

# Commercial Crop Production

## Fruit Crops - Pear

**Table 1. Symptoms, source of inoculum and management of pear diseases**

<b>Disease (Pathogen)</b>	
<b>Black rot</b> ( <i>Botryosphaeria obtusae</i> )	<p><b>Symptoms:</b> Symptoms are observed on leaves, limbs and fruit. Leaf lesions begin as small purple flecks that enlarge and develop a tan to brown center. Heavily infected leaves become chlorotic (yellow), die and drop off of the tree. Red flecks that develop into purple raised spots are observed on immature fruit. As fruit matures the lesions enlarge with concentric rings and fruit may rot around the core. Slightly sunken red colored cankers can form on the limbs and may cause the limb to crack and die.</p> <p><b>Source of Inoculum:</b> The fungus survives between seasons on infected wood and fruit. Spores are released from fungal fruiting structures during rain events.</p> <p><b>Management:</b> Remove and burn infected twigs, limbs and mummified fruit. Dip pruning tools in 10 percent chlorine bleach solution or another registered disinfectant between cuts. Apply fungicides according to the pear spray schedule.</p>
<b>Blossom blast</b> ( <i>Pseudomonas syringae</i> )	<p><b>Symptoms:</b> Buds are the most sensitive to infection and fail to open when infected. Eventually buds dry out and die. Infections that occur after bloom result in slightly depressed shiny black spots on the fruit and leaves.</p> <p><b>Source of Inoculum:</b> <i>Pseudomonas</i> is ubiquitous on plants. Cold weather and wet weather favor population and disease development. High populations of pseudomonads induce freeze damage in fruit and foliage tissue at temperatures 3° to 6°F higher than would occur in their absence.</p> <p><b>Management:</b> Protect trees against frost. Maintain a firm, wet soil surface with a low cover crop to keep orchards warm. Apply copper-based bactericides during dormancy.</p>
<b>Fire blight</b> ( <i>Erwinia amylovora</i> )	<p><b>Symptoms:</b> Affects blossoms, leaves, twigs and young fruit. Infected blossoms wilt suddenly and turn dark brown, followed by blighting of leaves and terminals. Infected twigs and leaves turn dark brown to black, and leaves cling to the stem, often remaining attached most of the season.</p> <p><b>Source of Inoculum:</b> The bacteria overwinter at the base of blighted twigs or in cankers on larger limbs. Bacteria are spread by bees and splashing rain.</p> <p><b>Management:</b> Spray during bloom with copper fungicides or streptomycin according to manufacturer's directions. Prune out and burn infected twigs. Cut 12-15 inches below affected tissue. Dip pruning tools in 10 percent chlorine bleach solution between cuts. Use resistant varieties such as Orient, Moon Glow and Biscamp.</p>
<b>Early leaf spot or Fabraea leaf</b> ( <i>Fabraea</i> spp.)	<p><b>Symptoms:</b> The disease begins on the lower leaves in early spring. Spots on the leaves, mostly circular in outline, are dark brown to nearly black, with purplish margins. Spotted leaves turn yellow and shed.</p> <p><b>Source of Inoculum:</b> The fungus survives mainly in infected leaves on the ground. May also form minute cankers on the bark of twigs and shoots.</p> <p><b>Management:</b> Rake and burn fallen leaves. Begin sprays in April after leaves have unfolded. Orient has moderate resistance, and Maxine is very resistant. Follow a pear spray schedule.</p>
<b>Flyspeck</b> ( <i>Schizothyrium pomi</i> , formerly <i>Microthyriella rubi</i> )	<p><b>Symptoms:</b> Shiny black raised specks on the fruit. These specks are the fruiting structures of the fungus. Spores are produced within the specks during warm and moist weather.</p> <p><b>Source of Inoculum:</b> The fruiting structures survive between seasons on infected twigs. Spores are dispersed by wind.</p> <p><b>Management:</b> Well-pruned trees will develop less disease during dry to moderately wet weather. Thin fruit to promote air flow and improve fungicide coverage. Follow a pear spray schedule.</p>
<b>Crown gall</b> ( <i>Agrobacterium tumefaciens</i> )	<p><b>Symptoms:</b> Affects roots and crown of host plant, causing galling of tissue and reduction in the movement of water and nutrients through the plant. Galls may be spongy or hard.</p> <p><b>Source of Inoculum:</b> This bacterium lives in the soil.</p> <p><b>Management:</b> Check planting stock for galls or swelling and rogue-infected plants. Avoid planting new plants in the same site for several years. Treat before planting with Galltrol.</p>
<b>Leaf spots</b> (various fungi)	<p><b>Symptoms:</b> Leaf spots vary in size depending on the pathogen. Severely infected leaves turn yellow and drop from the tree.</p> <p><b>Source of Inoculum:</b> Fungus may overwinter on diseased leaves or twig cankers. Spores are released in the spring and dispersed by rain or irrigation water. Secondary infections can occur during warm and wet periods during the summer.</p>

