e-GRO Alert





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2022 Insect and Disease Management Recommendations

Each year, Dr. Mary Hausbeck and Dr. Dave Smitley release updated insecticide, miticide, and fungicide recommendations. Check out this year's recommendations for greenhouse ornamentals.

Michigan State University Extension has updated their insect and disease management recommendations for the 2022 greenhouse season. The pesticides are evaluated by a network of researchers involved in the IR-4 Project, a research group that facilitates the labeling of pesticides on specialty crops, including greenhouse crops.

These recommendations are updated yearly to reflect efficacy of pesticides as MSU Extension specialists and their nationwide colleagues perform research trials evaluating the products against common greenhouse insects, mites or diseases (Photo 1).

Photo 1. Researchers perform fungicide efficacy trials on greenhouse crops such as these snapdragons in order to provide the best recommendations for growers. Photo credit: MSU Veggie & Greenhouse Ornamental Pathology Facebook Page.

For example, at Michigan State University it is Dr. Mary Hausbeck's lab who completes the efficacy trials of fungicides on greenhouse ornamentals. These recommendations are for Michigan, so please check that all are labeled for use in your state or country.

How do researchers screen for fungicide efficacy? It may not be poinsettia season, but the process is the same for spring ornamentals. First, plant material is obtained from commercial growers to perform these trials (Photo 2). Plants are then treated with different fungicides while some are left untreated as controls. The plants are then inoculated with the pathogen-of-interest, in this case *Botrytis* on poinsettia. The plants are then bagged in order to increase the relative humidity around the plant, thereby making the environmental conditions for disease development optimal (Photo 3). The plants with different fungicide treatments and those of the control are then evaluated for disease severity and a mean disease score is determined (Photo 4). Researchers then analyze the data using statistics in order to determine if the disease severity was different between the treatments applied.

Disease management for 2022

Using these methods and the shared results among collaborating researchers, MSU Extension plant pathologist Mary Hausbeck has released her new "2022 Greenhouse Disease Management" recommendations (Photo 5). The products are classified on a range from “A+” or “B/B-” team products. The “A” team products provide the best control for the diseases, and “B” team products are those that provide limited control and are good to include in a spray rotation.

Hausbeck has also provided an updated “2022 Greenhouse Impatiens Downy Mildew Program” for both susceptible and impatiens downy mildew-resistant cultivars.

Hausbeck and her colleagues have also developed a guide for disease management specifically for vegetable and herb crops (Photo 6).

Photo 2. Finished plant material is obtained from a commercial grower for fungicide efficacy trials. Photo: Nikki Lukasko.

Photo 3. After the plants are inoculated with the pathogen, then are bagged in order to increase the relative humidity and to develop optimal environmental conditions for pathogen infection. Photo: Nikki Lukasko.

Photo 4. The plants are then evaluated for the severity of disease; Here, a poinsettia bract with Botrytis infection. Photo: Nikki Lukasko.

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Greenhouse Disease Management 2020*

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Botrytis

- "A" Team. Daconil (chlorothalonil)[M05], Decree (fenhexamid)[17], Pageant Intrinsic (pyraclostrobin + boscalid)[11/7], Affirm WDG (polyoxin D zinc salt)[19], Astun (isofetamid)[7], Broadform (fluopyram + trifloxystrobin)[7/11], Orkestra (fluxapyroxad + pyraclostrobin)[7/11], Palladium (cyprodinil + fludioxonil)[9/12], Mural (azoxystrobin + benzovindiflupyr)[11/7], Medallion/Emblem (fludioxonil – do not apply to geraniums)[12]
- "B" Team. (Not recommended when disease pressure is high). Iprodione Pro 2SE/Chipco 26019/26 GT (iprodione)[2]

Powdery Mildew

- "A+" Team. Eagle (myclobutanil)[3], Terraguard SC (triflumizole)[3], Tourney (metconazole)[3]
- "A/A-" Team. Pageant Intrinsic (pyraclostrobin + boscalid)[11/7], Palladium WDG (fludioxonil + cyprodinil)[12/9], Mural (azoxystrobin + benzovindiflupyr)[11/7], Orkestra (fluxapyroxad + pyraclostrobin)[11/7]
- "B" Team. Heritage (azoxystrobin)[11], Compass (trifloxystrobin)[11], Insignia (pyraclostrobin)[11]

