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Cooperative Extension

2020 Guidelines for Fire Blight Management in New York

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Background

Fire blight is a reoccurring problem for apple production regions in western NY and an occasional problem for production regions in eastern NY. When fire blight outbreaks have occurred in eastern NY, they often catch the industry off guard and result in devastating shoot blight epidemics. Blossom blight is manageable, but low or undetectable levels of blossom blight can lead to subsequent shoot blight outbreaks during favorable seasons.

Streptomycin-resistant strains of the fire blight bacterium, Erwinia amylovora, (SmR Ea) were identified in western NY in 2002, and from 2011 to 2013. The occurrence of SmR Ea was localized to specific fields at specific operations and was not present region wide. In subsequent surveys from 2014 and 2016, SmR Ea was not detected in western NY, even in orchards that had SmR Ea in previous years. Unfortunately, statewide surveying in 2018 and 2019 has led to the discovery of SmR Ea strains in western NY. Confirmation and genotyping of SmR Ea strains detected in 2019 is still underway.

Given the availability of kasugamycin, an effective antibiotic with a different mode of action than streptomycin, we are poised to ensure the longevity of both antibiotics by implementing simple resistance management practices. Despite new detections of SmR Ea, the availability of two bactericidal antibiotics, improved copper products, biopesticides, and resistance inducers still allows for a standard set of guidelines for the management of fire blight.

Nine general guidelines for season-long management of fire blight in apples and pears.

1. All fire blight strikes and shoots with larger cankers should be removed during winter pruning. Remove any trees where the central leader or main trunk has become infected. Infected wood should be removed from the orchard and either burned or placed where it will dry out rapidly. The fire blight pathogen can withstand cold temperatures but is intolerant to drying.
2. Copper sprays should be applied at green tip. Processing varieties can be protected with copper as late as ½ inch green depending on requirements of the label.
3. During bloom, follow a blossom blight forecasting system such as the ones offered in NEWA (newa.cornell.edu/index.php?page=apple-diseases) or RIMpro. Time applications during high risk weather only. If the operation rarely or has never had fire blight, it may not be necessary to apply antibiotic each time a high-risk period is forecast. Regardless of model predictions, it is rarely necessary to make more than three applications for blossom blight.

4. Begin antibiotic applications for blossom blight with a single application of streptomycin at 24 oz/acre. Consider including the penetrating surfactant Regulaid (1 pt/100 gal of application volume) in the first streptomycin spray to enhance the effectiveness of streptomycin. Regulaid would be especially beneficial when applied under rapid drying conditions. Regulaid can be omitted from subsequent applications to minimize the leaf yellowing that is sometimes associated with repeated applications of streptomycin. If later antibiotic applications are needed, streptomycin or kasugamycin (Kasumin 2L 64 fl oz/A in 100 gallons of water) should be used. Consider making at least one application of Kasumin 2L for resistance management purposes. If there are concerns about the effectiveness of streptomycin or kasugamycin, contact one of the people listed on the last page to discuss the product failure and determine if it would be necessary to submit a sample for antibiotic resistance testing. The presence of shoot blight later in the season isn't necessarily an indication that antibiotics applied during bloom failed due to resistance.
5. In the two weeks following bloom, scout for and prune out fire blight strikes promptly. Destroy pruned strikes by burning or leaving them out to dry. It is best to prune well back into healthy wood, at least 12 inches behind the water-soaked margin. Take care as summer pruning may stimulate active shoot growth leading to new susceptible tissues that could later become infected. If fire blight reaches the central leader, the tree should be removed. However, the spot may be safely replanted.
6. Preventative applications of prohexadione-calcium (Apogee or Kudos) for shoot blight should be seriously considered, especially on highly-susceptible apple varieties during shoot elongation beginning in late bloom.
    a. For maximum effectiveness, prohexadione-calcium should be applied at 6-12 oz/100 gal (3-6 oz/100 gal for tree <5 years) when trees have 1-2" of shoot growth. A second application should be made 14-21 days later.
    b. An application of prohexadione-calcium at pink at 6 oz/100 gal may reduce blossom blight and subsequent shoot blight in high vigor blocks. However, this practice should not be a substitute for a robust blossom blight program (see 4).
    c. A program where prohexadione-calcium is applied at low rates slowly over the period of active shoot growth is gaining popularity for reduced impacts on tree productivity. Specific programs may vary slightly, but generally consist of three applications at 1-2 oz/100 gal on a 14-day schedule beginning with early shoot growth in mid to late bloom. Take caution, as such programs have not been widely validated over many seasons and locations.
7. Preventative applications of copper can be used post-bloom and during the summer to protect against shoot blight infections. Copper must be applied before infection occurs as it will only reduce bacteria on the surface of tissues. Copper will have no effect on existing shoot blight infections. Copper may cause fruit russet in young developing fruit. Apply with adequate drying time and use hydrated lime may to safen copper. Terminal shoots can outgrow protective residues of copper. Hence, a low rate fixed copper program consists of applications on a 7-10 day schedule during high risk weather until terminal bud set.
8. It may be possible to save plantings on resistant rootstocks that have a moderate amount of shoot blight. Apply prohexadione-calcium at the highest rate for the planting (6-12 oz/100 gal) and allow 5 days for the product to affect the tree. Afterwards, prune out

