



In This Issue

Hop fungicide list for downy and powdery mildew diseases with activities

Calendar of Events

July 21, 2021 – UW-Hancock Ag Research Station Field Day (1-4:30PM)
July 22, 2021 – UW-Extension Langlade Co. Airport Ag Research Station Field Day
November 30-December 2, 2021 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
February 8-10, 2022 – UW-Madison Div. of Extension & WPVGA Grower Education Conference, Holiday Inn, Stevens Point, WI

Amanda Gevens, Chair, Professor & Extension Vegetable Pathologist, UW-Madison, Dept. of Plant Pathology, 608-575-3029, Email: gevens@wisc.edu.

Currently registered fungicides for hop downy mildew and powdery mildew for Wisconsin. I have included critical information regarding active ingredients, rate, days to harvest, modes of action, as well as critical remarks. Page 134 of the Wisconsin Vegetable Production Guide (A3422 Extension Publication) <https://cdn.shopify.com/s/files/1/0145/8808/4272/files/A3422-2021.pdf> begins a more comprehensive and detailed section on hop fungicides and common practices.

In recent years, downy mildew has become commonplace in established hop yards of Wisconsin, with powdery mildew increasing as a more common disease concern. As yards age, additional diseases may arise including Phoma, Alternaria, and Fusarium pathogens infecting foliage and cones. Generally, fungicides with activity on powdery mildew also have control of these true fungal pathogens. Fungicides specific to downy mildew are very specialized for oomycetes/water molds such as the downy mildew pathogen – and do not control true fungal pathogens.

Disease (pathogen)	Active ingredient	Rate/acre of Commercial product	Days to harvest	Fungicide activity (FRAC #)	Remarks
Downy mildew (<i>Pseudoperonospora humuli</i>)	ametoctradin + dimethomorph	11.0-14.0 fl oz Zampro	7	systemic + protectant (45+40)	Do not apply >40 fl oz per acre/season. Apply no more than 3 applications per season. Do not make >2 sequential applications before alternating to different mode of action.
	copper oxychloride and copper hydroxide	1.8 pt Badge SC 0.75 lb Badge X2	14	protectant (M1)	Do not mix with fosetyl aluminum. Apply as needed.
	copper oxychloride and basic copper sulfate copper hydroxide	C-O-C-S WDG 4.0-6.0 lb 1.33 lb Champ Dry Prill 1.33 lb Champ Formula II Flowable 1.06 lb Champ WG	14	protectant (M1)	

		0.75-1.5 lb Kocide 3000 1.5 lb Kocide 2000 2.0 lb Kentan DF 1.33-2.67 pt NuCop 3L			
	copper ammonium complex	2.0 qt Copper Count N	14	protectant (M1)	
	cuprous oxide	2.0 lb Nordox	14	protectant (M1)	
	copper octanoate	0.5-2.0 gal Cueva in 100 gal water	14	protectant (M1)	
	basic copper sulfate	1.0-1.25 lb Cuprofix Ultra 40 Disperss	14	protectant (M1)	Apply after pruning but before training. Apply again as needed on a 10 day basis after training.
	cyazofamid	2.1-2.75 fl oz Ranman	3	protectant + limited systemic (21)	Apply prior to or at first sign of disease. Follow resistance management guidelines. Rainfast.
	cymoxanil	3.2 oz Curzate DF	7	locally systemic (27)	Apply with a protectant fungicide such as copper hydroxide. Rainfast in 2 hours.
	dimethomorph	6.0 fl oz Forum	7	systemic (40)	Do not make >3 applications per season. Addition of an adjuvant to spray mix is recommended. Good antisporeulant. Rainfast.
	famoxadone + cymoxanil	8.0 oz Tanos	7	locally systemic, curative (27+11)	Use with a tank mix partner. Apply preventatively and use on a 6-8 day spray schedule. Follow resistance management guidelines. Excellent curative activity. Good leaf protectant. Rainfast.
	fluopicolide	4.0 fl oz Presidio	24	systemic (43)	Must be tank-mixed with another fungicide with a different mode of action
	folpet	3 lb/acre Folpan 80 WDG	14	protectant (M4)	Can be applied up to 4X per season at 28-day intervals. Do not apply more than 12 lb of Folpan per acre/year. Mix with a systemic fungicide starting at first spike appearance.
	fosetyl aluminum	2.5 Aliette 5.0 lb/100 gal spray volume Linebacker	24	upregulates resistance in the plant (33)	Do not tank mix with copper. Initiate application when weather conditions favor disease (warm and humid). Avoid mixing with foliar fertilizers or surfactants.
	mandipropamid	8.0 fl oz Revus	7	systemic (40)	A non-ionic surfactant is recommended with use of this product. Follow resistance management guidelines.
	mefenoxam	0.5 pt Ridomil Gold SL	45	systemic (4)	Label allows drench and foliar applications. Follow resistance management guidelines. Can be highly effective and is 2-way systemic, however, downy mildew pathogen can acquire resistance.
	metalaxyl	1.0 qt MetaStar 2E	45	systemic (4)	Label allows drench and foliar applications. Follow resistance management guidelines.

	mono and dipotassium salts of phosphorous acid	1.0-3.0 qt/100 gal water Fosphite	0	protectant, induces plant resistance, systemic (33)	Do not apply at intervals of less than 3 days. Apply when conditions favor disease when shoots are 6 to 12 inches tall, after training at 5-6 ft tall, about 3 weeks after 2 nd application and during bloom.
	oxathiapiprolin + mandipropamid	5.5-8.0 fl oz/A Orondis Ultra	7	protectant, systemic, and curative activity 49 + 40	Begin applications prior to disease development and continue on a 7 to 10 day interval. Use higher rate when disease pressure is high.
	potassium bicarbonate	2.5-5.0 lb/100 gal spray volume Armicarb	0	protectant (NC)	Do not exceed mix rate of 5.0 lb/100 gal of water. Do not store unused portion of spray for more than 12 hours prior to use.
	pyraclostrobin + boscalid	14.0 oz/100 gal spray volume Pristine	14	contact and locally systemic (11 +7)	Use preventatively and apply at 14-21 day intervals as needed. Follow resistance management guidelines.
	extract of <i>Reynoutria sachalinensis</i>	1.0-4.0 qt Regalia	0	induced systemic resistance (P5)	Use preventatively and apply at 7-day intervals as needed. Emergence to wire touch 1.0-2.0 qt recommended/wire touch through harvest 2.0-4.0 qt. OMRI approved. Has some contact fungicidal activity.
	mono potassium phosphate and mono potassium phosphite	2.0-4.0 qt Phorcephite 1.0-3.0 qt in 20 gal of water Rampart	0	induces plant resistance, some protectant activity (NC)	Apply when conditions favor disease when shoots are 6-12 inches tall, after training at 5-6 ft tall, about 3 weeks after 2 nd application, and during bloom.
	<i>Bacillus pumilis</i> QST 2808	2.0-4.0 qt/100 gal spray volume of Sonata	0	protectant (44)	Use when conditions favor disease and apply at 7-14 day intervals as needed. OMRI approved.
Powdery mildew (<i>Podosphaera macularis</i> and <i>humili</i>)	trifloxystrobin	1.0 oz with every 15-30 gal spray volume Flint	14	surface-systemic or translaminar (11)	Apply preventatively for best results. Apply on a 10 to 14 day interval. Follow resistance management guidelines.
	pyraclostrobin + boscalid	14.0 oz/100 gal spray volume Pristine	14	contact and locally systemic (11 +7)	Use preventatively and apply at 14-21 day intervals as needed. Follow resistance management guidelines.
	myclobutanil	2.0-10.0 oz Rally	14	locally systemic (3)	Emergence to training label rate is 2-4 oz/training to wire is 4-6 oz/wire to 14-day prior to harvest is 6-10 oz. Follow resistance management guidelines.
	tebuconazole	4.0-8.0 fl oz Monsoon, ONSET 3.6L, Orius 3.6F, Tebustar 3.6L, Tebuzol 3.6F, Toledo 3.6F	14	locally systemic (3)	Apply at 10 to 14 day intervals. Follow resistance management guidelines.
	triflumizole	12.0 fl oz Procure 480SC	7	locally systemic (3)	Use prior to/at disease onset and reapply on a 14 day schedule.
	quinoxifen	4.0-8.2 fl oz Quintec	21	systemic protectant (13)	Follow resistance management guidelines, including 'do not apply more than 4X per season.' Minimum spray interval is 7 days.

	metrafenone	15.4 fl oz Vivando	3	protectant and curative (8)	No curative activity. Must be applied in advance of infection. Do not make more than 2 applications/year, totaling no more than 30.8 fl oz. Do not mix with oils.
	fluopyram + tebuconazole	8.0-17.0 fl oz/acre Luna Experience	14	contact and locally systemic (11 +7)	Apply preventatively for best results. Apply on a 14 day interval. Follow resistance management guidelines. No more than 34 fl oz per acre per year. Also controls Botrytis.
	cyflufenamid	6-8 oz Torino	0	protectant, curative (U6)	Do not exceed two applications per year.
	fluopyram	6.5-6.84 fl oz/acre Velum	7	preventative, systemic, and curative (7)	Follow resistance management strategies.
	fluopyram + trifloxystrobin	3-7.6 fl oz/acre Luna Sensation	14	contact, locally systemic (11 +7)	Apply preventatively. Apply on a 14 day interval. Follow resistance management guidelines. No more than 27.1 fl oz per acre per year. Also controls Botrytis; and Downy mildew at highest label rate.
	flutriafol	5-7 fl oz/acre Rhyme	7	locally systemic (3)	Apply preventatively for best results. Apply no more than 28 fl oz/acre per year. Follow resistance management guidelines.
	metrafenone	15.4 fl oz Vivando	3	preventative, curative and systemic (U8)	Has no curative properties. Should be tank mixed with a curative.
	flutianil	6-8 fl oz Gatten	7	systemic (U13)	Do not make more than 4 applications per year.
	potassium bicarbonate	2.5-5.0 lb/100 gal spray volume Armicarb 100	0	protectant (NC or not classified)	Do not exceed mix rate of 5.0 lb/100 gal of water. Do not store unused portion of spray for more than 12 hours prior to use.
	sodium bicarbonate	4.0 oz/10 gal water spray volume Milstop	0	protectant (NC)	Begin application when weather favors disease and apply at 1-2 week intervals. Tighten intervals when pressure heightens.
	copper octanoate	0.5-2.0 gal Cueva in 100 gal water	14	protectant (M1)	Apply soon after training vines.
	mono and dipotassium salts of phosphorous acid	1-3 qt/100 gal water Phosphite/ 1-3 qt in 20 gal of water Rampart	0	protectant, induces plant resistance (33)	Apply at 2 to 3 week intervals. Do not apply at an interval less than 3 days.
	extract of <i>Reynoutria sachalinensis</i>	1-4 qt Regalia	0	induced systemic resistance (P5)	Use preventatively and apply at 7 day intervals as need. Emergence to wire-touch 1-2 qt recommended/wire-touch through harvest 2-4 qt. OMRI approved.
	<i>Bacillus subtilis</i> QST 713 strain	4-6 qt/100 gal spray volume of Serenade ASO, Serenade MAX	0	protectant (44)	Use when conditions favor disease and apply at 7 day intervals as needed. OMRI approved.
	<i>Bacillus pumilis</i> QST 2808	2-4 qt/100 gal spray volume of Sonata	0	protectant (44)	Use when conditions favor disease and apply at 7-14 day interval as needed. OMRI approved.
	Neem oil	0.5-1.0% in 25- 100 gal water spray volume Trilogy	0	Protectant (NC)	Use when conditions favor disease and apply at a 7-14 day interval as needed. OMRI approved. Also miticide/insecticide.