2025 Fungicide Resistance Management Guidelines for Apple Scab, Bitter rot, and Powdery Mildew Control in the Mid-Atlantic United States

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Fungicide	Active Ingredient(s)	FRAC Code[4]	PHI (days)	Risk Rating[5]	Management Required[6]	Apple Scab[7]	Bitter rot[7, 10]	Powdery Mildew[7]	General Fungicide Resistance Management Guidelines[8]
Kocide 3000 or similar	fixed copper(s)	M1	see label	L	N	G	G	-	FRAC code M fungicides are low risk, protectant fungicides. Use alone, or tank mix with high-risk fungicides to improve efficacy
Microthiol or similar	sulfur	M2	see label	L	N	F	G	G	
Manzate or similar	Mancozeb	M3	77	L	N	G	E	-	
Ziram	ziram	M3	14	L	N	G	E	-	
Captan	captan	M4	0	L	N	G	E	-	
Dodine, Syllit	dodine	U12[R+]	see label	L-M	Y	E	-	-	Select fungicides with at least a "G" rating. Rotate among fungicides with different FRAC codes. Tank mix high risk fungicides with FRAC code M product if the product is not formulated with a FRAC code M fungicide. When resistance is qualitative (FRAC code 1 and 11 fungicides), resistant pathogen strains are completely insensitive and cannot be controlled with the fungicide. With quantitative resistance (FRAC Code 3 fungicides), pathogen strains exhibit a range in fungicide sensitivity and efficacy depends on level of insensitivity. Better control can be obtained with highest label rates and shortest spray intervals. Specific notes: Newer code 3 fungicides expected to be as effective as older ones when applied at same rate of active ingredient.
Gatten	flutianil	U13	14	L-M	Y	-	-	E	
Torino	cyflufenamid	U6	14	L-M	Y	N	-	E	
Omega	fluazinam	29	28	L-M	N	E	E	N	
Topsin M	thiophanate methyl	1[R+]	1	H	Y	N	F-G	G	
Rally	myclobutanil	3[R+]	14	M-H	Y	E	N	E	
Cevya	mefentrifluconazole	3	0	M-H	Y	E	S	G-E	
Procure, Trionic	triflumizole	3	14	M-H	Y	E	N	G	
Topguard, Rhyme	flutriafol	3	14	M-H	Y	G	N	E	
Indar	fenbuconazole	3	14	M-H	Y	E	N	G	
Inspire Super	difenconazole + cyprodinil	3 + 9	14	M	Y	E	S	G	
Luna Flex	difenocozole + fluopyram	3 + 7	14	M	Y	E	S	E	
Aprovia	benxovindiflupyr	7	30	H	Y	E	E	F-G	
Excalia	Inpyrfluxam	7	PF*	H	Y	E	S	F-G	
Fontelis	penthiopyrad	7	28	H	Y	E	F	F-G	
Luna Flex	fluopyram + difenconazole	7 + 3	14	M	Y	E	S	E	
Luna Sensation	fluopyram + trifloxystrobin	7 + 11	14	M	Y	E	G	E	
Luna Tranquility	fluopyram + pyrimethanil	7 + 9	72	M	Y	E	N	E	
Miravis	pydiflumetofen	7	30	H	Y	E	S	G-E	
Merivon	fluxapyroxad + pyraclostrobin	7 + 11	0	M	Y	E	E	E	
Pristine	boscalid + pyraclostrobin	7 + 11	0	M	Y	G-E	E	G	
Tesaris	fluxapyroxad	7	0	H	Y	E	N	E	
Scala, Penbotec[9]	pyrimethanil	9[R]	72/PH	H	Y	G	N	N	
Vangard	cyprodinil	9	0	H	Y	G	N	N	
Inspire Super	cyprodinil + difenconazole	9 + 3	14	M-H	Y	E	S	G	
Luna Tranquility	pyrimethanil + fluopyram	9 + 7	72	M-H	Y	E	N	E	
Flint Extra	trifloxystrobin	11[R+]	14	H	Y	E	G	G-E	
Kenja	isofetamid	11	20	H	Y	E	S	G-E	
Luna Sensation	trifloxystrobin + fluopyram	11 + 7	14	H	Y	E	E	E	
Sovran	kresoxim-methyl	11	30	H	Y	E	S	G-E	
Pristine	pyraclostrobin + boscalid	11 + 7	0	H	Y	G-E	E	G	
Merivon	pyraclostrobin + fluxapyroxad	11 + 7	0	H	Y	E	E	E	
Scholar[9]	fludioxonil	12	PH	L-M	Y	-	E	-	
Axios	Ipflufenoquin	52	7	L-M	Y	E	-	E	

Efficacy Ratings: - = Not labelled, N = poor or not recommended, S = slight, F = fair, G = good, E = excellent

[4] FRAC code: M= multi-site mode of action (MOA), numbered groups = fungicides with similar MOA.

[5] Risk Ratings: L = low risk, M = moderate risk or H = high risk for fungicide resistance to develop.

[6] Risk management required according to fungicide label; Y = yes, N = no.

[7] Refer to your grower's state guide for rates and recommendations. Efficacy in this chart pertains to at-risk materials mixed with FRAC code M fungicides.

[8] See fungicide label for specific crops, rates and instructions for correct use.

[9] Postharvest use only.

[10] Reference: https://apsjournals.apsnet.org/doi/10.1094/PDIS-06-21-1142-RE

*Do not apply after petal fall

[R] = resistance known for scab and/or mildew for this class of fungicides.

(+) control failures detected for this class of fungicides in the mid-Atlantic and Northeast regions.

