



## Integrated Pest Management Program

Department of Plant Science and Landscape Architecture  
UConn Extension

### Selected Fungicides and Bactericides Labeled for Vegetable Bedding Plants and Transplants

If any information in this table is inconsistent with the label, then follow the label.

Fungicide	Targeted Pest	Labeled Crops	Comments
azoxystrobin (Heritage) 4 hr. REI Group 11	Leaf spots and blights, downy mildew, botrytis blight, powdery mildew (depending upon crop, see label)	Vegetable plants grown for transplanting.	Preventive and curative broad-spectrum curative fungicide.
azoxystrobin & benzovindiflupyr (Mural) 12 hr. REI Group 11 and 7	Leaf spots and blights, downy mildew, powdery mildew, rhizoctonia stem rot (see label, depending upon crop)	Cucurbits and fruiting vegetable transplants grown for resale to consumers.	A broad-spectrum fungicide for foliar applications with translaminar activity for plants grown for resale to consumers.
Basic Copper Sulfate (Cuprofix Ultra 40 Disperss) (Cuproxat FL) OMRI certified product 48 hr. REI Group M01	Various leaf spots and blights, downy mildew, bacterial spot and blight, late blight on tomatoes (depending upon the crop, see label).	Cucumber, eggplant, pepper, tomato transplants.	Preventative, contact fungicides. Crops grown in the greenhouse may be more sensitive to copper injury so the user should determine plant sensitivity. Observe for 7 to 10 days for symptoms of injury.
<i>Bacillus amyloliquefaciens</i> D747 (Double Nickel) (Triathlon BA) 4 hr. REI OMRI-certified products Group BM02	Fungal & bacterial leaf spots and blights, downy mildew, powdery mildew, damping off ( <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Fusarium</i> , <i>Phytophthora</i> ) (depending upon crops, see labels)	Cole crops, bulb, cucurbit, fruiting and leafy vegetable transplants.	Broad-spectrum, preventative biological fungicides. Begin applications when conditions in the greenhouse favor disease development.

<i>Bacillus amyloliquefaciens</i> F727 (Stargus) 4 hr. REI OMRI-certified product Group BM02	Bacterial spot & blight, botrytis blight, late blight, damping off and root rots ( <i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> ), downy mildew (depending upon crops, see labels)	Brassica, bulb, cucurbit, fruiting and leafy vegetable transplants.	Broad-spectrum, preventive biological fungicide for growing media or foliar applications. Activates ISR (induced systemic resistance).
<i>Bacillus subtilis</i> QST 713 (Cease) 4 hr. REI Group BM02 OMRI-certified product	Fungal and bacterial leaf spots, powdery mildew, <i>Botrytis</i> blight downy mildew.	Cole crops, bulb, cucurbit, leafy and fruiting vegetable transplants.	Broad-spectrum, preventative biological fungicide. Begin applications when conditions in the greenhouse favor disease development.
<i>Bacillus amyloliquefaciens</i> ENV503 (Companion Biological Fungicide Wettable Powder) 4 hr. REI Group BM02	Damping off fungi, root rots ( <i>Fusarium</i> , <i>Pythium</i> , <i>Phytophthora</i> , <i>Rhizoctonia</i> ), <i>Botrytis</i> blight, leaf spots, (fungal and bacterial), late blight, powdery mildew	Cole crops, bulb, cucurbit, leafy and fruiting vegetable transplants.	Preventative biological fungicide for control and suppression of soil and foliar diseases. Activates ISR (induced systemic resistance).
<i>Bacillus subtilis</i> MB1 600 (Subtilis NG) 4 hr. REI Group BM02	<i>Botrytis</i> blight, powdery mildew, damping off and root rots ( <i>Rhizoctonia</i> , <i>Pythium</i> , <i>Fusarium</i> )	Cucurbit and fruiting vegetable transplants.	Preventative biological fungicide for growing media or foliar applications.
Boscalid & pyraclostrobin (Pageant Intrinsic) 12 hr. REI Group 7 and 11	Leaf spots and blights, powdery mildew, damping off ( <i>Pythium</i> and <i>Rhizoctonia</i> ), crown and basal rot ( <i>Fusarium</i> , <i>Rhizoctonia</i> , and <i>Sclerotinia</i> ), downy mildew, <i>Botrytis</i> and <i>Phytophthora</i>	Tomato transplants for the home consumer market. See supplemental label for use on leafy green vegetable transplants for the home consumer market.	Preventive, broad-spectrum fungicide. Pyraclostrobin has local systemic activity and translaminar activity. Do not use for transplants for agricultural production fields.