existing and newly developing shoot blight every two weeks for the rest of the season. Remove any trees where fire blight has reached the central leader. If pruning seems to stimulate additional shoot growth, a second application of prohexadione-calcium could be warranted.

9. Replant skips in late fall to better synchronize next season's bloom with the established trees, if you need to interplant apple trees in existing orchards where trees were killed by fire blight and removed.

Eight additional guidelines <u>for new plantings</u> (1-2 years)

1. If possible, plant varieties grafted on fire blight-resistant rootstocks.
2. Trees should be carefully examined for fire blight infections before planting. Infected trees should be submitted for strep-resistance testing and subsequently discarded. Contact anyone listed on the last page under "Sample Submission" for SR Ea testing.
3. Immediately after planting, and 14 days later, a copper application should be made using the lower copper rates that are labeled for use after green tip. Ensure that soil has settled to avoid phytotoxicity to roots.
4. Trees should be scouted at 7-day intervals for fire blight strikes until July 31st. Infected trees should be removed as described above. Plantings also need to be scouted 7-10 days after hail or severe summer storms. The NEWA fire blight disease forecast tool (newa.cornell.edu/index.php?page=apple-diseases) can assist by providing an estimate of symptom emergence following a storm or other trauma event. Also, scout the planting at the end of the season (mid-September).
5. If possible, remove flowers before they open. New plantings may have considerable numbers of flowers the first year, and blossom removal may not be practical. If done, remove the blossoms during dry weather and before a lot of heat units have accumulated, because both factors contribute to higher risk of fire blight infection.
6. Trees should receive an application of copper at a stage equivalent to bloom. Observe the labeled REI before blossom removal.
7. To protect any remaining bloom, follow the chemical management program above.
8. Samples of any infections observed after planting should be submitted for strep-resistance testing – contact anyone listed on the last page. Infected trees should be removed entirely in high density orchards.

Eleven guidelines for on-farm nursery production

1. Collect budwood from orchards where fire blight is not established or from a neighboring farm without fire blight.
2. Limit streptomycin and kasugamycin applications to 2-3 per season. These should be timed according to a disease forecast prediction or CCE alert.
3. When fire blight pressure is high and shoots are actively growing, apply copper at the lowest labeled rate to prevent shoot blight.
4. Before conducting tree management tasks in the nursery apply a copper product at the lowest labeled rate and observe the labeled REI.
5. Any pinching, leaf twisting, should be done on dry sunny days with low relative humidity, after the REI of a copper application has expired.
6. When working in the nursery, field workers must wear clean clothing, and should wash hands and disinfect working tools often.

7. If fire blight is found in the nursery, completely remove the infected trees including the root system, and place them in trash bags between rows. Subsequently, remove the culled trees from between the rows and discard them. Under no circumstances should unbagged infected trees be pulled between nursery rows when trees are wet, otherwise fire blight will be spread down the rows.
8. Manage potato leafhoppers in the nursery using a registered product.
9. Maintain weed control through cultivation. Apply registered post-emergence herbicides using a shielded boom. There are some residual herbicides registered for use in nurseries.
10. When trees have reached the desired height, consider applying the lowest labeled rate of Apogee (1-2 oz/100 gal) to slow growth and reduce susceptibility to shoot blight.
11. Manage nitrogen levels to balance tree growth and fire blight susceptibility.

