

Viruses in Pumpkins

Jerry Brust, IPM Vegetable Specialist
University of Maryland
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Several aphid species are responsible for transmission of the most common viruses in pumpkins. Although some cucumber beetles have been shown to vector some viruses (Cucumber mosaic virus) their success rate under field conditions makes them a minor contributor to most virus infection problems. However, squash mosaic virus I and II (SqMV) is vectored most commonly by spotted cucumber beetles and a few other species of cucumber beetles but not by aphids, the striped cucumber beetle or the western corn rootworm beetle. The spotted cucumber beetles can carry the virus for 10-20 days and transmit the virus when they regurgitate fluid into their feeding site. SqMV-I infection usually results in mild plant symptoms while SqMV-II infection results in severe plant symptoms. SqMV is usually first introduced into a field via seedborne infection and is not very common in pumpkin and squash fields in the mid-Atlantic compared with the viruses vectored by aphids.

Aphid vectored viruses belong to two main virus families: potyviruses: papaya ringspot virus type W, (PRSV-W), watermelon mosaic virus (WMV, formerly called WMV-2), and zucchini yellow mosaic virus (ZYMV); and cucumoviruses: cucumber mosaic virus, (CMV).

Aphid Virus Infection and Symptoms

Both WMV and CMV are capable of infecting all commercially grown cucurbits.

The most common symptoms caused by these viruses are leaf mosaic (variegated patterns of dark and light green to yellow that form a mosaic) and leaf distortion. Symptoms may vary from plant to plant according to the species or varieties, viral concentration in the plant, timing of infection, single or mixed infection, or temperature. External symptoms may develop within four or five days after young plants become infected, but may take up to 14 days to develop when the foliage is older and more mature. Symptoms develop more rapidly at 79° to 89°F than at 61° to 75°F. Virus symptoms are more severe on plants exposed to short days or reduced light than on plants exposed to long days and bright light. Cucurbit plants rarely become infected in the seedling stage. When this does happen, the cotyledons may turn yellow and wilt. New leaves are slightly mottled a yellowish green; remain small, wrinkled, and distorted. Plants infected in the seedling stage remain dwarfed or may die, and seldom produce fruit.

Typically, viruses affect pumpkins by causing lumps, bumps and rings to appear on the skin of the fruit. However, at times there is little loss if the pumpkin fruit has been pollinated and begins to grow before virus infection occurs. Infection just at pollination may cause the pumpkin fruit to have blotches or stripes of green or yellow color. If the plant is infected before pollination there usually is no fruit production, but if some are produced then symptoms on the fruit include surface discoloration, bumps and other fruit deformity, early browning, shrinking or death, small fruit size and poor yields. Secondary infection by other microorganisms may occur on the virus infected fruits and cause soft rot.

On pumpkin plants, viruses can either infect the plant alone or together. If a plant is infected by only one virus, the symptoms generally are milder than if by two or more. Infection by two viruses initially causes strong mosaic and distortion on leaves. Infected plants have smaller and smaller new leaves. Late stage infections include leaves that turn yellow or become scorched along the edge.

Aphid species

Out of a possible 40 species of aphids that can be found in pumpkin fields, only four have been shown to carry and effectively transmit the mosaic viruses. The melon (*Aphis gossypii*) and green peach (*Myzus persicae*) aphids were strong vectors while the potato (*Macrosiphum euphorbia*) and bean (*Aphis fabae*) aphids were fairly poor vectors. The corn leaf aphid is one of the most numerous in pumpkin patches, but does not carry the virus.

Management

Aphids transmit the virus to plants through their sucking mouthparts. Viruses that are non-persistently transmitted as are almost all the pumpkin viruses are difficult to manage because the aphids acquire and transmit the virus so quickly. The non-persistent (NP) acquisition or transmission of the virus is completed in a matter of seconds to 1 minute. NP viruses cannot spread very far from where they were originally acquired. Pesticides sprayed on the plant will eventually kill the aphids, but too late to stop them from transmitting the virus. Therefore, insecticides have little effect on NP virus transmission by transient, non-colonizing aphids, though insecticides can control direct damage by insect feeding and honeydew production. These insecticides include Fulfill, Thionex, some pyrethroids and the neonicotinoids.

Resistant varieties: A limited number of resistant pumpkin varieties are available for certain viruses ('Jack-be-Little' to CMV and 'Magician' has moderate resistance to ZYMV).

Reflective mulch: This mulch is highly reflective and the light reflecting off the mulch confuses the aphids who register light wavelengths of open sky when they fly over the mulch and therefore do not land in the area. The mulch works until the pumpkin plants cover the plastic mulch. This control method can increase the time with no infection occurring in the pumpkin field by 2-4 weeks.

Planting dates: Virus infection is less severe when pumpkins are planted earlier in the season. The fruit is not affected as much in earlier plantings because the fruit was set before the virus arrived. How early pumpkins can be planted depends on your market.

Weeds as Alternative Hosts

Many weeds are capable of acting as reservoirs for the virus even though they show no symptoms. Aphids will often land on these plants and probe and "taste" the plants at which time they acquire the virus in a matter of seconds. Some of these weeds include: Shepherd's purse, Virginia pepperweed, Chicory, Canada thistle, Jerusalem artichoke, Prickly lettuce, Dandelion, Cocklebur, Endive, Escarole, Sunflower, Yellow rocket, many Wild mustards and radish, Marsh yellowcress, Pennycress, several Chickweed species, Common lambsquarters, and most Morning glory and Speedwell weeds.