Copper Hydroxide Kalmor 48 hr. REI OMRI-certified product Group M01	Bacterial spot (pepper), angular leaf spot & downy mildew (cucumber), bacterial and fungal leaf spots and blights (tomato)	Cucumber, eggplant, pepper, tomato transplants.	Protectant, contact fungicide. See label for plant safety information.
Copper oxychloride & copper hydroxide (Badge X2) OMRI-certified product (Badge SC) 24 hr. REI Group M01	Fungal & bacterial spots, and blights, downy mildew (depending upon crop, see label)	Cucumber, eggplant, pepper, tomato transplants.	Contact fungicides. Badge X2 is a low load dry copper formulation that is a mixture of two high purity copper salts; copper oxychloride and copper hydroxide. Badge® SC is a liquid formulation. See labels for plant safety information.
Copper octanoate (Camelot O) (Grotto) 4 hr. REI Group M01 OMRI-certified products	Bacterial & fungal leaf spots (many), powdery mildew, downy mildew, early blight, late blight and others (depending upon crop, see label)	Crucifers, cucurbit, lettuce, onion, tomato, eggplant, pepper transplants.	Contact fungicides. See label for plant safety information.
Copper sulfate pentahydrate (Phyton 35) 48 hr. REI Group M01	Fungal and bacterial leaf spots, downy mildew, powdery mildew, <i>Botrytis</i> blight, and late blight on tomatoes	Cole crops, cucurbit, eggplant, pepper and tomato transplants.	Systemic, preventive and curative bactericide and fungicide. Thorough coverage needed. See label for plant safety information.
Cyazofamid (Ranman) (Segway O) 12 hr. REI Group 21	Ranman: Pythium damping off on tomato, downy mildew on basil Segway O: Pythium damping off on tomato and pepper transplants, Phytophthora blight, crown and root rot on pepper transplants	Tomato and pepper greenhouse transplants.	Locally systemic fungicides. Apply as a drench.
Difenoconazole & Pydiflumetofen (Postiva) 12 hr. REI Group 3 & 7	Cucurbit vegetables: various leaf spots and blights, powdery mildew. Tomatoes: early blight, Septoria leaf spot, powdery mildew	Cucurbit and fruiting vegetables for retail sale to consumers. Not for commercial vegetable field production.	Broad spectrum, preventive and systemic fungicide.

Fenhexamid (Decree 50 WDG) 12 hr. REI Group 17	Botrytis blight	Tomatoes, cucumber and leafy greens (except spinach).	Preventative translaminar fungicide. Do not apply in vegetable agricultural fields.
Fludioxonil (Spirato GHN) 12 hr. REI Group 12	Leaf blight and spots, powdery mildew, early blight, botrytis blight, sclerotina (depending upon crop, see label)	Cucurbit and fruiting vegetable transplants.	Protectant fungicide for certain vegetable seedlings and transplants. Not for field vegetable production use.
<i>Gliocladium catenulatum</i> J1446 (LALSTOP G46 WG) 4 hr. REI OMRI-certified product Group BM02	Damping off, root and stem rot ( <i>Alternaria, Fusarium, Pythium, Phytophthora, Rhizoctonia</i> and others), powdery mildew suppression	Cucurbit, fruiting, leafy, bulb, brassica leafy vegetable transplants.	Preventive biological fungicide that can be incorporation into the media, applied as a drench or foliar spray.
<i>Gliocladium virens</i> GL-21 (SoilGard) 4 hr. REI OMRI certified product Group BM02	<i>Pythium, Rhizoctonia, Sclerotium, Phytophthora</i> and <i>Fusarium</i>	Fruiting and leafy vegetable transplants.	Preventive biological fungicide applied before transplanting into the field.
Hydrogen peroxide & peroxyacetic acid (ZeroTol 2.0) 0 hr. REI (drench) 1 hr. REI (spray) OMRI-certified product	Downy mildew, powdery mildew, leaf spots and blights, root rots ( <i>Pythium, Fusarium, Rhizoctonia</i> )	Cucumbers, eggplant, peppers, tomatoes, lettuce transplants.	Contact fungicide. Strong oxidizing agent. See label for plant safety information.
Insecticidal Soap: potassium salts of fatty acids (Kopa Insecticidal Soap) (M-Pede) 12 hr. REI OMRI-certified products	Powdery Mildew	Cucurbit, fruiting and leafy vegetable transplants (see labels).	Contact fungicides. Short residual activity. See labels for plant safety information.

