

HOW VIRUSES ATTACK PLANTS

Viruses are incapable of reproducing without the help of a host, whose cells copy their genetic material and fabricate the building blocks of new virus particles. Most plant viruses are transmitted by insect vectors that cause damage to the plant and create an entry point for pathogens, or that tap into the phloem to feed. Once inside, viruses use the handful of genes in their tiny genomes to orchestrate the plant cells' machinery, while evading the plant's defenses. Below is a generalized depiction of this infection process for RNA viruses, the most common type of plant virus.

Some viruses can infect plants when aphids and other insects tap into the phloem to feed. Such insect vectors can also pick up virus particles and carry them to new plant hosts.

Other viruses infect plant cells through a wound site created by a leaf-munching insect such as a beetle.

Viral capsid shell opens to release the viral genome, which is translated into proteins that direct the formation of a viral factory from membranes of the endoplasmic reticulum and other organelles.

Viral factories

Phloem
Xylem

Some virus particles enter the plant's transport streams.

Viral RNA is replicated and exported to the cytoplasm.

Movement proteins

Viral RNA and newly assembled viral particles move to other cells through plasmodesmata, which can be widened by virus-encoded movement proteins.

Argonaute proteins

Antiviral proteins, such as those in the Argonaute family, patrol cells for invading pathogens, but they cannot break into the viral factories.