Carlavirus in Beans - a new disease
Green beans

• Industry value: $75m
• QLD: 80% Vic: 15%
• Summer production in SE Qld; winter production north Qld (Bowen)
• Crops harvested 9 to 11 weeks after planting
• Beans natural host of at least 30 viruses worldwide

• Industry limiting diseases caused by several begomoviruses and potyviruses overseas

• In Australia, bean summer death (TYDV) and bean common mosaic virus well controlled through cultivar resistance
Bean virus – south Queensland 2016

- French bean crops in Fassifern area in summer/autumn 2016 had high% of plants with leaf mottling and curled, twisted and discoloured pods

- Significant crop losses through crop failure and downgrading and extensive culling of product in packing shed

- Potyvirus e.g. bean common mosaic virus (BCMV) eliminated as possible cause and a Carlavirus in the Cowpea mild mottle group consistently found in infected plants

- This was the first record of this virus group from legumes in Australia

CPMMV infected French beans with green mottle symptoms and deformed, twisted pods
CPMMV soybean

• A related virus was found in soybean from the Lockyer valley at same time (April 2016)

• Virus in bean and soybean identified by RT – PCR with primers targeting coat protein (CP)

• Phylogenetic analysis clearly indicated bean and soybean isolates from Qld distinct isolates of CPMMV
Queensland CPMMV - what do we know?

- Found in French bean at Kalbar in April 2016, and in bean at Bowen in August 2016
- Virus present in 2017 in south Qld production areas
- CPMMV group is genetically variable and the Qld isolates do not seem to be closely related to available viral sequences from other countries
- Whitefly transmission (*MEAM1 Bemisia tabaci*) confirmed in lab tests for both bean and soybean isolates
CPMMV hosts

- Natural field hosts of bean virus in Fassifern were French bean, soybean and mung bean

- Hosts of CPMMV from Fassifern in glasshouse inoculation tests were French bean (20 varieties), soybean, cowpea, mung bean, Adzuki bean, Phasey bean

- Non-host species include: chickpea, lucerne, peanut, tomato in inoculation test
CPMMV genetic diversity

Maximum Likelihood phylogram for the partial coat protein gene

Bean and soybean isolates only share 71% nt identity in this region
CPMMV and Australia

• Likely a recent incursion into Australia. Within last 10 years?

• More than one incursion based on phylogenetic data from Qld isolates

• Grain legume seed most likely pathway e.g. soybean, mung bean, *Phaseolus* species

• Negative evidence to date
Seed transmission tests - Queensland

• Not detected in grow out tests of commercial seed lots of bean, soybean and mung bean
  
  – French bean (1864 young plants tested)
  – soybean (2000 plants)
  – mung bean (1768 plants)
Future work/ scenarios

- Further work on epidemiology, genetic diversity, host range and seed transmission of Qld isolates
- Virus established in south Qld and potential threat to both bean and soybean
- CPMMV currently an issue with bean production in Brazil
- Seen as threat to US soybean industry
- Damaging in winter nurseries in Puerto Rico and many varieties react severely to virus.