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<b>Disease (Pathogen)</b>	
	<p><b>Management:</b> Rake and bury or burn diseased leaves. Dispersion can be reduced by increasing space between trees. Use labeled fungicides.</p>
<p><b>Powdery mildew</b> (<i>Podosphaera leucotricha</i>)</p>	<p><b>Symptoms:</b> Symptoms first appear on the underside of leaves as grayish-white patches. Chlorotic (yellowing) spots appear in the upper surface of the leaves. As the disease progresses, grayish-white patches form on the upper leaf surface. Severely infected leaves curl and drop from the tree. Flower buds may also become infected and infected buds open 5-8 days later than non-infected buds. Symptoms also appear on fruit.</p> <p><b>Source of Inoculum:</b> The fungus overwinters in dormant buds infected the previous season. Spores are released in the air during the day and germinate during dry weather.</p> <p><b>Management:</b> Dormant season pruning will reduce the number of potentially infected buds. During the season, prune and destroy severely diseased shoots. Fungicides applied during the season will reduce the release of spores and spread within the tree.</p>
<p><b>Pear scab</b> (<i>Venturia pirina</i>)</p>	<p><b>Symptoms:</b> Dark brown to black spots form on infected fruit, which often are misshapen. Brown lesions form on leaves, but these may appear to be velvety and olive green when the fungus is actively sporulating.</p> <p><b>Source of Inoculum:</b> The fungus overwinters mainly in infected leaves on the ground but it may also survive in infected twigs.</p> <p><b>Management:</b> Rake and burn fallen leaves. Begin sprays in April after leaves have unfolded. Follow a pear spray schedule.</p>
<p><b>Quince rust</b> (<i>Gymnosporangium clavipes</i>)</p>	<p><b>Symptoms:</b> Dark green spots form on the calyx end of fruit and extend internally to the core. Fruit are distorted and drop prematurely.</p> <p><b>Source of Inoculum:</b> Affects fruit of apple, crabapple, pear, hawthorne and quince. This fungus must have eastern red cedar or dwarf or prostrate junipers as alternate hosts to complete its life cycle. Galls are formed on the alternate host in which the fungus survives and infects apples and other host crops.</p> <p><b>Management:</b> Remove alternate host plants in vicinity of desired trees; or remove all galls from cedar trees during the winter; or follow a regular spray program beginning at blossom and continuing until fruit are formed. A combination of the above measures may be necessary.</p>
<p><b>Sooty blotch</b> (<i>Gloeodes pomigena</i> and other fungi)</p>	<p><b>Symptoms:</b> Olive green, soot-like smudges on mature fruit. Fungal fruiting bodies are produced in the thallus.</p> <p><b>Source of Inoculum:</b> The fungus survives between seasons on infected twigs of apple and woody plants common to hedgerows and woodlots. Spores are spread during the spring and early summer by rain. Disease develops throughout the growing season.</p> <p><b>Management:</b> Well-pruned trees will develop less disease during dry to moderately wet weather. Thin fruit to promote air flow and improve fungicide coverage. Follow a pear spray schedule.</p>

