

Fruit Crops Strawberries

Diseases of Strawberries and Fungicides Labeled for their Control

Disease	Fungicides ^a	Efficacy ^b
<p>ANTHRACNOSE CROWN ROT (<i>Colletotrichum</i> spp.)</p> <p>Symptoms: Plants wilt suddenly and die during warm weather. Crowns have a reddish discoloration extending into the center. Black lesions occur on leaf petioles or runners. Disease development is inhibited by cool weather.</p> <p>Source of inoculum: The fungus survives the winter on infected plant parts or is introduced on infected planting material. Fungal spores are spread primarily by rain splashing and wind driven rain.</p> <p>Control: Use disease-free transplants. Dip plants in a fungicide prior to planting. Rogue out infected plants and treat surrounding plants with fungicides.</p>	<p><i>Abound, Heritage, Quadris</i> (azoxystrobin)</p> <p><i>Bumper, Orbit, Tilt</i> (propiconazole)</p> <p><i>Cabrio</i> (pyraclostrobin)</p> <p><i>Captevate</i> (captan + fenhexamid)</p> <p><i>Iprodione, Nevado, Rovral</i> (iprodione)</p> <p><i>Pristine</i> (boscalid + pyraclostrobin)</p>	<p>++++</p> <p>++++</p> <p>++++</p> <p>++++</p>
<p>PHYTOPHTHORA CROWN ROT (<i>Phytophthora</i> spp.)</p> <p>Symptoms: Youngest leaves often wilt first followed by the collapse of the entire plant. Crowns exhibit extensive, brown discoloration that extends from the crown downward or from an infected stolon.</p> <p>Source of inoculum: Oospores that survive in the soil or on infected transplants. Spreads primarily in water.</p> <p>Control: Use disease-free transplants, improve drainage and avoid low spots. Dip transplants in suitable fungicide prior to planting. Rogue out infected plants and treat surrounding plants with fungicide.</p>	<p><i>Aliette, Legion</i> (aluminum tris)</p> <p><i>Ridomil</i> (mefenoxam)</p> <p><i>Fosphite, etc.</i> (phosphite)</p>	<p>++</p> <p>++++</p> <p>++</p>
<p>GRAY MOLD (<i>Botrytis cinerea</i>)</p> <p>Symptoms: This fungus attacks flowers, flower parts, fruit and leaves. On the fruit it causes a rot that is at first light brown and soft (not “leaky”). As the berry rots it becomes covered with a grayish, powdery growth, and in the final stages of rot becomes tough and firm in texture.</p> <p>Source of inoculum: The fungus survives in the decaying tissues of strawberries and many other plants. Fungal spores are wind dispersed.</p> <p>Control: Control leaf diseases and remove dead leaves that can furnish a site for the fungus to develop. Remove infected fruit from the field. Spray with fungicides.</p>	<p><i>Abound, Heritage, Quadris</i> (azoxystrobin)</p> <p><i>Cabrio</i> (pyraclostrobin)</p> <p><i>Captan, Captec</i> (captan)</p> <p><i>Captevate</i> (captan + fenhexamid)</p> <p><i>Elevate</i> (fenhexamide)</p> <p><i>Flint</i> (trifloxystrobin)</p> <p><i>Pristine</i> (boscalid + pyraclostrobin)</p> <p><i>Iprodione, Nevado, Rovral</i> (iprodione)</p> <p><i>Scala</i> (pyrimethanil)</p> <p><i>Switch</i> (cyprodinil + fludioxonil)</p> <p><i>Thiram</i> (thiram)</p> <p><i>Topsin, etc.</i> (thiophanate-methyl)</p>	<p>+++</p> <p>+++</p> <p>+++++</p> <p>+++++</p> <p>+++++</p> <p>+++++</p> <p>+++</p> <p>+++++</p> <p>+++</p> <p>++++</p>
<p>ANGULAR LEAF SPOT (<i>Xanthomonas fragariae</i>)</p> <p>Symptoms: First visible as tiny, water-soaked spots</p>		

