

Common Weed Hosts of Insect-Transmitted Viruses of Florida Vegetable Crops¹

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Weed growth can severely decrease the commercial, recreational, and aesthetic values of crops, landscapes, and waterways. More information on weeds can be found in Hall et al. (2009i). Other than affecting crop production by reducing the amount of nutrients available to the main crop, weeds can also influence crop production by acting as reservoirs of various viruses that are transmitted by insects. Several insects transmit different viruses in different crops, but aphids and whiteflies are among the most important virus *vectors* (carriers of viruses) on vegetable crops in Florida. The insect vectors feed on various parts of weeds that are infected by a virus and acquire the virus in the process. They then can feed on uninfected agricultural crops and transmit the virus to them. Insects are often attracted to weeds and survive on them because weeds can provide food for insects when preferred food is scarce, or weeds can provide shelter from adverse conditions such as bad weather or pesticide applications. Several weeds have been reported as virus hosts by Kucharek and Purcifull (2001). The current publication includes additional and updated material since that time and provides links to further information on specific viruses that affect vegetable crops. Certain volunteer vegetable plants can also act as sources of viruses that endanger the main crop.

Information on weed hosts of various vegetable viruses can be found in Table 1. Virus names are often based on the name of the vegetable they attack; however, certain viruses affect many different vegetables, e.g., *Cucumber mosaic*

virus attacks bell pepper, tomato, spinach, cantaloupe, cucumber, pumpkin, squash, celery, and watercress. References to appropriate publications are provided for easy cross-reference and more details about the virus under consideration. Common viruses with their family and genus names are provided in Table 2. Information is also provided for each vegetable that was reported infected by the virus, and on the insect vectors that transmit the virus. Some viruses, such as *Tomato mosaic virus*, are not transmitted by vectors. Others, such as *Bean common mosaic virus*, can be transmitted by vectors or through seed. Detailed information about viruses and their transmission has been summarized by Adams and Antoniw (2011). Common and scientific names of weeds that act as virus sources are listed in Table 3.

Removal of weeds that act as virus sources may be helpful in reducing the initial infestation by a virus of the main crop in the same field as well as other fields that are near the weeds. Removal of volunteer plants from field borders may also help in management of viral diseases (Momol and Pernezny 2006).

While a number of weeds in and around fields of different crops can act as virus sources for the main vegetable crop, some of them are particularly important because of their ability to host a number of different viruses. A few of these are balsam apple (Figure 1), creeping cucumber (Figure 2), groundcherry (Figure 3), dayflower (Figure 4), American

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black nightshade (Figure 5), hairy indigo (Figure 6), and citron (Figure 7). The American black nightshade is common in Florida (MacRae 2010), and it is possible that some of the references to “nightshade” in Table 1 or to “black nightshade” may actually refer to this plant. Recognition of these common virus host plants is important because they may be reservoirs for viruses, allowing them to survive during the off-season when the main vegetable crops are not grown.



Figure 1. Balsam apple (*Momordica* spp.).
Credits: Brent Sellers (Hall et al. 2009a), UF/IFAS



Figure 2. Creeping cucumber (*Melothria pendula*).
Credits: Gaurav Goyal, UF/IFAS



Figure 3. Cutleaf groundcherry (*Physalis angulata*).
Credits: Brent Sellers (Hall et al. 2009b), UF/IFAS



Figure 4. Dayflower (*Commelina* spp.).
Credits: Gaurav Goyal, UF/IFAS



Figure 5. American black nightshade (*Solanum americanum*).
Credits: Gaurav Goyal, UF/IFAS