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**Table 2. Seasonal fungicide spray schedule for pears**

Developmental Stage	Diseases
Dormant	Fire blight Blossom blast
Tight (or green) cluster	Pear scab Early leaf spot Powdery mildew
Pink	Pear scab Early leaf spot Powdery mildew
Bloom	Early leaf spot Fire blight Pear scab Powdery mildew
Petal fall	Fire blight Pear scab Leaf spots Powdery mildew
Cover sprays	Pear scab Leaf spots Powdery mildew Sooty blotch Fly speck

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**Table 3. Recommended pesticides, rates and pesticide use restrictions for pears**

Chemical Name (Product Mode of Action Group <sup>1</sup> )	Product Name <sup>2</sup>	Rate <sup>3</sup>	Maximum Use	PHI <sup>4</sup>	Diseases
boscalid + pyraclostrobin (7, 11)	Pristine	14.5-18.5 oz	74 oz	0	Pear scab Flyspeck Powdery mildew Quince rust (suppression) Sooty blotch
captan	Captan 50WP Captan 80WDG	2.5 lb/100 gal 1.6 lb/100 gal	1 app 1 app	NA NA	Postharvest rots (Captan 50WP can only be used for mechanical fruit dips.)
copper hydroxide (M1) <sup>6,7</sup>	Badge SC Badge X20G Champ WG Champ Formula2 Kentan DF Kocide 3000 Kocide 2000	0.9 pt 0.5 lb 1 lb 0.66 pt 1 lb 0.5 lb 0.75 lb	56.3 pt 16 lb 32 lb 44 pt 16 lb ai 53.3 lb 45.7 lb	See labels	Fire blight Blossom blast
copper hydroxide+ mancozeb <sup>6,7</sup> (M1, M3)	ManKocide	1.5 lb	53.3 lb	See label	Fire blight (Do not apply after bloom.) Blossom blast
copper sulfate <sup>6,7</sup> (M1)	Cuprofix Ultra 40 Disperss  Cuproxtat  Mastercop  Top Cop with Sulfur	0.75 lb 7.5-10 lb (dormant)  15-20 pt (dormant only) 0.5 pt 4.6 pt (dormant) 2 qt/100 gal	40 lb 1 app  1 app  2 pt 1 app	See labels	Fire blight Blossom blast (dormant sprays only)
copper sulfate + copper oxychloride <sup>6,7</sup> (M1)	C-O-C-S WDG	12-15.6 lb (dormant) 0.5-1 lb (bloom)	1 app  31 lb	See labels	Fire blight Blossom blast
difenoconazole+ cyprodinil (3, 9)	Inspire Super	12 fl oz	60 fl oz	14	Flyspeck Powdery mildew Quince rust Sooty blotch
fenarimol (3)	Rubigan EC  Vintage SC	8-12 fl oz  4-12 fl oz	84 fl oz  48 fl oz	30  30	Pear scab Powdery mildew Rusts  Pear scab Powdery mildew

