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Perspective

Disrupt the Carrot Virus Y Crop Growth and their Developments

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DESCRIPTION

Carrot virus Y (CarVY) is a newly described potyvirus that causes disease in carrot leaves and roots, significantly reducing yield and quality. It infects crops in most commercial carrot growing areas in Australia. Infection sometimes reaches very high rates in individual plants, leading to them being abandoned because the roots are not marketable. A wide range of commonly grown carrot varieties are susceptible. Symptoms of CarVY disease on carrot leaves are yellow speckling, leaf edge necrosis or overall red and yellow leaves, more divided leaflets creating a "feather" appearance and stunted plant growth. The roots of early infected plants were stout and had severe deformations and nodules, while late infected plants were thin and minimally deformed. The known host range of CarVY is very narrow, and the main source of infection by aphid vectors to newly sown plants is infected "volunteer" carrots and neighboring infected carrot plants.

Continuous irrigated carrot production in sequential plantings on the same farm throughout the year results in widespread viral infection, while intermittent production results in low disease incidence. The exposure of young carrot plants to the maximum aphid population causes the first epidemic. Case histories showing how control measures affected the incidence of CarVY were described for farms that implemented them compared to farms that did not. An integrated control strategy designed for sustainable management of CarVY disease in carrots is described. Preliminary testing indicates that seed transmission of CarVY may occur at low levels in carrots, so introduction of the virus to quarantine sites may be the result of accidental seeding contaminated carrots.

Models of carrot virus Y (CarVY) spread were examined in carrot plantations in Western Australia, in which naturally transmitted aphids spread the virus from external sources of infection. In three field trials, CarVY "infected" plants were introduced into or at varying distances from carrot plantations. There was a clear decrease in the incidence of CarVY with distance from nearby sources of infection. Expanding and consolidating clusters of infected plants are concentrated near these sources, but later, isolated, expanding clusters of plants form farther away. With a small external source of virus, the initial spread at the edge of the plantation will be less widespread than with a larger source. When 15 m wide fallow areas separated the CarVY source from the carrot plots, spread was much slower than when the distance was only 1 m; the upwind direction of this source is also slower than the downwind direction of this source.

The data collected helps validate the inclusion of isolation and "safe" planting spacing, intermediate fallowing, upwind planting, rapid removal of virus sources, avoidance of adjacent coastal plantings, and manipulation planting dates as part of an integrated disease management strategy for CarVY crops in carrots.

For at least 10 years, carrot breeders in the UK have reported that carrot roots show internal necrosis around the root core, extending from tip to tip, and this is thought to be related to the presence of presence of viruses. During the 2009 growing season, some growers found up to 10% of their yield affected by these symptoms, although symptom development appeared to be locally significant, with many growers reporting

CONCLUSION

There were no signs of root symptoms in the plants. It is difficult to classify affected carrots because symptoms tend to be internal. Results from a limited investigation conducted in 2010 suggest that there may be an association between the presence of root necrosis symptoms and viral infections. However, the majority of carrots tested in previous research were negative when tested for PYFV or Carrot Motley Dwarf (CMD) virus complexes. This finding raises the question of whether other viruses can cause the development of carrot root necrosis. Worldwide, more than 30 viruses are known to affect carrots.

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