

New Disease Management Recommendations

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Black Root Rot (*Thielaviopsis basicola*). Black root rot is caused by the fungus *Thielaviopsis basicola*. It is a serious threat to pansies, petunias and vinca, and may also infect cyclamen, calibrachoa, poinsettia, primula, impatiens, snapdragon, verbena, phlox, begonia and nicotiana. Black root rot symptoms are often mistaken for nutrient deficiencies. Leaves may turn yellow and the youngest leaves become stunted and tinged with red. In mild infections, older leaves are yellow-green with the veins remaining green. *Thielaviopsis* produces a spore that can persist on floor mats, greenhouse benches, or flats/pots. It is not recommended to reuse plug trays for crops that are susceptible to black root rot. University studies have shown that fungus gnats and shore flies can move *Thielaviopsis* around a greenhouse by eating the spores and excreting them into nearby pots. Based on MSU studies, fungicides with thiophanate-methyl as the primary active ingredient (Cleary's 3336 F is an example) should be used frequently for black root rot. Terraguard has also shown to be effective in MSU studies against black root rot and is a good choice as a rotational product as it has a different mode of action (FRAC). Due to the voraciousness of this pathogen, biocontrol products are not recommended as a primary method of control. A misstep early in the disease epidemic may result in an unsalable crop; therefore, choosing an effective fungicide to control black root rot is critical. Using the highest labeled rate of each treatment with close reapplication intervals is also recommended.

***Thielaviopsis* 'A' Team**

Cleary's 3336 F/OHP 6672	1	t-methyl
Terraguard SC	3	triflumizole

Powdery Mildew. The white talcum-like colonies of powdery mildew start small but can rapidly blight the leaves, stems, and flowers of susceptible crops. Some powdery mildews can infect many different annual and perennial flowers and vegetables while others can be specific to one plant type. The abundant conidia (spores) give a white, powdery or fluffy appearance. Sometimes the disease only causes yellowing and withering of leaves and stunted plant growth and the characteristic white powdery spores are not produced, making identification of the disease difficult. High relative humidity can prompt epidemics. Gerbera daisy, calibrachoa, zinnia, asters, and verbena are very susceptible and may need to be protected with frequent applications of effective fungicides. Other crops may not need frequent fungicide treatments but should be scouted regularly for signs of powdery mildew. Research has found that certain cultivars of a plant crop may be more susceptible than others.

Powdery Mildew 'A+' Team

Eagle 20EW	3	myclobutanil
Terraguard SC	3	triflumizole

Powdery Mildew 'A/A-' Team Cont.

Mural WG	11/7	azoxystrobin/benzovindiflupyr
Broadform SC	11/7	trifloxystrobin/fluopyram

Powdery Mildew 'A/A-' Team

Pageant 38WG	11/7	pyraclostrobin/boscalid
Palladium WDG	9/12	cyprodinil/fludioxonil
Orchestra	7/11	fluxapyroxad/pyraclostrobin

Powdery Mildew 'B' Team

Heritage WDG	11	azoxystrobin
Compass O WDG	11	trifloxystrobin
Insignia WG	11	pyraclostrobin

Downy Mildew. Downy mildew is an important pathogen on several important annual crops in Michigan. In recent years, the host range has expanded and includes crops such as viburnum and basil. The specific pathogens that cause the various downy mildew diseases differ based on the host, meaning that it will not likely spread to other nearby, unrelated crops in greenhouses or in the landscape. For example, the downy mildew pathogen that infects rose will not cause disease on other ornamentals such

as coleus, snapdragon or impatiens. Downy mildew can occur on all aboveground plant parts, blighting the leaves and stems. Sometimes the first symptoms of downy mildew are confused with a nutrient deficiency or spray injury. Leaf spots may be purplish or brown and appear square since they may be limited by the larger veins. Some downy mildews, such as the one that infects roses, do not always produce a fuzzy mat of spores on the underside of the leaf that is noticeable without magnification. On other crops, such as impatiens and coleus, sporulation may be easily observed on the underside of infected leaves. When the infection becomes severe, leaves may drop from the plant, leaving the plant nearly devoid of foliage. By the time the disease is defoliating the plant, the downy mildew is advanced and stopping it becomes difficult.

Downy Mildew 'A' Team

Segovis	49	oxathiapiprolin
Subdue MAXX	4	mefenoxam
Adorn SC	43	fluopicolide

Downy Mildew 'A-' Team

FenStop SC	11	fenamidone
Micora SC	40	mandipropamid
Orvego SC	45/40	ametotocradin/dimethomorph
Segway SC	21	cyazofamid
Stature SC	40	dimethomorph

Downy Mildew 'B' Team

Compass O WDG	11	trifloxystrobin
Alude	33	phosphorous acid
Heritage WDG	11	azoxystrobin
Insignia WG	11	pyraclostrobin
Protect DF	M3	mancozeb
Pageant Intrinsic 38WG	11/7	pyraclostrobin/boscalid

Pythium Crown and Root Rot. A common and persistent disease in the greenhouse industry is crown and root rot caused by the water mold *Pythium*. This pathogen can “nibble” the feeding roots of plants, resulting in stunted growth. *Pythium* also causes severe symptoms, such as crown rot, that can result in plant death. Saturated, overwatered growing media favors the *Pythium* pathogen. *Pythium* can persist in the greenhouse and ‘hibernate’ on dirty plant containers, benches, hoses, and greenhouse walkways, ready to become activated by the right crop and weather conditions. Almost any greenhouse crop can be infected by *Pythium*, but the disease is most often found on geraniums, poinsettias, and snapdragons. Sanitation is especially important in limiting root rot. Minimizing stress on the crop by promoting good growth makes the plant less vulnerable to attack by a root rot. If *Pythium* crown and root rot is a recurring problem, growing cultivars that are less susceptible to the pathogen may be an option. Scouting is an important first step in controlling *Pythium* root rot. If *Pythium* has a significant head start, the root system of some plants will be too rotted and the fungicides will not be able to rescue them.

Pythium 'A' Team*

Terrazole L/Truban WP	14	etrizazole
Subdue MAXX EC*	4	mefenoxam
Banol	28	propamocarb

*Watch for pathogen resistance.

Pythium 'B/B-' Team

Captan	M4	captan
Empress SC	11	pyraclostrobin
FenStop SC	11	fenamidone
Heritage WDG	11	azoxystrobin
Segway SC	21	cyazofamid
Alude	33	phosphorous acid

Fungicides. Fungicides are assigned FRAC codes by the Fungicide Resistance Action Committee which are based on the mode of action of the active ingredients. Check product labels and rotate among FRAC codes when applying fungicides.

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