Downy Mildew

- "A+" Team. Subdue MAXX (mefenoxam)[4], Adorn (fluopicolide)[43], Segovis (oxathiapiprolin)[49]
- "A-" Team. Stature SC (dimethomorph)[40], Micora (mandipropamid)[40], Orvego (ametoctradin + dimethomorph)[45/50], Segway (cyazofamid)[21], FenStop (fenamidone)[11]
- "B" Team. Alude (phosphorous acid products)[33], Heritage 50WG (azoxystrobin)[11], Insignia (pyraclostrobin)[11], Pageant Intrinsic (pyraclostrobin + boscalid)[11/7], Protect DF (mancozeb)[M03], Compass (trifloxystrobin)[11]

Phytophthora

- "A" Team. Subdue MAXX (mefenoxam)[4], Adorn (fluopicolide)[43], Micora (mandipropamid)[40], Segovis (oxathiapiprolin)[49]
- "B" Team. FenStop (fenamidone)[11], Alude (phosphorous acid products)[33], Captan (captan)[M04], Aliette WDG (fosetyl-al)[33], Segway (cyazofamid)[21], Truban/Terrazole L (etridiazole)[14], Orvego (ametoctradin + dimethomorph)[45/50], Stature SC (dimethomorph)[40]

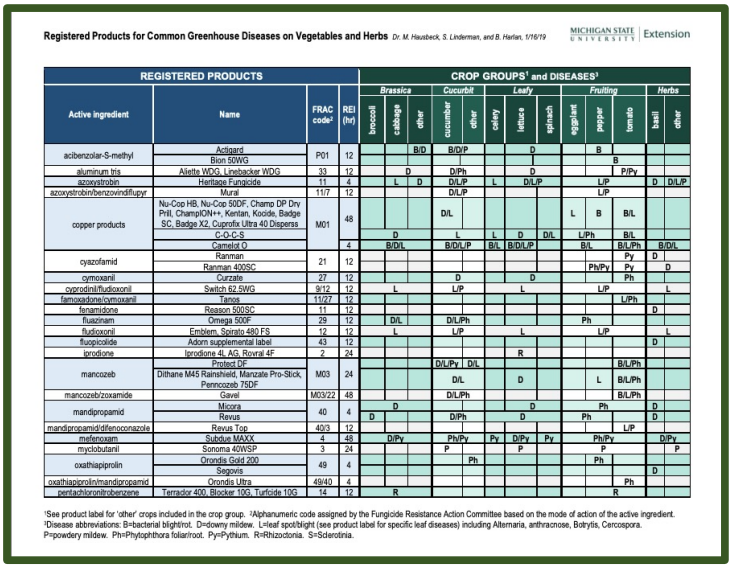
Pythium

- "A" Team. Truban/Terrazole L (etridiazole)[14], Banol (propamocarb)[28], Subdue MAXX (mefenoxam) [4/Watch for pathogen resistance]
- "B/B-" Team. Captan (captan)[M04], FenStop SC (fenamidone)[11], Heritage 50WDG (azoxystrobin)[11], Empress Intrinsic Brand Fungicide (pyraclostrobin)[11], Segway (cyazofamid)[21], Alude (phosphorous acid products)[33]

Rhizoctonia

- "A" Team. Medallion/Emblem (fludioxonil)[12], Terraclor 400 (pentachloronitrobenzene)[14], Affirm WDG (polyoxin D zinc salt)[[19], Pageant Intrinsic (pyraclostrobin + boscalid)[11/7], Tourney (metconazole)[3], Empress Intrinsic Brand Fungicide (pyraclostrobin)[11]
- "B+" Team. 3336/OHP 6672 (thiophanate-methyl)[1], Captan (captan)[M04], Heritage 50WG (azoxystrobin)[11]

Photo 5. The 2022 disease management recommendations are available for PDF download on the Michigan State University Extension website. Photo: Heidi Lindberg



Registered Products for Common Greenhouse Diseases on Vegetables and Herbs *Dr. M. Hausbeck, S. Linderman, and B. Harlan, 1/16/19*