Mancozeb (Protect DF) 24 hr. REI Group MO3	Anthracoze, fungal leaf spots and blights, downy mildew (depending upon crop, see label)	Cucumber, melon, squash and tomato transplants.	Contact, protectant fungicide.
Mandipropamid (Micora) 4 hr. REI Group 40	Downy mildews, Phytophthora blight (suppression), late blight on tomatoes	Basil, Brassica, fruiting and leafy and vegetable transplants grown in an enclosed greenhouse with permanent flooring for resale to consumers.	Contact, protectant and translaminar fungicide for vegetable and basil transplants for sale to consumers.
Mefenoxam (Subdue MAXX) 48 hr. REI Group 4	Basal stem rot ( <i>Phyophthora</i> spp.) Damping off ( <i>Pythium</i> ) Downy Mildew on Cole crops	Cole crops, bulb, cucurbit, leafy and fruiting vegetable transplants grown for retail sales to consumers.	Systemic fungicide.
Mineral Oil (SuffOil- X) 4 hr. REI OMRI-certified product	Powdery mildew	Cucumber, eggplant, melon, pepper, pumpkin, squash and tomato transplants.	Contact fungicide. Thorough coverage of all plant parts is important. See label for plant safety information.
Pentachloronitrobenzene PCNB (Terraclor 400) 12 hr. REI Group 14	Root and stem rot, damping off ( <i>Rhizoctonia solani</i> , <i>Pellicularia filamentosa</i> )	Vegetable bedding plants (broccoli, Brussel sprouts, cabbage, cauliflower, pepper and tomato).	Protectant, contact fungicide. Apply as a soil drench.
Penthiopyrad (Fontelis) 12 hr. REI Group 7	<i>Alternaria</i> , botrytis blight, powdery mildew, leaf spots and blights	Tomato, peppers, edible-peel cucurbits (cucumbers, summer squash).	Broad-spectrum fungicide with preventative, curative, and locally systemic activity. See label for plant safety information.
Phosphorus Acid (Alude) 4 hr. REI Group P07	Downy mildew, <i>Phytophthora</i> spp.	Brassica, cucurbit, pepper, tomato and leafy vegetable transplants.	Systemic fungicide. See label for plant safety information.
Phosphorus Acid (Fosphite) 4 hr. REI Group P07	Anthracoze, bacterial leaf spot downy mildew, powdery mildew, root rots ( <i>Phytophthora</i> , <i>Pythium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> )	Brassica, cucurbit, and leafy vegetable transplants.	Systemic fungicide. See label for plant safety information.

