



Agriculture: Tomato Pest Management Guidelines

Late Blight

Phytophthora infestans

Symptoms and Signs

Leaf symptoms of late blight first appear as small, [water-soaked areas\(/PMG/P/D-TO-PINF-FO.002.html\)](/PMG/P/D-TO-PINF-FO.002.html) that rapidly enlarge to form purple-brown, oily-appearing blotches. On the lower side of leaves, rings of grayish white mycelium and spore-forming structures may appear around the blotches. Entire leaves die and infections quickly spread to petioles and young stems. [Infected fruit\(/PMG/P/D-TO-PINF-FR.001.html\)](/PMG/P/D-TO-PINF-FR.001.html) turn brown but remain firm unless infected by secondary decay organisms; symptoms usually begin on the shoulders of the fruit because spores land on fruit from above.

Comments on the Disease

Late blight is found when humid conditions coincide with mild temperatures for prolonged periods. When humidity is above 90% and the average temperature is in the range of 60° to 78°F, infection occurs in about 10 hours. If conditions are ideal for disease development, disease development is rapid and losses can be severe. The fungus overwinters in potatoes, tomatoes, [hairy nightshade\(/PMG/WEEDS/hairy_nightshade.html\)](/PMG/WEEDS/hairy_nightshade.html), and possibly in the soil. Spores of the fungus are easily spread by wind to other plants.

Management

- Tomato varieties resistant to certain races of the late blight fungus are grown where the disease occurs regularly.
- Remove any nearby volunteer tomato and potato plants and nightshades.
- Check transplants to ensure they are free of late blight before planting.
- Avoid sprinkler irrigation, if possible, because it favors the development of late blight.
- Fungicides are generally needed only if the disease appears during a time of year when rain is likely or overhead irrigation is practiced. Mefenoxam-resistant strains of the pathogen are widespread in California and this fungicide is no longer effective.
- Disc tomato fields in fall to eliminate a winter reservoir for the fungus.

Monitoring and Treatment Decisions

Apply a protectant fungicide before disease development begins; once an outbreak occurs in a field, it is important to apply additional applications at regular intervals. Coverage must be thorough for applications to be effective.

	Common name	Amount per acre**	REI‡	PHI‡
	(Example trade name)		(hours)	(days)
Pesticide precautions Protect water Calculate VOCs Protect bees				
Not all registered pesticides are listed. The following are ranked with the pesticides having the greatest IPM value listed first—the most effective and least likely to cause resistance are at the top of the table. When choosing a pesticide, consider information relating to the pesticide's properties(/agriculture/tomato/General-Properties-of-Fungicides-Used-in-Tomatoes/) and application timing, honey bees(/beeprecaution/), and environmental impact(/mitigation/index.html). Always read the label of the product being used.				
A.	FAMOXADONE + CYMOXANIL			
	(Tanos)	8 oz	12	3
	MODE OF ACTION GROUP NAME (NUMBER ¹): Quinone outside inhibitor (11) + cyanoacetamide-oximes (27)			
B.	DIMETHOMORPH			
	(Zapro)	Label rates	See label	See label
	MODE OF ACTION GROUP NAME (NUMBER ¹): Cinnamic acid (40)			
C.	AZOXYSTROBIN			
	(Quadris F)	6 fl oz	4	0
	MODE OF ACTION GROUP NAME (NUMBER ¹): Quinone outside inhibitor (11)			
	COMMENTS: Apply at 5- to 7-day intervals. Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Do not alternate or tank mix with fungicides to which resistance has developed in the pathogen population.			
D.	AZOXYSTROBIN + DIFENOCONAZOLE			
	(Quadris Top)	8 fl oz	12	0
	MODE OF ACTION GROUP NAME (NUMBER ¹): Quinone outside inhibitor (11) + Dimethylation inhibitor (3)			
E.	CHLOROTHALONIL			
	(Bravo Weather Stik)	1.5–2 pt	12	0
	MODE OF ACTION GROUP NAME (NUMBER ¹): Multi-site contact (M5)			
F.	MANCOZEB			

	Common name	Amount per acre**	REI‡	PHI‡
	(Example trade name)		(hours)	(days)
	(Dithane M-45)	1.5–2 lb	24	5
	(Dithane F-45 Rainshield)	1.2–1.6 qt	24	5
	(Penncozeb 75DF)	1.5–2 lb	24	5
	MODE OF ACTION GROUP NAME (NUMBER ¹): Multi-site contact (M3)			
G.	PYRACLOSTROBIN			
	(Cabrio EG)	8–16 oz	12	0
	MODE OF ACTION GROUP NAME (NUMBER ¹): Quinone outside inhibitor (11)			

**	See label for dilution rate.
†	Restricted entry interval (REI) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (PHI) is the number of days from treatment until harvest can take place. In some cases the REI exceeds the PHI. The longer of these two intervals is the minimum time that must elapse before harvest may take place.
¹	Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC)(http://www.frac.info/) according to different modes of action. Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode of action Group numbers 1, 4, 9, 11, or 17 before rotating to a fungicide with a different mode of action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode of action Group number.



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