

INSECT VECTORS MOVE DISEASE

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Insects can be vectors of many plant pathogens including bacteria, mycoplasmas, viruses and fungi. They spread diseases in two basic methods; first, they carry fungal spores around with them like a bee pollinating plants. These spores are superficial and simply contaminate the insect. In greenhouses, fungus gnats and shore flies have been proven to move living spores of such root pathogens as *Pythium*, *Fusarium* and *Thielaviopsis* from infected plants to others in the growing area. Other insects spread disease when they feed on an infected plant or weed. Insects like aphids, glassy winged sharpshooters or psyllids, can pick up a virus or bacterium in as short a feeding time as ten seconds. The pathogens (virus or bacterium) can remain in their mouth parts or digestive tract for the rest of their lives, allowing the insects to transmit the pathogens throughout their lives.

Aphids (*Myzus persicae*, *Aphis gossypii* and *Aphis craccivora*) are known to transmit many viruses like cucumber mosaic virus (CMV), tobacco ring spot virus and dasheen mosaic virus (DMV). It takes less than one minute of feeding for an aphid to acquire some viruses. Cucumber beetles also transmit CMV. Control of viral diseases is mostly accomplished through cultural methods. Destroy infected plants, disinfect cutting tools and send plants with suspicious symptoms to a diagnostic lab for problem identification. Finally, control of aphids with insecticides is essential since they can spread many viruses from weeds around the growing area into your crop.



Aphid infestation on squash

Fungus gnat (*Bradysia coprophila*) larvae pick up spores as they move around and feed in the potting media and soil. When they become adult flies, these spores may stick to their bodies. In addition, fungus gnats and other flies spread disease by wounding cuttings and roots allowing fungal pathogens in the potting medium or soil can enter roots via the wounds caused by feeding. **Shore flies** (*Scatella stagnalis*) sometimes have *Thielaviopsis basicola*, *Pythium*, *Erwinia* and *Pseudomonas* in their excrement (frass) which is left on the soil around plants or on leaves. In 1990, it was proven for the first time that healthy plants could develop disease after only 6 days of exposure to *Pythium*-carrying fungus gnats and shore flies. A more recent study of *Fusarium* root and stem rot

on *Lisianthus* in 2005, showed that shore flies, fungus gnats and moth flies all were able to transmit this disease. Shore flies had the fungi both interior and exterior while the other insects only had spores on their bodies. Control of disease depends jointly on control of the insect and the fungi. Discard infected plants regularly and use fungicides preventatively. Shore flies are especially difficult to control. Eliminate breeding sites-organic debris and standing water and use insecticides if necessary.



Fungus gnats eat gerbera plug roots to kill the plant

Whiteflies (several species including *Bemisia argentifolii* and *Trialeurodes vaporariorum*) transmit viruses both by feeding and by moving disease on their bodies. There are 66 types of Gemini viruses that primarily damage vegetable crops although some ornamentals are affected. These viruses cost \$140 million in Florida tomato crop in 1991-2. Ornamental viruses are on the rise and a special working group has been very active in their identification for the past 5-6 years. Always send unusual symptoms to a diagnostic lab for proper identification in order to prevent losses due to new viruses.



Sooty mold can grow on whitefly honeydew excretion

Thrips, especially the Western flower thrips (*Frankliniella occidentalis*) spreads Tomato Spotted wilt Virus (TSWV a TOSPO virus). This virus is acquired while thrips are larvae and then transmitted via adults. It only takes 5 minutes of feeding to give virus to the plant in sufficient numbers for infection to occur. Thrips often acquire TSWV from nearby weeds like oxalis, chickweed, jewelweed, bittercress, and prostrate spurge. Extensive research in the early 1990's led to the discovery that a new virus was present. Impatiens Necrotic Spot Virus (INSV, which is closely related to TSWV) is a continuing problem in ornamentals especially. These two TOSPO viruses are the most commonly found virus in ornamentals produced in greenhouses. In 1993, a Canadian study tested efficacy of horticultural oil and insecticidal soap on thrips feeding. Horticultural oil decreased viral transmission and insecticidal soap seemed to lessen thrips feeding damage but did not have an effect on viral transmission. Use insecticides wisely, eliminate weeds growing in and around greenhouses and never use symptomatic plants for propagation.



These black thrips are easily seen with the naked eye on this calla lily

Psyllids (*Diaphorina citrii*) carry *Liberobacter* sp. (a phloem-limited bacterium) that causes Citrus Greening Disease. This disease can kill citrus trees in about 5 years and since it normally takes an orange tree 10 years before it is profitable this can be a severely damaging problem. This disease was first found in Florida in 2005. The bacterium also infects periwinkle, *Nicotiana xanthii* (a tobacco relative) and mock orange.

Glassy Winged Sharpshooter (GWSS, *Homalodisca coagulata*) is a large insect, about ½" long with ivory or yellow stippling on their brown backs. They transmit Pierce's Disease which is a xylem-limited bacterium (*Xylella fastidiosa*) that chokes off the xylem in oleanders, grapes, stone fruits and a growing list of native and cultivated landscape trees. Pierce's disease can kill an oleander or grape in as little as 1-2 years. Pierce's Disease has been transmitted by blue-green sharpshooters for many years. These sharpshooters are small weak insects that are unable to fly for long distances. In contrast, the

GWSS can travel up to ¼ mile per trip, feeds on leaves of a very large host range of plants and effectively transmits the disease.

Insect Vector	Disease	Vector Method
Aphids	Viruses like CMV and DMV	Feeding
Fungus gnats Shore flies	Fungal root rot diseases (Fusarium, Pythium)	Physical transmission and feeding
Glassy-winged Sharp shooters	Xylem-limited bacteria (Pierce's disease)	Feeding
Psillids	Bacterial disease (Citrus greening gisease)	Feeding
Thrips	TOSPO viruses	Feeding
Whiteflies	Gemini viruses	Feeding and physical transmission