Sample submission instructions

If fire blight infected trees and strikes are observed after proper streptomycin application, call or email one of the persons below to provide you with sample submission instructions, and possibly to come and collect samples and take data on the situation.

- Janet van Zoeren, Tel: 585-797-8368,
  email: jev67@cornell.edu
  Lake Ontario region

- Mike Basedow, Tel: 585-410-6823,
  email: mrb254@cornell.edu
  Lake Champlain region

- Dan Donahue, Tel: 518-322-7812
  email: djd13@cornell.edu
  Hudson Valley region

- Anna Wallis, Tel: 518-410-6823
  email: aew232@cornell.edu
  Cornell AgriTech

- Juliet Carroll, Tel: 315-787-2430,
  email: jec3@cornell.edu
  Western NY

- Kerik Cox, Tel: 315-787-2401,
  email: kdc33@cornell.edu
  Statewide

Fire Blight Susceptibility in Apple Cultivars and Rootstocks

Compiled by Nicole Mattoon and Juliet Carroll, NYS IPM Program

Susceptibility guide to management

Highly Susceptible – fire blight management needed

Apple Cultivar	Source	Apple Rootstock	Source
Highly Susceptible Cultivars		**Highly Susceptible Rootstocks**	
Barry	2, 6	M.26	1, 2, 3, 4, 5
Ben Davis	2, 6	M.27	2, 3, 4, 6
Braeburn	2, 6	M.9	2, 3, 4, 5
Burgundy	2, 6	Mark	2, 3, 4
Fuji	2, 5, 6, 7	Ottawa 3	1, 2, 3, 4, 5
Gala (all strains)	2, 5, 6, 7	P. 2, 16, 22	2, 3, 4
Ginger Gold	2, 5, 6, 7		
Golden Russet	6		
Granny Smith	2, 5, 6, 7		
Idared	2, 5, 6, 7		
Jonagold	2, 5, 6, 7		
Jonathan	2, 5, 6, 7		
Lady Apple	4		
Lodi	2, 5, 6, 7		
Monroe	4, 6		
Mutsu (Crispin)	2, 4, 5, 6, 7		
Niagara	2, 4, 6		
Nittany	2, 4, 6		
NY 2	4		
NY 674	4		
Paula Red / Dandee Red	2, 4, 5, 6, 7		
Pink Lady	5, 6		
Raritan	2, 4, 6		
Red Yorking	2, 4, 6		
R.I. Greening	2, 5, 6		
Rome Beauty	2, 5, 6, 7		
Ruby Frost	4		
Spigold	2, 6, 7		
Starr	2, 4, 6		
Suncrisp	4		
Twenty Ounce	2, 6, 7		
Tydeman	4		
Yellow Transparent	2, 4, 6		
York Imperial	2, 4, 6		

Susceptibility guide to management

Moderately Susceptible – fire blight management usually needed where disease is prevalent

Apple Cultivar	Source	Apple Rootstock	Source
Moderately Susceptible Cultivars		**Moderately Susceptible Rootstocks**	
Ambrosia	4	Antonovka 313	2
Arlet	4	B.118	1, 4
Baldwin	2, 4, 6	Bud. 9	2, 3, 4, 5
Beacon	2, 6, 7	G.11	1, 2, 5, 6
Cameo	3, 7	G.935	6
Cortland	2, 4, 6, 7	MM. 106	2, 3, 4
Creston (BC815-10)	3, 4, 7	MM. 111	3, 4
Earligold	2, 4, 6	M.7	3, 6
Enterprise	5, 6, 7	P.18	1, 2
Fortune	7		
Gloster	2, 4, 6		
Goldrush	4, 7		
Golden Delicious	2, 4, 5, 6, 7		
Golden Supreme	7		
Gravenstein Holly	2, 4, 5, 6, 7		
Grimes Golden	2, 5, 6		
Honeycrisp	7		
Jerseymac	2, 5, 6, 7		
Jonafree	6, 7		
Jonamac	2, 5, 6, 7		
Julyred	2, 4, 5, 6		
Macoun	2, 5, 6, 7		
Maiden Blush	2, 4, 6		
McIntosh	2, 5, 6, 7		
Milton	2, 4, 5, 6		
Minneiska (SweeTango)	4		
Mollies Delicious	2, 4, 5, 6		
Northern Spy	2, 5, 6, 7		
NY 1	4		
NY 674 (Autumn Crisp)	7		
NY 75414-1	7		
Orin	7		
Pinova	5, 6		
Pioneer Mac	3, 7		
Pristine	7		
Puritan	2, 4, 6		
Quinte	2, 4, 6		
Redfree	2, 4, 5, 6, 7		
Sansa	3, 7		
Scotia	2, 4, 6		
SnapDragon	4		
Spartan	2, 6, 7		
Spijon	2, 4		
Starkspur (Delicious)	7		
Starkspur Earliblaze	2, 4, 6		
Stayman	2, 4, 7		
Summer Rambo	2, 4		
Summerred	2, 4, 6		
Sunrise	3, 7		
Wayne	2, 4, 6		
Wealthy	2, 6		
Winesap	2, 4, 6		
Zestar!	4		