Phosphorus Acid (Kphite 7LP) 4 hr. REI Group PO7	Anthrachnose, downy mildew, powdery mildew, bacterial leaf spots, and root rots ( <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , and <i>Fusarium</i> )	Brassica, cucurbit, and miscellaneous food crops.	Systemic fungicide. See label for plant safety information.
Phosphorous Acid & hydrogen peroxide (OxiPhos) 4 hr. REI	Downy mildew, powdery mildew, black rot (Cole crops), leaf spots and blights (depending upon crops, see label)	Bulb, cole, cucurbit, fruiting and leafy vegetable transplants.	Strong oxidizing agent. Do not use at higher than labeled rate as leaf burn may result.
Polyoxin D zinc salt (Affirm WDG) 4 hr. REI Group 19	Cucurbit vegetables: Powdery mildew, botrytis, leaf spot, early blight Fruiting vegetables: Powdery mildew, <i>Botrytis</i> , early blight, suppression of anthracnose	Cucurbit and fruiting vegetables (eggplant, pepper, tomato) transplants.	Preventative and curative fungicide. Active ingredient (polyxin) is a natural antibiotic and fermentation product of a soil bacterium.
Potassium bicarbonate (Milstop) 1 hr. REI (Kaligreen) 4 hr. REI OMRI-certified products	Powdery mildew, botrytis and others	Broccoli, Brussel sprouts, cabbage, cantaloupe, cauliflower, celery, cucumber, eggplant, lettuce, okra, pepper, tomato and squash transplants.	Contact, eradicant fungicides. Through coverage essential. Potassium bicarbonate disrupts the potassium ion balance in the fungus cell, causing the cell walls to collapse.
Propamocarb hydrochloride HCl (Previcur Flex) 12 hr. REI Group 28	Root rot and damping off caused by <i>Pythium</i> , <i>Phytophthora</i>	Greenhouse leaf lettuce, cucurbits, peppers & tomatoes.	Systemic fungicide. Apply in the evening. Phytotoxicity may occur if applied directly to dry growing media, especially in intense sunlight.
<i>Pseudomonas chloraphis</i> AFS009 (Zio) 4 hr. REI Group BM02 OMRI-certified product	Damping off, root rots ( <i>Pythium</i> , <i>Phytophthora</i> , <i>Rhizoctonia</i> ), Botrytis Blight (suppression with low disease pressure)	Vegetable transplants.	Preventive biological fungicide.

Pyrimethanil (Scala SC) 12 hr. REI Group 9	Gray mold ( <i>Botrytis</i> ), early blight ( <i>Alternaria</i> )	Tomato transplants.	Preventative fungicide. Apply only in well-ventilated greenhouses and ventilate for at least 2 hours after application. Phytotoxicity may occur in unventilated greenhouses with relative humidity above 80%.
<i>Reynoutria sachalinensis</i> extract (Regalia GC) 4 hr. REI Group P05 OMRI-certified product	Powdery mildew, downy mildew, bacterial leaf spot, early & late blight, <i>Alternaria</i> leaf spot, botrytis blight, damping off (depends upon crop, see label)	Bulb, Cole, cucurbit, leafy and fruiting vegetable transplants.	Preventive, biological fungicide with translaminar activity. Plant activator. Formulation of an extract from giant knotweed. Use preventatively to increase the natural defense system of plants.
<i>Streptomyces</i> K 61 (Mycostop) 4 hr. REI Group BM02 OMRI-certified product	<i>Alternaria</i> , Botrytis blight (suppression), <i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i>	Many vegetable transplants. Do not treat melon seeds.	Preventative biological fungicide. Contains a beneficial bacterium. Apply as a soil spray or drench.
<i>Streptomyces lydicus</i> WYEC 108 (Actinovate AG) 1 hr. REI (spray) OMRI-certified product	Suppression of <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Pythium</i> , <i>Phytophthora</i> , downy mildew, powdery mildew, Botrytis blight, <i>Alternaria</i>	Cole crop, bulb, cucurbit, fruiting and leafy vegetable transplants.	Preventative biological fungicide for suppression of root rot diseases and foliar pathogens.
Streptomycin sulfate (Agri-mycin 17) 12 hr. REI Group 25 OMRI-certified product	Bacterial spot and speck	Tomatoes & pepper transplants.	Xylem mobile fungicide. Repeated applications can result in resistant bacteria.
Sulfur (Microthiol Disperss) (Micro Sulf) 24 hr. REI Group M02 OMRI-certified product	Powdery mildew	Many vegetables.	Contact fungicides. Crops grown in greenhouses may be more sensitive to sulfur injury, so trial first with the lowest label rate. See label for plant safety information. Do not use within two weeks of an oil treatment.