Figure 6. Hairy indigo (*Indigofera hirsuta*).
Credits: Robert McSorley, UF/IFAS

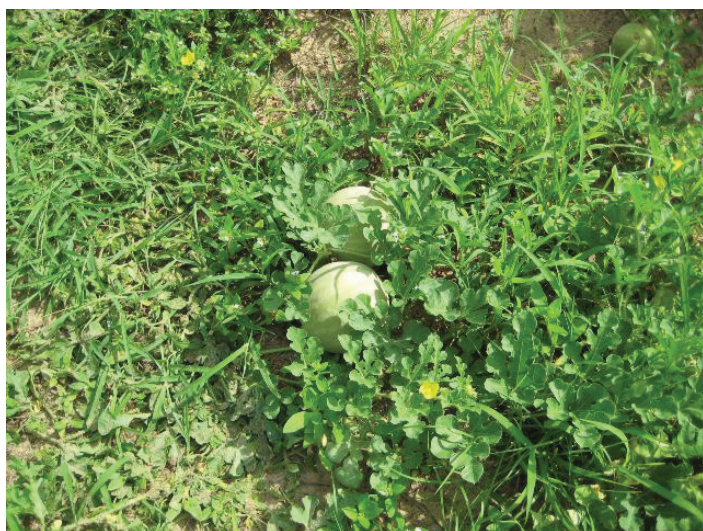


Figure 7. Citron (*Citrullus lanatus* var. *citroides*).
Credits: Gaurav Goyal, UF/IFAS

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Table 1. Weed hosts of several important vegetable viruses in Florida.

Weed Host	Virus	Reference
Alyceclover	<i>Watermelon mosaic virus</i>	Mossler and Nesheim (2011)
American burnweed	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
American pokeweed	<i>Cucumber mosaic virus</i>	Ferreira and Boley (1992)
Balsam apple	<i>Cucurbit leaf crumple virus</i>	Webb et al. (2010), Webb et al. (2011)
Balsam apple	<i>Papaya ringspot virus Type W</i>	Kucharek and Purcifull (2001), Larson et al. (2011)
Balsam apple	<i>Squash vein yellowing virus</i>	Baker et al. (2008), Adkins et al. (2008), Adkins et al. (2010)
Balsam pear	<i>Zucchini yellow mosaic virus</i>	Fukumoto et al. (1993)
Beggarticks	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
Beggarticks	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Big chickweed	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Bull thistle	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Burr clover	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Butterweed	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
Canadian horseweed	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
Canadian toadflax	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Carolina cranesbill	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Carolina desertchicory	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Cheeseweed mallow	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Cheeseweed mallow	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Chicory	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Citron	<i>Watermelon mosaic virus</i>	Kucharek and Purcifull (2001)
Clasping Venus' looking-glass	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Cocklebur	<i>Tobacco rattle virus</i>	Dikova (1946)
Common chickweed	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Common chickweed	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989), Groves et al. (2002)
Common groundsel	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Common plantain	<i>Tobacco mosaic virus</i>	Zitter and Daughtrey (1989)
Common sowthistle	<i>Tobacco etch virus</i>	Sikora (1998)
Creeping cucumber	<i>Papaya ringspot virus type W</i>	Kucharek and Purcifull (2001), Mossler and Nesheim (2011), Larson et al. (2011)
Creeping cucumber	<i>Squash vein yellowing virus</i>	Baker et al. (2008), Adkins et al. (2008), Adkins et al. (2010)
Creeping cucumber	<i>Zucchini yellow mosaic virus</i>	Kucharek and Purcifull (2001), Mossler and Nesheim (2011), Mossler (2010)
Curlytop knotweed	<i>Tobacco rattle virus</i>	Dikova (1946)
Dayflower	<i>Cucumber mosaic virus</i>	Momol and Pernezny (2006), Raid and Kucharek (2006a), Raid and Kucharek (2006b), Ferreira and Boley (1992)
Dogfennel	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Field bindweed	<i>Cucumber mosaic virus</i>	Rodríguez-Alvarado et al. (2002)
Field bindweed	<i>Pepper mottle virus</i>	Rodríguez-Alvarado et al. (2002)
Field bindweed	<i>Tobacco rattle virus</i>	Dikova (1946)
Florida beggarweed	<i>Watermelon mosaic virus</i>	Larson et al. (2011)
Groundcherry	<i>Cucumber mosaic virus</i>	Raid and Kucharek (2006b), Ferreira and Boley (1992)
Groundcherry	<i>Pepper mottle virus</i>	Rodríguez-Alvarado et al. (2002)
Groundcherry	<i>Tobacco etch virus</i>	Johnson (2011)
Hairy bittercress	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)