Fungicides with the same color belong to the same FRAC code.

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2025 Fungicide Resistance Management Guidelines for Brown Rot, Powdery Mildew, and Peach Scab Control in the Mid-Atlantic United States

Alan R. Biggs, West Virginia University and Kari Peter, Penn State University

Fungicide	Active Ingredient(s)	FRAC Code[4]	PHI (days)	Risk Rating[5]	Management Required[6]	Brown Rot[7]	Powdery mildew[7]	Peach Scab[7]	General Fungicide Resistance Management Guidelines[8]
Kocide 3000 or similar	fixed copper(s)	M1	see label	L	N	S	-	N	FRAC code M fungicides are low risk, protectant fungicides. Use alone, or tank mix with high-risk fungicides to improve efficacy.
Microthiol or similar	sulfur	M2	see label	L	N	G	E	G	
Thiram Granuflo	thiram	M3	7	L	N	G	-	G	
Ziram	ziram	M3	14	L	N	N	-	G	
Captan	captan	M4	0	L	N	G	-	G	
Bravo or similar	chlorothalonil	M5	see label	L	N	F-G	-	E	
Gatten[10]	flutianil	U13	3	L	N	-	E	-	
Topsin M	thiophanate methyl	1	1	H	Y	E	F-G	G	
Rovral/Meteor	iprodione	2	see label	M-H	Y	F-G	-	F-G	
Topguard, Rhyme	flutriafol	3[R]	7	H	Y	G	E	N	Select fungicides with at least a "G" rating. Rotate among fungicides with different FRAC codes. Tank mix high risk fungicides with FRAC code M product if the product is not formulated with a FRAC code M fungicide. When resistance is qualitative (FRAC code 1 and 11 fungicides), resistant pathogen strains are completely insensitive and cannot be controlled with the fungicide. With quantitative resistance (FRAC Code 3 fungicides), pathogen strains exhibit a range in fungicide sensitivity and efficacy depends on level of insensitivity. Better control can be obtained with highest label rates and shortest spray intervals. Specific notes: Newer code 3 fungicides expected to be as effective as older ones when applied at same rate of active ingredient.
Orius	tebuconazole	3	0	H	Y	E	E	N	
Indar	fenbuconazole	3	0	H	Y	E	N	G	
Cevya	mefentrifluconazole	3	0	H	Y	E	G	E	
Quash	metconazole	3	14	H	Y	E	G	G	
Tilt, Propimax	propiconazole	3	0	H	Y	E	G	N	
Luna Experience	tebuconazole + fluopyram	3 + 7	1	M - H	Y	E	G	E	
Luna Flex	difenoconazole + fluopyram	3 + 7	7	M - H	Y	E	G-E	E	
Inspire Super	difenconazole + cyprodinil	3 + 9	2	M - H	Y	E	G	F	
Fontelis	penthiopyrad	7	0	H	Y	G	F-G	F	
Luna Flex	fluopyram + difenconazole	7 + 3	7	M - H	Y	E	G-E	E	
Luna Experience	fluopyram + tebuconazole	7+ 3	0	M - H	Y	E	G	E	
Luna Sensation	fluopyram + trifloxystrobin	7 + 11	1	M - H	Y	E	E	E	
Miravis	pydiflumetofen	7	0	H	Y	E	G-E	E	
Merivon	fluxapyroxad + pyraclostrobin	7 + 11	0	M - H	Y	E	E	G	
Pristine	boscalid + pyraclostrobin	7 + 11	0	M - H	Y	E	E	G	
Tesaris	fluxapyroxad	7	0	H	Y	E	E	E	
Scala, Penbotec[9]	pyrimethanil	9	2/PH	H	Y	E	N	N	
Vangard	cyprodinil	9	2	H	Y	G	N	N	
Inspire Super	cyprodinil + difenconazole	9 + 3	2	H	Y	E	S	F	
Abound	azoxystrobin	11	0	H	Y	G	E	N	
Kenja	isofetamid	11	1	H	Y	E	-	-	
Flint Extra	trifloxystrobin	11	1	H	Y	E	E	G	
Luna Sensation	trifloxystrobin + fluopyram	11 + 7	1	H	Y	E	E	G	
Merivon	pyraclostrobin + fluxapyroxad	11 + 7	0	H	Y	E	E	G	
Pristine	pyraclostrobin + boscalid	11 + 7	0	H	Y	E	E	G	
Scholar[9]	fludioxonil	12	PH	L-M	Y	E	-	-	
Quintec	quinoxyfen	13	7	L-M	Y	-	E	-	

Efficacy Ratings: - = Not labelled, N = poor or not recommended, S = slight, F = fair, G = good, E = excellent

[4] FRAC code: M= multi-site mode of action (MOA), numbered groups = fungicides with similar MOA.

[5] Risk Ratings: L = low risk, M = moderate risk or H = high risk for fungicide resistance to develop.

[6] Risk management required according to fungicide label; Y = yes, N =no.

[7] Refer to your grower's state guide for rates and recommendations. Efficacy in this chart pertains to at-risk materials mixed with FRAC code M fungicides.
Brown rot ratings are for the disease pre-harvest on fruit (not blossom blight or post-harvest rot).

[8] See fungicide label for specific crops, rates and instructions for correct use.

[9] Postharvest (PH) use only.

[10] Labeled for cherry and apple only.

[R] = resistance known for brown rot and/or scab for this class of fungicides.

(+) control failures detected in the mid-Atlantic and Northeast regions.

Fungicides with the same color belong to the same FRAC code.

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