Virus diseases of cucurbits

The viruses
There are three viruses causing major production losses in cucurbits in Queensland:

- papaya ringspot virus (PRSV)
- watermelon mosaic virus (WMV)
- zucchini yellow mosaic virus (ZYMV).

These viruses infect all commercially grown cucurbits including zucchini, pumpkin, cucumber, squash, watermelon, rockmelon and honeydew melon.

The symptoms
Virus infection in cucurbits is typically associated with mosaic symptoms on leaves and lumpy, distorted fruit. The range of symptoms produced by each virus can overlap and plants are commonly infected by more than one virus at once.

WMV causes mosaic symptoms on leaves but rarely fruit distortion in any cucurbit. In general, WMV appears to produce less severe symptoms than either PRSV or ZYMV.

Virus sources and spread
The viruses are spread from plant to plant by aphids and not by other sap-sucking insects such as whiteflies, thrips or leafhoppers. The viruses need living plants to survive and cannot live in soil or dead plant material.

The main sources of the three viruses are old, diseased cucurbit crops, cucurbits in the home garden, and cucurbit weed species such as wild gherkins (Cucumis anguria) and paddy melons (Citrullus lanatus). They are then spread from these plants into young crops by aphids.

WMV can also infect a range of other plant species, including legumes, carrot and weed species in several plant families. ZYMV may also infect several crop and weed species outside the cucurbit family. PRSV-W is confined to crop and weed species within the cucurbit family. A closely related strain (PRSV-P) infects papaya.

While these alternative hosts may aid survival of the viruses between seasons, infected cucurbit crops are the major source of virus for new plantings.

PRSV and WMV are not seed-borne but infrequent and very low levels of seed transmission (<1%) have been found for some ZYMV strains. Affected seeds often lack vigour and germinate poorly.

The role of aphids in spreading the viruses
The viruses are spread by many species of aphids moving through or within a crop. The aphids pick up the virus after feeding on infected leaves for only a few seconds and remain capable of spreading the virus for up to several hours after feeding. Winged aphids may be carried several kilometres by wind.

In this way, small numbers of aphids are able to successfully spread the viruses to large numbers of plants. As a result, devastating
crop losses can occur without significant numbers of aphids being observed.

Most commonly, virus is spread by aphid species which do not settle and establish a colony within a crop but move from plant to plant, briefly tasting as they search for suitable host plants.

**Disease control**

All three viruses can be managed using the same methods.

As the greatest yield losses occur when plants are infected early in life, control measures are aimed at delaying and minimising the levels of virus within crops. No single measure provides complete control and integrating multiple measures will provide better control.

Control options include:

- destroying old cucurbit crops as soon as harvesting is completed
- destroying weeds and volunteer cucurbits within and around crops as these harbour the viruses and/or the aphids
- separating new crops from maturing crops as these will have high levels of virus infection
- avoiding overlapping crops of cucurbits, particularly zucchini
- arranging sequential plantings so that younger plantings are upwind of older crops
- separating crops, for example by using blocks of non-susceptible crops
- using resistant or tolerant varieties. These are available for all three viruses in pumpkin and zucchini
- using super-reflective plastic mulches, as these deter aphids from landing on leaves and can delay disease development in zucchini and other cucurbit species which do not rapidly cover the mulched area
- combing super-reflective mulches with weekly applications of stylet oil, applied to cover leaf surfaces thoroughly.

Regular insecticide applications generally have little effect on the spread of these viruses, as it usually occurs with very short feeding times. Some insecticides actually increase virus spread as the chemicals agitate the aphids causing more frequent movement and feeding.

Severe yellow mosaic on a pumpkin leaf infected with ZYMV. Leaf distortion and blistering is also common. The symptoms for PRSV and WMV also look similar.

A watermelon infected with erect terminals which is a common early symptom of PRSV infection.

Plants infected with ZYMV or PRSV regularly fail to set fruit, with those that do being small and distorted.

**More information**

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