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Engineered citrus virus silences key psyllid genes, offering new route to control citrus greening

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RNA interference strategy targets the insectâ??s osmoregulatory system, reducing survival and reproduction across two generations in laboratory research



Researchers have engineered a citrus-infecting virus to disrupt essential physiological functions in the Asian citrus psyllid, the insect responsible for spreading the bacterium associated with citrus greening disease. The approach significantly reduced the pest's survival, lifespan and reproductive capacity, pointing to a potential new direction for citrus pest management. The study, published in Pest Management Science in October 2026, developed recombinant Citrus tristeza virus (CTV) vectors to deliver gene-silencing molecules targeting the Asian citrus psyllid (Diaphorina citri).

The psyllid transmits Candidatus Liberibacter asiaticus, the bacterium associated with huanglongbing (HLB), commonly known as citrus greening. The disease is among the most damaging threats to citrus production worldwide, while control of its insect vector continues to depend heavily on repeated insecticide applications.

Targeting the psyllid's physiological balance

The research focused on two genes involved in osmoregulation — the biological process that helps an organism maintain its internal water and solute balance. Using engineered CTV vectors, the researchers targeted the psyllid's sucrose hydrolase gene (DcSuh) and aquaporin gene (DcAQP). These genes support the insect's ability to regulate physiological conditions while feeding on the sucrose-rich phloem sap of citrus plants.

The engineered virus enabled citrus plants to produce double-stranded RNA designed to silence the corresponding genes in psyllids feeding on them. This plant-mediated RNA interference approach disrupted functions considered essential to the insect's development and survival.

Effects extend to survival and reproduction

Psyllids reared on citrus plants infected with the engineered viral vectors showed significant reductions in survival, longevity and fecundity. Gene silencing was also associated with developmental abnormalities and higher mortality. Importantly, the effects continued across two successive generations, suggesting that the RNA interference response was sustained beyond the initially exposed population.

The findings identify the psyllid's osmoregulatory pathways as potential targets for population suppression. They also demonstrate the potential of CTV-based vectors as a delivery platform for plant-mediated gene silencing in citrus.

From laboratory findings to pest management potential

The research offers a possible biological approach to complement existing strategies for managing the Asian citrus psyllid. By targeting essential insect genes through the host plant, the technology could provide an alternative research pathway to conventional insecticide-led control. However, the findings represent a research-stage advance rather than a commercially established pest-control solution. Further work will be needed to assess field performance, delivery reliability, durability, non-target effects, regulatory requirements and practical deployment at commercial orchard scale.