Susceptibility guide to management

Least Susceptible – fire blight management needed only under high disease pressure or not needed

Apple Cultivar	Source	Apple Rootstock	Source
Least Susceptible Cultivars		**Least Susceptible Rootstocks**	
Arkansas Black	2, 4, 6	G.16	2, 3
Britemac	2, 4, 6	G.202	1, 3
Carroll	2, 4, 6	G.210	1, 2, 3, 6
Delicious	2, 6, 7	G.214	1, 3, 6
Empire	2, 6, 7	G.222	1, 3, 6
Freedom	5, 6	G.30	2, 3, 4, 6
Haralson	5, 6	G.41	1, 3
Jamba	2, 4, 6	G.65	2, 3, 4
Liberty	2, 5, 6, 7	G.814	3, 6
Macfree	5, 6, 7	G.890	3, 6
Melba	2, 4, 6	G.969	1, 3, 6
Melrose	5, 6	V.1	1, 3
Early McIntosh	4, 7		
Murray	5		
Northwestern Greening	2, 4, 6		
Nova Easygrow	5, 6		
Novamac	5		
Prima	6, 7		
Priscilla	2, 5, 6, 7		
Smoothee (Golden Delicious)	6		
Stark Bounty	2, 6, 7		
Stark Splendor	2, 6, 7		
Turley	2, 4, 6		
Viking	2, 7		
Wellington	2, 4		
Cultivar Susceptibility Unknown			
Acey Mac			
Elliot			
Senshu			
Shizuka			

Sources of information on cultivar susceptibility to fire blight:

1 - Michigan State University Web site, Nancy J. Butler, “Disease on Apples”.
2 - West Virginia University, Kearneysville website, K.S. Yoder and A.R. Biggs.
3 - Steven Miller and Alan Biggs in NE183 plot, West Virginia.
4 - Other field observations (private consultants, faculty and Extension educators).
5 - Purdue University, Janna Beckerman, "Disease Susceptibility of Common Apple Cultivars".
6 - Colorado State University, R.D Koski and W.R Jacobi, "Fire Blight".
7 - Breth, D.I., Reddy, M.V.B., Norelli, J., and Aldwinckle, H. 2000. Successful fire blight control is in the details. NY Fruit Quarterly 8(1):6-12.

Sources of information on rootstock susceptibility to fire blight:

1 - Robert Crassweller and James Schupp, Penn State, “Apple Rootstocks." extension.psu.edu/plants/tree-fruit/tfpg
2 - Paul Domoto, Department of Horticulture, Iowa State University, and Jim Cummins, Cornell University. "Characteristics of Apple Rootstock." www.ars.usda.gov/northeast-area/geneva-ny/plant-genetic-resources-research/docs/characteristics-of-apple-rootstock/
3 - R.D Koski and W.R. Jacobi, Colorado State University, "Fire Blight." extension.colostate.edu/docs/pubs/garden/02907.pdf
4 - Janna Beckerman, Department of Botany and Plant Pathology, Purdue University, "Fire Blight on Fruit Trees in the Home Orchard"
5 - Russo, N.L., Robinson, T.L., Fazio, G., and Aldwinckle, H.S. 2007. Field evaluation of 64 apple rootstocks for orchard performance and fire blight resistance. HortScience 42(7):1517-1525.
6 - Other field observations (private consultants, faculty and Extension educators).