Fruit Crops Strawberries

Disease	Fungicides ^a	Efficacy ^b
<p>on the lower leaf surface that enlarge into angular lesions delimited by leaf veins. Lesions appear translucent when held up to the light. Bacterial ooze may be found on lesions on lower leaf surface.</p> <p>Source of inoculum: The bacterium survives in infected leaf debris or is introduced on infected planting material. Bacterial cells are spread primarily by rain splashing and wind driven rain. Disease develops best under cool, wet conditions.</p> <p>Control: Use disease-free transplants. Spray with copper fungicides.</p>	<p>Cuprofix (copper sulfate)</p> <p>Kocide, etc. (copper hydroxide)</p>	<p>+</p> <p>+</p>
<p>POWDERY MILDEW (<i>Sphaerotheca macularis</i> f. sp. <i>fragariae</i>)</p> <p>Symptoms: A white powdery growth is present on the undersurface of infected leaves and on fruit. Infected leaves have a tendency to roll up.</p> <p>Source of inoculum: The fungus persists from year to year on infected strawberries and other wild hosts. Usually a problem in the spring and early summer months.</p> <p>Control: Many varieties are resistant to this disease. Spray with fungicides.</p>	<p>Abound, Heritage, Quadris (azoxystrobin)</p> <p>Bumper, Orbit, Tilt (propiconazole)</p> <p>Cabrio (pyraclostrobin)</p> <p>Captevate (captan + fenhexamid)</p> <p>Flint (trifloxystrobin)</p> <p>Kocide, etc. (copper hydroxide)</p> <p>Microthiol, etc. (sulfur)</p> <p>Nova, Rally (myclobutanil)</p> <p>Orbit, Tilt (propiconazole)</p> <p>Pristine (boscalid + pyraclostrobin)</p> <p>Procure (triflumizole)</p> <p>Quintec (quinoxifen)</p> <p>Topsin, etc. (thiophanate-methyl)</p>	<p>++++</p> <p>++++</p> <p>++++</p> <p>+++</p> <p>+++++</p> <p>++++</p> <p>+++++</p> <p>+++++</p> <p>++++</p>
<p>LEAF SPOT (<i>Mycosphaerella fragariae</i>) (also "rust" or bird's-eye spot)</p> <p>Symptoms: The spots are at first less than 1/8 inch in diameter and purplish-red. Spots enlarge to about 3/16 inch. They have white or gray centers with purplish borders.</p> <p>Source of inoculum: The fungus survives from year to year on infected plant parts.</p> <p>Control: Spray with fungicides.</p>	<p>Bumper, Orbit, Tilt (propiconazole)</p> <p>Cabrio (pyraclostrobin)</p> <p>Captan, Captec (captan)</p> <p>Kocide, etc. (copper hydroxide)</p> <p>Nova, Rally (myclobutanil)</p> <p>Orbit, Tilt (propiconazole)</p> <p>Pristine (boscalid + pyraclostrobin)</p> <p>Iprodione, Nevado, Rovral (iprodione)</p> <p>Syllit (dodine)</p> <p>Topsin, etc. (thiophanate-methyl)</p> <p>Captan + Topsin</p>	<p>++</p> <p>++++</p> <p>++++</p> <p>++</p> <p>+++</p> <p>++</p> <p>++++</p>
<p>LEAF BLIGHT (<i>Phomopsis obscurans</i>)</p> <p>Symptoms: First appears as large, circular, reddish-purple spots that become zonate with age (i.e., they have a dark brown center surrounded by a lighter brown area with a purplish border). Mature spots may be circular, oval or V-shaped.</p> <p>Source of inoculum: The fungus lives from year to</p>	<p>see Leaf Spot</p>	

Fruit Crops Strawberries

Disease	Fungicides ^a	Efficacy ^b
<p>year primarily on infected plant tissue. Control: Use disease-free transplants. Spray with fungicides.</p>		
<p>LEAF BLOTCH (<i>Gnomonia</i> spp.)</p> <p>Symptoms: First appears as purplish to brownish blotches on young leaves. Later appears as large, light brown spots on older leaves. May affect fruit as well. Source of inoculum: The fungus lives from year to year primarily on infected plant tissue. Control: Spray with fungicides.</p>	<p>see Leaf Spot</p>	
<p>LEAF SCORCH (<i>Diplocarpon earlianum</i>)</p> <p>Symptoms: The first appears on upper leaf surfaces as small purplish spots that enlarge rapidly into irregular purplish blotches from 1/16 to 3/16 inch in diameter. The spots may become numerous and coalesce. In severe cases the edges of the leaflets curl upward and the tissue dies, giving the plant a scorched appearance. Source of inoculum: The fungus survives from year to year on infected leaves. Control: Use disease-free transplants. Rotate strawberry fields, if possible. Spray with fungicides.</p>	<p>see Leaf Spot</p>	
<p>ROOT KNOT NEMATODES (<i>Meloidogyne</i> spp.)</p> <p>Symptoms: Affected plants are stunted, unthrifty, unproductive and often pale green. Galls or knots on the roots are rather small. Numerous secondary roots may develop at the small swellings. Frequently, blackened rotted roots are associated with root knot problems. Source of inoculum: Root knot nematodes live from year to year in the soil and on the roots of strawberry plants and many weeds. Root knot is more severe in light soil types. Control: Fumigate plant bed soil and field soil. See table on Nematode Control in Fruit Crops.</p>		
<p>SUMMER DWARF or BUD NEMATODE (<i>Aphelenchoides besseyi</i>)</p> <p>Symptoms: Affected plants are severely stunted during the summer and early fall. Older leaflets are usually darker green with a greasy appearance. Young leaflets are reduced in size, usually crinkled, somewhat elongated with shorter petioles. