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## DISEASE NOTES OR NEW RECORDS

# Carrot as a natural host of *Watermelon mosaic virus*

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*Abstract.* Carrot was confirmed as a new natural and experimental host of *Watermelon mosaic virus* by serology, host reactions and sequence comparisons of the coat protein.

Carrot (*Daucus carota*) is an important vegetable crop in southern Queensland and is grown during the cooler autumn to spring period. As part of a national survey for the presence and incidence of the potyvirus Carrot virus Y (CarVY) in Australia (Latham and Jones 2004; Latham *et al*. 2004), carrot crops in four production areas in southern Queensland were surveyed. Samples were initially tested using the generic potyvirus monoclonal antibody (Agdia Inc., USA). Any positives from this group were then tested individually against antibodies to *Celery mosaic virus* (CeMV) (DSMZ, Germany) which is serologically closely related to CarVY (Moran *et al*. 2002). Carrot samples reacting with CeMV antibodies were classified as CarVY as previous work had shown that CarVY, not CeMV, naturally infects carrots in Australia (Moran *et al*. 2002; Latham *et al*. 2004).

During this work, eight samples from cv. Stefano reacted with the generic potyvirus antibodies but failed to react with antibodies to CeMV, suggesting that a potyvirus outside the CeMV sub-group was present. RNA was extracted from one sample (isolate 1286) using an RNEasy Plant Mini Kit (QIAGEN) according to the manufacturer's directions. Complementary DNA synthesis, PCR amplification, cloning and sequencing were performed as previously described (Parry *et al*. 2004). A consensus sequence of 438 nucleotides was obtained from three clones of isolate 1286 and when translated and aligned using FASTA, these 146 amino acids had an identity of 99.3% with *Watermelon mosaic virus* (WMV, GenBank accession AAA484).

When isolate 1286, and six other isolates from carrot which did not react with CeMV antibodies, were tested against WMV antibodies (WMV 2 BIORAD Cat. No. 51276-DAS ELISA as per manufacturer's protocol), all gave strong positive values in ELISA. One isolate was positive for both WMV and CeMV, indicating a mixed infection with CarVY.

When inoculated to a range of test plants, two isolates (1286 and 1414) produced symptoms typical of WMV including systemic mosaic on *Cucurbita pepo* cvv. Blackjack and Green Buttons, and *Nicotiania benthaminia*. Symptoms developed on the inoculated leaves only of *Chenopodium amaranticolor* and *Phaseolus vulgaris* cv. Bountiful. Infection of test plants was confirmed by ELISA.

The two isolates were propagated in *C. pepo* and then inoculated to seedling plants of the carrot cvv. Murdoch, Stefano, Condor and Ricardo (three pots/cultivar/isolate). No clear symptoms were seen in the carrot plants over a 6 week period. However, infection with WMV was confirmed in all cultivars by testing samples from young leaves by ELISA.

In this work, serology, sequence analysis and host reactions have confirmed that carrot is a natural host of WMV. Although several species of Apiaceae are known to be hosts of WMV, this appears to be the first record for carrot as either a natural or experimental host.

Although carrot was symptomless and most likely little affected by the virus, it could have a role as an alternative host, providing inoculum for more sensitive hosts. During the survey in southern Queensland, WMV was found at only a low incidence in carrot crops but still more frequently than CarVY. The latter was detected from only one location in one sample (Latham *et al*. 2004). A possible reason for this is that WMV is endemic in southern Queensland (Greber 1978) and infects almost all cucurbit species, thus providing a greater inoculum source. In contrast, CarVY has a very limited host range within Apiaceae and carrots are not grown commercially in the region during the hot summer months.

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