

IDENTIFICATION AND MANAGEMENT OF A FUNGAL DISEASE COMPLEX IN MELONS

PROJECT VM22001

WHAT IS MOSAIC DISEASE

Mosaic disease of cucurbits is caused by *Papaya ringspot virus* (PRSV), *Watermelon mosaic virus* (WMV) and *Zucchini yellow mosaic virus* (ZYMV). Any of these three *Potyvirus* species can cause the disease. Geographically, mosaic disease is mostly caused by PRSV in Queensland, WMV in New South Wales and ZYMV in Western Australia. As all three viruses can occur in all growing districts, mixed infections can occur, however, this is not common in Australia. Mosaic disease affects all cucurbit crops including melons.

What does it look like?

A typical symptom of the disease is the yellow-green mosaic pattern on leaves, hence the name mosaic disease. Leaves can also have a blistered appearance and become shoe stringed and stand upright (Figure 1 - A). Fruit also can have a blistered appearance, mosaic patterns and/or concentric rings. In melons the most common fruit symptom is the concentric ring pattern (Figure 1 - B).



Figure 1. Typical symptoms of Mosaic disease in cucurbits. (A) leaf symptom on pumpkin leaves, (B) fruit symptom on watermelon

These symptoms can be confused with other virus infections, such as *Cucumber green mottle mosaic virus* (CGMMV) and *Melon necrotic spot virus* (MNSV). Diagnostic testing may be needed to verify which virus is present. Some of the symptoms can also be confused with nutrient disorders, herbicide damage or mite feeding damage.

A key difference between virus infection and other causes is the location of symptoms on the plants. Typically, with viruses, the symptoms will be on new growth rather than old growth and the plants will not grow out of the symptoms.

Where does it come from?

The major source of potyvirus causing mosaic disease is from other cucurbits, particularly old infected crops. Cucurbit weeds are an important source of the viruses in the environment for transfer into early crops, and once established in crops, they then become the major source for subsequent plantings. The main cucurbit weed host to be aware of is prickly paddy melon (*Cucumis myriocarpus*) (Figure 2), although other wild and weedy cucurbits are also likely to host the viruses (e.g citron melon - *Citrullus amarus* and West Indian gherkin or burr gherkin - *Cucumis anguria*). These weeds often have mild or absent symptoms but still remain a source of virus.

Of the three potyviruses causing mosaic disease, only ZYMV is known to be seed-borne, and seed is not considered a high-risk source of the virus.



Figure 2. Prickly paddy melon (*Cucumis myriocarpus*)
© Weeds of Melbourne

How is it spread?

The potyviruses can be spread by insects but only a select few species of aphids. The most common of these aphid virus vectors include green peach aphid (*Myzus persicae*), melon aphid (*Aphis gossypii*) and cowpea aphid (*Aphis caraccivora*). The potyviruses are spread in a non-persistent manner, which means the viruses are present only in the aphid's mouthparts and do not circulate within the insect's body. Consequently, non-persistent virus spread is very fast, requiring only a few minutes of feeding for the aphids to pick up the virus and transfer it to a new plant. The two key implications of this are (1) insecticides can not work fast enough to stop the spread and (2) actions that agitate the aphids increase virus spread (e.g use of insecticides).

A second major mechanism for virus spread is in sap on equipment or people.

The potyviruses are relatively stable in contaminated plant sap, at least for short periods of time. For example, trials in zucchini showed a rapid increase in virus spread once harvesting of fruit began. This is less of a concern for melon crops as harvest frequency is much less than with zucchini.

How to manage Mosaic disease?

Management of mosaic disease starts with minimising pathogen sources prior to planting to limit or prevent introduction into newly planted crops. The three key cornerstones to manage mosaic disease are (1) use quality seedlings, (2) reduction of virus sources (crop debris, volunteer cucurbit seedlings and cucurbit weeds) prior to planting and (3) limited use of insecticides. Integrated pest management in melons is essential given the overlap in conditions and sources between multiple insect pests including aphids, whitefly, thrips and mites.

An Agreco Australia field trial in Bundaberg, QLD, evaluated different ways to treat old crop debris to minimise virus spread into new plantings. The important points from this trial were:

1. There was no correlation between aphid numbers and virus incidence. This is not surprising as virus spread often occurs with very low aphid numbers and given the symptoms are only seen 7-10 days after virus infection, the aphids that are seen are not the ones that caused the infection.
2. Herbicide treatment of old crop debris resulted in the least amount of virus spread into new plants over time compared to turning the water off or slashing the old plants, even when insecticide or oil was applied to plants prior to slashing.
3. There was some initial spread of virus from plants treated with herbicide, presumably due to disruption of the aphids; however, there was no cumulative increase in virus incidence as the dying plants were no longer attractive to the aphids. By contrast, virus spread continued with the remaining treatments.

Insecticides are useful to manage insect pests in melon crops and should be applied in this way. Additional or specific use to control mosaic disease will not provide benefit. Some insecticides claim to reduce virus spread; however, this is for a very different group of viruses, those that are persistently spread by insects. After the aphids pick up these persistently spread viruses during feeding, the viruses need to circulate within the insects' body to the salivary glands before the insect can transfer them to a new plant. This means there is sufficient time for the insecticide to stop the insect feeding before the virus transfer can occur. The opposite occurs with the potyviruses as they only need to be present on the aphid mouthparts for spread to occur. Consequently, the spread is very quick, and thus there is not sufficient time for these insecticides to stop virus transfer.

Figure 3 illustrates the major source of mosaic disease for new plantings. For example, where there is regrowth of old infected melon plants and aphid presence there is a high risk of virus transfer.

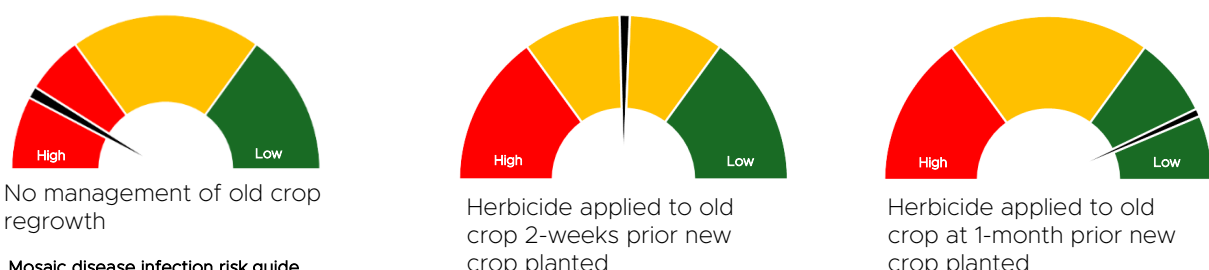


Figure 3. Mosaic disease infection risk guide

References

Information within this factsheet is adapted from 'A guide to identification and management of major virus diseases affecting Australian field vegetable crops' (2022) Hort Innovation project VG16086.

Field trial data cited in this article was also generated within the same Hort Innovation project.