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REGISTERED PRODUCTS				CROP GROUPS[1] and DISEASES[3]															
				Brassica			Cucurbit		Leafy			Fruiting				Herbs	
Active ingredient	Name	FRAC code[2]	REI (hr)	broccoli	cabbage	other	cucumber	other	celery	lettuce	spinach	eggplant	pepper	tomato	basil	other
acibenzolar-S-methyl	Actigard	P01	12			B/D	B/D/P			D			B			
	Bion 50WG													B		
aluminum tris	Aliette WDG, Linebacker WDG	33	12			D	D/Ph			D				P/Py		
azoxystrobin	Heritage Fungicide	11	4		L	D	D/L/P		L	D/L/P			L/P		D	D/L/P
azoxystrobin/benzovindiflupyr	Mural	11/7	12				D/L/P						L/P			
copper products	Nu-Cop HB, Nu-Cop 50DF, Champ DP Dry Prill, ChampION++, Kentan, Kocide, Badge SC, Badge X2, Cuprofix Ultra 40 Disperss	M01	48				D/L					L	B	B/L		
	C-O-C-S			D			L		L	D	D/L	L/Ph		B/L		
	Cameleo O		4		B/D/L		B/D/L/P		B/L	B/D/L/P		B/L		B/L/Ph		B/D/L
cyazofamid	Ranman	21	12											Py	D	
	Ranman 400SC												Ph/Py	Py		D
cymoxanil	Curzate	27	12				D			D				Ph		
cyprodinil/fludioxonil	Switch 62.5WG	9/12	12		L		L/P			L			L/P			L
famoxadone/cymoxanil	Tanos	11/27	12											L/Ph		
fenamidone	Reason 500SC	11	12												D	
fluazinam	Omega 500F	29	12		D/L		D/L/Ph						Ph			
fludioxonil	Emblem, Spirato 480 FS	12	12		L		L/P			L			L/P			L
fluopicolide	Adorn supplemental label	43	12												D	
iprodione	Iprodione 4L AG, Rovral 4F	2	24							R						
mancozeb	Protect DF	M03	24				D/L/Py	D/L						B/L/Ph		
	Dithane M45 Rainshield, Manzate Pro-Stick, Penncozeb 75DF						D/L			D			L	B/L/Ph		
mancozeb/zoxamide	Gavel	M03/22	48				D/L/Ph							B/L/Ph		
mandipropamid	Micora	40	4		D					D			Ph		D	
	Revus			D			D/Ph			D		Ph			D	
mandipropamid/difenoconazole	Revus Top	40/3	12											L/P		
mefenoxam	Subdue MAXX	4	48		D/Py		Ph/Py		Py	D/Py	Py		Ph/Py			D/Py
myclobutanil	Sonoma 40WSP	3	24				P			P			P			P
oxathiapiprolin	Orondis Gold 200	49	4					Ph					Ph			
	Segovis														D	
oxathiapiprolin/mandipropamid	Orondis Ultra	49/40	4											Ph		
pentachloronitrobenzene	Terradot 400, Blocker 10G, Turfcide 10G	14	12	R									R			

[1]See product label for 'other' crops included in the crop group. [2]Alphanumeric code assigned by the Fungicide Resistance Action Committee based on the mode of action of the active ingredient. [3]Disease abbreviations: B=bacterial blight/rot, D=downy mildew, L=leaf spot/blight (see product label for specific leaf diseases) including Alternaria, anthracnose, Botrytis, Cercospora. P=powdery mildew. Ph=Phytophthora foliar/root. Py=Pythium. R=Rhizoctonia. S=Sclerotinia.

Photo 6. The disease management recommendations for vegetable transplants and herbs are available for download on the veggies.msu.edu website. Photo: Heidi Lindberg

The disease management guide for vegetable transplants and herb crops provides the following information about each registered product: 1) active ingredient, 2) trade name of the product, 3) FRAC code (a guide for alternating products to delay/reduce pathogen resistance) and 4) re-entry interval. The disease recommendations are grouped by crop groups: 1) brassica, 2) cucurbit, 3) leafy, 4) fruiting and 5) herbs. Within each crop grouping, the table includes the target pathogen including: bacterial blight, downy mildew, leaf spot, powdery mildew, Phytophthora, Rhizoctonia and Sclerotinia.

Changes from 2021

The disease management recommendations are very similar between 2021 and 2022.