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Chemical Name (Product Mode of Action Group <sup>1</sup> )	Product Name <sup>2</sup>	Rate <sup>3</sup>	Maximum Use	PHI <sup>4</sup>	Diseases
fluxapyroxad + pyraclostrobin (7, 11)	Merivon	4-5.5 fl oz	22 fl oz	0	Flyspeck Pear scab Powdery mildew Sooty blotch Quince rust (suppression only)
fosetyl-al (33)	Aliette WDG	2.5-5 lb/100 gal	20 lb	1 year	Fire blight
kresoxim-methyl (11)	Sovran	3.2-6.4 oz	25.6 oz	30	Pear scab Powdery mildew Quince rust (suppression only)
mancozeb <sup>7</sup> (M3)	Dithane F45 Rainshield Dithane M45 Manzate Flowable OR Max Manzate Pro- stick Penncozeb 75DF Penncozeb 80WP Roper Rainshield	4.8 qt 3-6 lb 2.4-4.8 qt 3-6 lb 3.2-6.4 lb 3-6 lb 3-6 lb	19.2 qt 21-24 lb 16.8-19.2 qt 21-24 lb 22.4-25.6 lb 21-24 lb 21-24 lb	See labels	Early leaf spot Fire blight (see label for rates) Pear scab Rusts
oxytetracycline (41)	Mycoshield	1 lb/100 gal	10 app	60	Fire blight
penhiopyrad (7)	Fontelis	16-20 fl oz	61 fl oz	28	Pear scab Powdery mildew Rusts
phosphite (phosphorous acid salts) (33)	Alude Confine Extra Fosphite Fungi-phite Rampart	1.25-2.5 qt 1-3 qt 1-3 qt 1-2 qt 1-3 qt	See labels		Fire blight Powdery mildew
pyrimethanil	Scala SC	7-10 fl oz (alone) 5 fl oz (tank mix)	40	72	Pear scab
streptomycin (25)	Agri-Mycin 17	24-48 oz	See label	30	Fire blight
sulfur <sup>7</sup> (M2)	Liquid Sulfur Six Microfine Sulfur Microthiol Disperss Yellow Jacket Wettable Sulfur	0.75-3.5 pt/100 gal 10-60 lb 10-20 lb 10-60 lb	NA NA NA NA		Pear scab Powdery mildew
tebuconazole (3)	Tebuzol 45DF	4-8 oz	3 lb	75	Pear scab Powdery mildew

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Chemical Name (Product Mode of Action Group <sup>1</sup> )	Product Name <sup>2</sup>	Rate <sup>3</sup>	Maximum Use	PHI <sup>4</sup>	Diseases
tebuconazole + trifloxystrobin (3, 11)	Adament 50WG	4-5 oz	22 oz	75	Pear scab Powdery mildew Flayspeck Sooty blotch
thiabendazole (1)	Mertect 340F	16 fl oz/100 gal	1 app	NA	Postharvest rots (harvested fruit only)
thiophanate- methyl (1)	T-Methyl 70WSB Thiophanate- methyl 85WDG Topsin M 70WP Topsin M WSB	1 lb 0.8 lb 1 lb 1 lb	4 lb 3.2 lb 4 lb 4 lb	1 1 1 1	Pear scab Flayspeck Leaf spots Powdery mildew Sooty blotch
triflumizole	Procure 480SC	8-16 fl oz	64 fl oz	14	Pear scab Powdery mildew
trifloxystrobin (11)	Flint	2-2.5 oz	11 oz	14	Early leaf spot Flayspeck Pear scab Powdery mildew Sooty blotch
trifloxystrobin+ triadimefon (11, 3)	Strike Plus 50WDG	3-9 oz/100 gal (Non- bearing only, garden center and nursery stock only)	207 oz	1 year	Early leaf spot Pear scab Powdery mildew
ziram	Ziram 76DF	6 lb	42.4 lb	14	Early leaf spot Flayspeck Pear Scab Sooty blotch

<sup>1</sup>Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

<sup>2</sup>Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

<sup>3</sup>Rates are the amount of formulation per acre unless otherwise indicated. Usually 100 gallons of water are required to give good coverage with boom sprayers.

<sup>4</sup>Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

<sup>5</sup>All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

<sup>6</sup>See labels for correct application timings and rates to manage blossom blight.

<sup>7</sup>See labels for variety restrictions and the potential to damage (i.e. russeting) fruit.

Information in this section was last updated in December 2019 by Dr. R. Singh.