UF IFAS Extension UNIVERSITY of FLORIDA

PP329

Viburnum Downy Mildew[1]

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Downy mildew on viburnum is currently a serious concern throughout Florida. Winters in south Florida combine high humidity with cool nights, creating ideal conditions for disease development. Downy mildews are caused by several different species of pathogens that tend to be host specific. *Plasmopara viburni* is the pathogen that affects viburnum. Some literature indicates that downy mildew is favored by nighttime temperatures of about 50 to 72°F, and the disease has been reported on viburnum from November through late March in Florida. However, the disease may be present as early as October and as late as June in central parts of Florida (Spencer-Phillips, Gisi, and Lebeda 2002; Spencer-Phillips and Jeger 2004).

Figure 1. Foliar symptoms of *Viburnum odoratissimum* 'Awabuki' affected with downy mildew.
Credits: A.J. Palmateer, UF/IFAS

Hosts

Downy mildew has been reported on several species of viburnum including *V. acerifolium, V. dentatum, V. opulus, V. pubescens, V. odoratissimum, V. suspensum, V. tinus,* and *V. trilobum*. The two predominate species in Florida are *Viburnum odoratissimum* 'Awabuki' and *V. suspensum*.

Figure 2. Typical bronzing of the upper leaf surface of *Viburnum odoratissimum* 'Awabuki' as a result of downy mildew.
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Symptoms

New growth is most susceptible and may show symptoms first. Initially, leaves may look yellowish or speckled. The upper leaf surface often appears faded and blotchy with reddish brown spots on *V. odoratissimum* 'Awabuki' (Figure 1). Downy mildew symptoms on 'Awabuki' have

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been described as a bronzing of the leaf surface (Figure 2). However, dark brown to black, angular spots on the upper leaf of *V. suspensum* are typically less blotchy and more distinct (Figure 3). The downy mildew pathogen can be seen colonizing the underside of diseased leaves. Note the whitish gray downy-like growth on the underside of 'Awabuki' and *V. suspensum* leaves (Figures 4 and 5). As the disease progresses leaves begin to drop off, and large portions of the canopy can become defoliated (Figure 6).

Figure 3. Dark brown to angular black spots on the upper leaf of *Viburnum suspensum* caused by downy mildew.
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Figure 4. Whitish-gray downy like growth of *Plasmopara viburni* on the underside of a *V. odoratissimum* 'Awabuki' leaf.
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Figure 5. Whitish-gray downy like growth of *Plasmopara viburni* on the underside of a *Viburnum. suspensum* leaf.
Credits: A.J. Palmateer, UF/IFAS

Figure 6. Large portions of a *Viburnum odoratissimum* 'Awabuki' hedge exhibiting extensive defoliation as a result of downy mildew.
Credits: Brandon Balch, Woodfield Country Club

Life Cycle of the Disease

The pathogen that causes downy mildew is a type of water mold and is more closely related to algae than to fungi. Other similarly classified pathogens include *Phytophthora* and *Pythium* spp. Downy mildew can spread by two different types of spores. One type, zoospores, move through water. The sporangia that contain and release zoospores are easily windborne. This explains why this disease is spread by splash from overhead irrigation, rainfall, and wind. The other type of spore, the oospore, forms inside plant tissues where the pathogen can survive for years. Downy mildew is very aggressive and can spread rapidly, so action should be taken quickly if it is found.

Nursery Management

High levels of sanitation must be maintained in the nursery. Plugs or newly introduced plant material brought into the nursery should be carefully inspected and rejected if any symptoms are present. Hard surfaces in the growing area between crops should be sanitized with quaternary ammonia compounds (i.e., Greenshield, KleenGrow, etc.). All plant tissue (especially leaf tissue) should be removed from between crops and should not be composted on the nursery property. Plant debris should be disposed in dumpsters that are emptied offsite.

Frequent scouting for this pathogen should be conducted, especially as evening temperatures cool during the winter time. Florida's high relative humidity makes downy mildew extremely difficult to control. Plants should be spaced to allow as much air movement between them as possible in order to hasten leaf drying after irrigation or rainfall. Preventative treatment is crucial for commercial production. Refer to Table 1 for a list of fungicides labeled for use in Florida. Hands should be washed thoroughly after handling problematic plants and before handling non-affected plants.