For the 2022 growing season, the recommendations for Thielaviopsis include only the "A" team – or very effective products – due to the seriousness of the pathogen. The two "A" team fungicides for Thielaviopsis are the high labeled rates of ***3336/OHP 6672*** and ***Terraguard SC***.

While most fungicides classified as the "A" Team for Botrytis are the same as last year, ***Pageant Intrinsic*** has been moved to the "B" team (only recommended under low disease pressure). Due to increased fungicide resistance frequencies, the following products were removed from the "B" team and are no longer recommended for Botrytis control: ***Heritage***, ***Compass,*** and ***Insignia***.

Metconazole (***Tourney***) has been dropped entirely from the recommendations because the label states that the product is for outdoor use on ornamentals but does not mention greenhouse applications. In recent trials, that fungicide also had significant PGR effects on some plant species.

Insect management

MSU Extension entomology specialist for ornamentals, David Smitley has released his "2022 Greenhouse Pest Management with Insecticides" recommendations (Photo 7). These are the recommended products to control thrips, aphids, whiteflies, spider mites, broad and cyclamen mites, fungus gnats, mealybugs and Florida fern caterpillar.

Growers of greenhouse vegetables and greens can use the guide, "Recommended Insecticides for Common Greenhouse Pests on Vegetables, Herbs and Leafy Greens," when considering an insecticide application. The guide provides the names of the products, active ingredients, vegetable crops on the label and recommended pests they control. For more information on the guide, see the MSU Extension article, "Insecticides for common pests on greenhouse vegetables and transplants."

Notes on insecticides for 2022

There have been a few new products registered and released within the last three years:

Novato (clofentazine) has been added for spider mite control. This is the same active ingredient that was in Apollo. It works very well if resistance is not a problem. Because it is not used in the greenhouse industry much anymore, resistance may not be as much of a problem as it was in the past, and it is certainly worth trying.

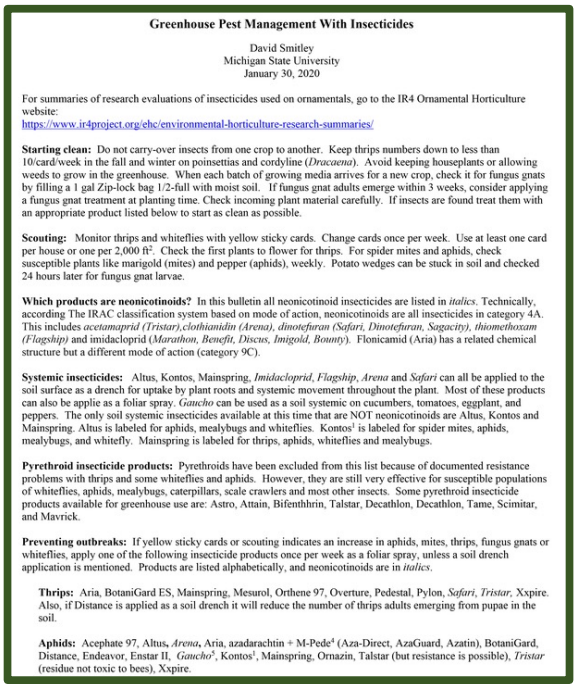
Ventigra (afidopyropen) is now labeled for control of aphids, whiteflies and mealybugs. Plants sensitive to Ventigra include coleus, poinsettia (in bract), impatiens and petunias (in flower).

Sarisa (cyclaniliprole) is now labeled for control of thrips, whiteflies and mealybugs. In recent research tests at Michigan State University we found Sarisa to reduce the number of thrips on marigolds as well as the most recent industry standard for thrips control, Pylon.

Pradia (cyclaniliprole and flonicamid) is a combination product, so it is like using Sarisa and Aria together. In research tests at MSU, Pradia also reduced the number of thrips on marigolds as well as Pylon, but it appeared to last a week or two longer than Sarisa. More testing of both products is needed.

In recent trials at Michigan State University, the Smitley lab found that ***Sarisa*** and ***Pradia*** reduced the number of thrips on marigolds as well as the most recent industry standard for thrips control, **Pylon**. Thrips control from Pradia appeared to last a week or two longer than that for Sarisa. ***Pradia*** (cyclaniliprole and flonicamid) is a combination product, so it is like using ***Sarisa*** and ***Aria*** together. More testing of both products is needed.