Weed Host	Virus	Reference
Hairy buttercup	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Hairy indigo	<i>Watermelon mosaic virus</i>	Mossler and Nesheim (2011), Kucharek and Purcifull (2001)
Henbit deadnettle	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Horse nettle	<i>Cucumber mosaic virus</i>	Raid and Kucharek (2006b), Ferreira and Boley (1992)
Horse nettle	<i>Tobacco mosaic virus</i>	Zitter and Daughtrey (1989)
Horse nettle	<i>Tobacco etch virus</i>	Johnson (2011)
Indian chickweed	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Ivy gourd	<i>Papaya ringspot virus type W</i>	Mossler and Nesheim (2011)
Jimson weed	<i>Pepper mottle virus</i>	Kucharek et al. (1996)
Jimson weed	<i>Potato virus Y</i>	Kucharek et al. (1996)
Jimson weed	<i>Tobacco etch virus</i>	Sikora (1998)
Jimson weed	<i>Tomato yellow leaf curl virus</i>	Brown and Simone (1994)
Johnsongrass	<i>Tobacco rattle virus</i>	Dikova (1946)
Lambsquarter	<i>Tobacco etch virus</i>	Sikora (1998)
Lambsquarter	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Lambsquarter	<i>Tobacco rattle virus</i>	Dikova (1946)
Lambsquarter	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Little hogweed	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Lupine	<i>Watermelon mosaic virus</i>	Mossler and Nesheim (2011)
Mallows	<i>Tomato yellow leaf curl virus</i>	Brown and Simone (1994)
Marsh parsley	<i>Western Celery mosaic virus/Celery mosaic virus</i>	Mossler et al. (2010)
Mexican pricklypoppy	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
Milkweed	<i>Cucumber mosaic virus</i>	Raid and Kucharek (2006b), Ferreira and Boley (1992)
Mock bishopweed	<i>Western Celery mosaic virus/Celery mosaic virus</i>	Mossler et al. (2010)
Mustard type weeds*	<i>Turnip mosaic virus</i>	Momol et al. (2005), Mossler et al. (2011)
Nasturtium	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Nettleleaf goosefoot	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Nettleleaf goosefoot	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Nightshade	<i>Cucumber mosaic virus</i>	Raid and Kucharek (2006b), Ferreira and Boley (1992)
Nightshade	<i>Pepper mottle virus</i>	Rodríguez-Alvarado et al. (2002)
Nightshade	<i>Potato virus Y</i>	Orsenigo and Zitter (1971), Momol and Pernezny (2006)
Nightshade	<i>Pseudo curly top virus</i>	Momol and Pernezny (2006)
Nightshade	<i>Tomato yellows virus</i>	Momol and Pernezny (2006)
Nightshade	<i>Tobacco etch virus</i>	Momol and Pernezny (2006), Sikora (1998)
Nightshade	<i>Tobacco mosaic virus</i>	Adkins and Roskopf (2002)
One leaf clover	<i>Watermelon mosaic virus</i>	Kucharek and Purcifull (2001)
Prickly lettuce	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Prickly lettuce	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Ragweed	<i>Cucumber mosaic virus</i>	Raid and Kucharek (2006b), Ferreira and Boley (1992)
Ragweed	<i>Pseudo curly top virus</i>	Momol and Pernezny (2006)
Redstem stork's bill	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Rough pigweed	<i>Tobacco rattle virus</i>	Dikova (1946)
Scarlet pimpernel	<i>Lettuce mosaic virus</i>	Koike and Davis (2009)
Shepherd's purse	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Showy rattlebox	<i>Watermelon mosaic virus</i>	Larson et al. (2011), Kucharek and Purcifull (2001)

Weed Host	Virus	Reference
Sicklepod	<i>Tobacco etch virus</i>	
Sowthistle	<i>Tomato spotted wilt virus</i>	Zitter and Daughtrey (1989)
Sowthistle	<i>Tomato yellow leaf curl virus</i>	Brown and Simone (1994)
Spiny sowthistle	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Spoonleaf purple everlasting	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
Tropical soda apple	<i>Tomato mottle virus</i>	McGovern et al. (1994)
Virginia pepperweed	<i>Bidens mottle virus</i>	Pernezny and Raid (2008)
Wild bushbean	<i>Bean golden mosaic virus</i>	Bracero and Rivera (2003)
Wild radish	<i>Tobacco rattle virus</i>	Dikova (1946)
Wild radish	<i>Tomato spotted wilt virus</i>	Groves et al. (2002)
* mustard type weeds—Shepherd's purse (Zitter and Provvidenti 1984), <i>Brassica</i> spp. (Jenner and Walsh 1996)		

Table 2. Common viruses, families, vegetable crop hosts, and their vectors.