<p><i>Swinglea glutinosa</i> extract (EcoSwing) 4 hr. REI Group BM01 OMRI-certified product</p>	<p>Alternaria leaf spot, Botrytis blight, powdery mildew, Basil downy mildew</p>	<p>Broccoli, cabbage, cauliflower, onion, cucumber, squash, eggplant, pepper, tomato and leafy vegetable transplants.</p>	<p>Preventive biological fungicide. Activates ISR (induced systemic resistance). Thorough coverage is needed.</p>
<p>Triflumizole (Terraquard SC) (Trionic 4SC) 12 hr. REI Group 3</p>	<p>Powdery mildew</p>	<p>Cucumber and tomato transplants.</p>	<p>Protective fungicide with curative action.</p>
<p>Thiophanate methyl (3336 F) (3336 EG) 12 hr. REI Group 1</p>	<p>Anthrachnose, botrytis blight, powdery mildew</p>	<p>Cucurbit and bean vegetable transplants.</p>	<p>Xylem mobile systemic fungicide. Resistant populations of <i>Botrytis</i> are common in the greenhouse. Not for field vegetable production.</p>
<p><i>Trichoderma asperellum</i> (ICC012) &amp; <i>Trichoderma gamsii</i> (ICC 080) (Obtego) 4 hr. REI Group BM02 OMRI-certified product</p>	<p>Root rots (<i>Phytophthora</i>, <i>Pythium</i>, <i>Rhizoctonia</i> and <i>Thielaviopsis</i>)</p>	<p>Cucurbits, fruiting and leafy vegetable transplants (except Brassica).</p>	<p>Preventive biological fungicide.</p>
<p><i>Trichoderma harzianum</i> Strain T-22 (RootShield Granules) 4 hr. REI Group BM02 OMRI-certified product</p>	<p>Root rots (<i>Pythium</i>, <i>Rhizoctonia</i>, <i>Fusarium</i>, and <i>Thielaviopsis</i>)</p>	<p>Bulb, cucurbit, fruiting, leafy and brassica leafy vegetable transplants.</p>	<p>Preventative biological fungicide that can be incorporated into greenhouse planting mix.</p>
<p><i>Trichoderma harzianum</i> Strain T-22 (RootShield WP) 4 hr. REI Group BM02 OMRI-certified product</p>	<p>Root rots (<i>Pythium</i>, <i>Rhizoctonia</i>, <i>Fusarium</i>, and <i>Thielaviopsis</i>)</p>	<p>Brassica leafy vegetables, bulb, cucurbit, and fruiting vegetable transplants.</p>	<p>Preventative biological fungicide. Apply as a soil drench with no overhead spray.</p>



<i>Trichoderma harzianum</i> T-22 & <i>Trichoderma virens</i> G-41 (RootShield Plus Granules) 4 hr. REI (RootShield Plus WP) 4 hr. REI Group BM02 OMRI-certified products	Root rots ( <i>Pythium</i> , <i>Phytophthora</i> , <i>Rhizoctonia</i> , <i>Fusarium</i> and <i>Thielaviopsis</i> )	Bulb, cucurbit, fruiting, leafy and Cole crop leafy vegetable transplants.	Preventative biological fungicides. Apply as a soil drench (RootShield Plus WP) or incorporate into greenhouse planting mix (RootShield Plus Granules).
<i>Ulocladium oudemansii</i> U3 Strain (BotryStop) 4 hr. REI Group BM02 OMRI-certified product	Botrytis Blight	Bulb, cucurbit and fruiting vegetable transplants.	Preventative biological fungicide. Thorough coverage needed.

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By Leanne Pundt, UConn Extension and Tina Smith (retired) UMass Extension, 2007. **Updated November 2020 by L. Pundt**

OMRI-certified product: determined by the Organic Materials Review Institute (OMRI) (<https://www.omri.org/>) to be suitable for use in certified organic production.

Fungicides are grouped by their mode of action (MoA) and each MoA group is assigned a Fungicide Resistance Action Committee (FRAC) code. Numbers and letters are used to distinguish the fungicide groups according to their cross-resistance behavior. The letters refer to P = host defense inducers, M = multi-site inhibitors. Most systemic fungicides (that are absorbed into plant tissues) are specific in their mode of action. Protectant fungicides are less likely to develop resistance problems as they have multi-site modes of action (M). To prevent the development of resistance, alternative applications among different FRAC codes with different modes of action and incorporate biological fungicides into your disease management plan. See <http://www.frac.info/>

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