Landscape Management

This pathogen may erupt under high humidity, cool temperatures, and overcrowding. Overcrowding reduces the wind movement between plants that helps leaves dry more quickly. Prevention is the only effective management strategy against downy mildew. Elimination of overhead and nighttime watering, excessive fertilization, overcrowded plantings, and other stresses on the plants are helpful steps towards avoiding or reducing the occurrence of this pathogen. However, our tightly arranged mass planting practices, irrigation systems, and periodic rainfall make this difficult to achieve. Thus, the leave and stems of viburnum species purchased for the landscape should be carefully inspected before they are installed to help ensure that affected plants are rejected. Once in the landscape, the plants can still be infected by windborne spores, but it is always better to avoid introducing the pathogen on plant materials. Chemical treatments can be expensive and do not provide much curative control. They are much more effective when applied preventively.

Fungicide Resistance Management

Resistance to a fungicide occurs when a pathogen develops a genetic mutation at the target site that reduces its sensitivity to a specific fungicide. If a single fungicide continues to be used, the fungicide-sensitive portion of the population is suppressed over time, and only the resistant portion of the population remains. This population reproduces and becomes the majority. Eventually, the fungicide is ineffective because this majority of the population is no longer susceptible to it. If a pathogen is resistant to a fungicide, it is usually resistant to all fungicides in that class.

To minimize the potential for fungicide resistance, the Fungicide Resistance Action Committee (FRAC) provides codes to facilitate proper rotation of chemical families that have similar modes of action. FRAC codes make proper fungicide rotation easy and are included with the chemical recommendations in this fact sheet (Table 1). When purchasing fungicides for managing downy mildew, fungicides with different FRAC codes should be selected and the manufacturer's label followed.

Non-Commercial Homeowner Recommendations

For the management of downy mildew in the nursery and landscape, professional use fungicides are listed in Table 1.

The landscape management recommendations described above should be followed and the fungicides listed in Table 2 can be used.

References

Spencer-Phillips, PTN., U. Gisi, and A. Lebeda (Eds). 2002. *Advances in downy mildew research*. Kluwer Academic Publishers, The Netherlands, 275pp.

Spencer-Phillips, PTN and M. Jeger (Eds). 2004. *Advances in downy mildew research volume 2*. Kluwer Academic Publishers, The Netherlands, 296pp.

Additional Notes

Rhapsody or Cease (*Bacillus subtilis* strain QST 713) may also provide protection against some forms of downy mildew in Florida landscapes, nurseries, and greenhouses when applied prior to infection.

Subdue Maxx (mefenoxam) may also provide protection against some forms of downy mildew in Florida landscapes, nurseries, and greenhouses.

Soilguard (*Gliocladium virens* G1-21) may also provide protection against some forms of downy mildew in Florida nurseries and greenhouses when applied prior to infection periods.

Remember, the label is the law; be sure to use products only in a manner consistent with the manufacturer directions on the labels. Please use pesticides safely.

Table 1. Fungicides for use in managing downy mildew by commercial operations

Product (active ingredients)	FRAC Group[2]	Use[1]
Adorn (fluopicolide)	**43**	**N, L, & G**
Aliette (fosetyl-Al)	**33**	**N, L, & G**
Fenstop (fenamidone)	**11**	**G**
Heritage (azoxystrobin)	**11**	**N, L, & G**
Micora (mandipropamid)	**40**	**N & G**
Mural (azoxystrobin + benzovindiflupyr)	**11 + 7**	**N, L, & G**
Orvego (ametoctradin + dimethomorph)	**45 + 40**	**N & G**
Pageant (pyraclostrobin + boscalid)	**11 + 7**	**N, L, & G**
Protect (manganese + zinc + ethylenebisdithiocarbamate)	**M3**	**N, L, & G**
Segway (cyazofamid)	**21**	**N, L, & G**
Segovis (oxathiapiprolin)	**U15**	**N, L, & G**
Stature (dimethomorph)	**40**	**N & G**
Subdue Maxx (mefenoxam)	**4**	**N, L, & G**
Vital (potassium phosphite)	**33**	**N, L, & G**

[1]**N=Nursery; L=Landscape, G=Greemhouse**
[2]Fungicides within the same group (with same numbers or letters) indicate same active ingredient or similar mode of action

Table 2. Fungicides for use in managing downy mildew in home landscapes.

Non-Commercial Homeowner Products
Concern Copper Soap Fungicide (copper octanoate)
Ferti-lome Broad Spectrum Landscape and Garden Fungicide, Ortho Max Garden Disease Control (chlorothalonil)
Monterey Agri-Fos (phosphorous acid)
Southern Ag Liquid Copper Fungicide (copper ammonium complex)
Southern Ag Triple Action Neem Oil (extract of neem oil)