Virus	Family	Genus	Crop Hosts	Vector
<i>Bean common mosaic virus</i>	Potyviridae	Potyvirus	Beans, snap beans	Aphids
<i>Bean golden mosaic virus</i>	Geminiviridae	Begomovirus	Beans, snap beans	Whiteflies
<i>Bean yellow mosaic virus</i>	Potyviridae	Potyvirus	Snap beans	Whiteflies
<i>Bidens mottle virus</i>	Potyviridae	Potyvirus	Endive, escarole lettuce	Green peach aphid (<i>Myzus persicae</i>)
<i>Cabbage leaf curl virus</i>	Geminiviridae	Begomovirus	Watercress	Whiteflies
<i>Cucumber mosaic virus</i>	Bromoviridae	Cucumovirus	Bell pepper, cantaloupe, celery, cucumber, pumpkin, spinach, squash, tomato, watercress	Aphids
<i>Cucurbit leaf crumple virus</i>	Geminiviridae	Begomovirus	Cantaloupe, cucumber, green beans, pumpkin, squash, watermelon, zucchini	Whiteflies
<i>Dasheen mosaic virus</i>	Potyviridae	Potyvirus	Malanga	Several species of aphids
<i>Groundnut ringspot virus</i>	Bunyaviridae	Tospovirus	Tomato	Thrips
<i>Lettuce mosaic virus</i>	Potyviridae	Potyvirus	Endive, escarole lettuce	Green peach aphid
<i>Papaya ringspot virus Type W</i>	Potyviridae	Potyvirus	Cantaloupe, cucumber, pumpkin, squash, watermelon	Aphids
<i>Pepper mottle virus</i>	Potyviridae	Potyvirus	Bell pepper	Aphids
<i>Potato virus Y</i>	Potyviridae	Potyvirus	Bell pepper, potato, tomato	Aphids
<i>Pseudo-curly top virus</i>	Geminiviridae	Begomovirus	Tomato	Whiteflies
<i>Squash vein yellowing virus</i>	Potyviridae	Ipomovirus	Squash, watermelon	Whiteflies
<i>Tobacco etch virus</i>	Potyviridae	Potyvirus	Bell pepper, tomato	Aphids
<i>Tobacco mosaic virus</i>	Virgaviridae	Tobamovirus	Bell pepper, tomato	
<i>Tobacco rattle virus</i>	Virgaviridae	Tobravirus	Potato	Stubby-root nematode
<i>Tobacco streak virus</i>	Bromoviridae	Ilarvirus	Snap beans	Thrips
<i>Tomato chlorosis</i>	Closteroviridae	Closterovirus	Tomato	Whiteflies
<i>Tomato mosaic virus</i>	Virgaviridae	Tobamovirus	Tomato	
<i>Tomato mottle virus</i>	Geminiviridae	Begomovirus	Tomato	Whiteflies
<i>Tomato spotted wilt virus</i>	Bunyaviridae	Tospovirus	Bell pepper, tomato, watermelon	Western flower thrips (<i>Franklinella occidentalis</i>), tobacco thrips (<i>F. fusca</i>)

Virus	Family	Genus	Crop Hosts	Vector
Tomato yellow leaf curl virus	Geminiviridae	Begomovirus	Tomato	Whiteflies
Turnip mosaic virus	Potyviridae	Potyvirus	Cabbage, spinach	Aphids
Papaya ringspot virus Type W	Potyviridae	Potyvirus	Squash, watermelon	Aphids
Watermelon mosaic virus	Potyviridae	Potyvirus	Cantaloupe, cucumber, pumpkin, squash, watermelon	Aphids
Western Celery mosaic virus/ Celery mosaic virus	Potyviridae	Potyvirus	Celery	Aphids
Zucchini yellow mosaic virus	Potyviridae	Potyvirus	Cantaloupe, cucumber, squash, watermelon	Aphids

Table 3. Common and scientific names of various weed hosts of viruses.

