?

Talk to Hort Innovation

Talk to your local vegetable levy SIAP member

Thanks and acknowledgements

- Growers, agronomists, companies, VegNet & AusVeg

- Hort Innovation, Vegetable Levy & state and territory agencies