For summaries of research evaluations of insecticides used for thrips on ornamentals, go to the IR4 Ornamental Horticulture website.



Greenhouse Pest Management With Insecticides

David Smitley
Michigan State University
January 30, 2020

For summaries of research evaluations of insecticides used on ornamentals, go to the IR4 Ornamental Horticulture website:
https://www.ir4project.org/ehc/environmental-horticulture-research-summaries/

Starting clean: Do not carry-over insects from one crop to another. Keep thrips numbers down to less than 10/card/week in the fall and winter on poinsettias and cordyline (*Dracaena*). Avoid keeping houseplants or allowing weeds to grow in the greenhouse. When each batch of growing media arrives for a new crop, check it for fungus gnats by filling a 1 gal Zip-lock bag 1/2-full with moist soil. If fungus gnat adults emerge within 3 weeks, consider applying a fungus gnat treatment at planting time. Check incoming plant material carefully. If insects are found treat them with an appropriate product listed below to start as clean as possible.

Scouting: Monitor thrips and whiteflies with yellow sticky cards. Change cards once per week. Use at least one card per house or one per 2,000 ft². Check the first plants to flower for thrips. For spider mites and aphids, check susceptible plants like marigold (mites) and pepper (aphids), weekly. Potato wedges can be stuck in soil and checked 24 hours later for fungus gnat larvae.

Which products are neonicotinoids? In this bulletin all neonicotinoid insecticides are listed in *italics*. Technically, according The IRAC classification system based on mode of action, neonicotinoids are all insecticides in category 4A. This includes *acetamaprid (Tristar),clothianidin (Arena), dinotefuran (Safari, Dinotefuran, Sagacity), thiomethoxam (Flagship)* and imidacloprid (*Marathon, Benefit, Discus, Imigold, Bounty*). Flonicamid (Aria) has a related chemical structure but a different mode of action (category 9C).

Systemic insecticides: Altus, Kontos, Mainspring, *Imidacloprid*, *Flagship*, *Arena* and *Safari* can all be applied to the soil surface as a drench for uptake by plant roots and systemic movement throughout the plant. Most of these products can also be applie as a foliar spray. *Gaucho* can be used as a soil systemic on cucumbers, tomatoes, eggplant, and peppers. The only soil systemic insecticides available at this time that are NOT neonicotinoids are Altus, Kontos and Mainspring. Altus is labeled for aphids, mealybugs and whiteflies. Kontos[1] is labeled for spider mites, aphids, mealybugs, and whitefly. Mainspring is labeled for thrips, aphids, whiteflies and mealybugs.

Pyrethroid insecticide products: Pyrethroids have been excluded from this list because of documented resistance problems with thrips and some whiteflies and aphids. However, they are still very effective for susceptible populations of whiteflies, aphids, mealybugs, caterpillars, scale crawlers and most other insects. Some pyrethroid insecticide products available for greenhouse use are: Astro, Attain, Bifenthrin, Talstar, Decathlon, Decathlon, Tame, Scimitar, and Mavrick.

Preventing outbreaks: If yellow sticky cards or scouting indicates an increase in aphids, mites, thrips, fungus gnats or whiteflies, apply one of the following insecticide products once per week as a foliar spray, unless a soil drench application is mentioned. Products are listed alphabetically, and neonicotinoids are in *italics*.

Thrips: Aria, BotaniGard ES, Mainspring, Mesurol, Orthene 97, Overture, Pedestal, Pylon, *Safari*, *Tristar*, Xxpire. Also, if Distance is applied as a soil drench it will reduce the number of thrips adults emerging from pupae in the soil.

Aphids: Acephate 97, Altus, *Arena*, Aria, azadarachtin + M-Pede[4] (Aza-Direct, AzaGuard, Azatin), BotaniGard, Distance, Endeavor, Enstar II, *Gaucho*[2], Kontos[1], Mainspring, Ornazin, Talstar (but resistance is possible), *Tristar* (residue not toxic to bees), Xxpire.

Photo 7. The insect management recommendations are available for download as a PDF on the MSU Extension website. Photo: Heidi Lindberg

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