Alyce clover, <i>Alysicarpus ovalifolius</i> (Newman et al. 2010a)
American burnweed, <i>Erechtites hieraciifolius</i>
American pokeweed, <i>Phytolacca americana</i> (Stevens 2009d)
Balsam pear (= Balsam apple), <i>Momordica charantia</i> (Hall et al. 2009a)
Beggarticks, <i>Bidens</i> spp. (Hall et al. 2009h)
Big chickweed, <i>Cerastium fontanum</i> subsp. <i>Vulgare</i>
Bull thistle, <i>Cirsium vulgare</i> (Sellers and Ferrell 2010)
Burr clover, <i>Medicago polymorpha</i>
Butterweed, <i>Packera glabella</i>
Canadian horseweed, <i>Conyza</i> (= <i>Erigeron</i>) <i>Canadensis</i>
Canadian toadflax, <i>Linaria Canadensis</i>
Carolina cranesbill, <i>Geranium carolinianum</i>
Carolina desertchicory, <i>Pyrrhopappus carolinianus</i>
Cheeseweed mallow, <i>Malva parviflora</i>
Chicory, <i>Cichorium intybus</i> (Stephens 2009a)
Citron, <i>Citrullus lanatus</i> (Thunb.) var. <i>citroides</i> (Bailey) Mansf. (Stephens 2009b)
Clasping Venus' looking-glass, <i>Triodanis perfoliata</i>
Cocklebur, <i>Xanthium strumarium</i>
Common chickweed, <i>Stellaria media</i>
Common groundsel, <i>Senecio vulgaris</i>
Common plantain, <i>Plantago major</i>
Common sowthistle, <i>Sonchus oleraceus</i>
Creeping cucumber, <i>Melothria pendula</i>
Curlytop knotweed, <i>Polygonum lapathifolium</i>
Dayflower, <i>Commelina</i> spp. (Ferrell et al. 2009)
Dogfennel, <i>Eupatorium capillifolium</i>
Field bindweed, <i>Convolvulus arvensis</i>
Florida beggarweed, <i>Desmodium tortuosum</i>
Groundcherry, <i>Physalis</i> spp. (Hall et al. 2009b)
Hairy bittercress, <i>Cardamine hirsute</i>
Hairy buttercup, <i>Ranunculus sardous</i>
Hairy indigo, <i>Indigofera hirsuta</i> (Newman et al. 2010b)
Henbit deadnettle, <i>Lamium amplexicaule</i>
Horse nettle, <i>Solanum carolinense</i> (Hall et al. 2009c)
Indian chickweed, <i>Mollugo verticillata</i>

Ivy gourd, <i>Coccinia grandis</i>
Jimson weed, <i>Datura stramonium</i> (Hall et al. 2009d)
Johnsongrass, <i>Sorghum halepense</i>
Lambsquarter (Common lambsquarters), <i>Chenopodium album</i> (Hall et al. 2009e)
Little hogweed, <i>Portulaca oleracea</i> (MacRae 2010)
Lupine, <i>Lupinus</i> spp.
Mallows, <i>Malva</i> sp.
Marsh parsley (= wild cherry), <i>Cyclospermum leptophyllum</i> (= <i>Apium leptophyllum</i>)
Mexican pricklypoppy, <i>Argemone mexicana</i> (Sellers 2011)
Milkweed, <i>Asclepias curassavica</i> (Gilman 2011)
Mock bishopweed, <i>Ptilimnium capillaceum</i>
Nasturtium, <i>Tropaeolum majus</i> (Stephens 2009c)
Nettleleaf goosefoot, <i>Chenopodium murale</i>
Nightshade, <i>Solanum</i> spp. (MacRae 2010)
One leaf clover (White moneywort), <i>Alysicarpus vaginalis</i>
Prickly lettuce, <i>Lactuca serriola</i>
Ragweed, <i>Ambrosia</i> spp.
Redstem stork's bill, <i>Erodium cicutarium</i>
Rough pigweed, <i>Amaranthus retroflexus</i> (Stephens 2009e)
Scarlet pimpernel, <i>Anagallis arvensis</i>
Shepherd's purse, <i>Capsella bursa-pastoris</i>
Showy rattlebox (=showy crotalaria), <i>Crotalaria spectabilis</i>
Sicklepod, <i>Senna obtusifolia</i> (Hall et al. 2009f)
Sowthistle, <i>Sonchus</i> spp.
Spiny sowthistle, <i>Sonchus asper</i>
Spoonleaf purple everlasting, <i>Gnaphalium purpureum</i>
Tropical soda apple, <i>Solanum viarum</i> (Sellers et al. 2010)
Virginia pepperweed, <i>Lepidium virginicum</i>
Wild bushbean, <i>Macroptilium lathyroides</i>
Wild radish, <i>Raphanus raphanistrum</i> (Hall et al. 2009g)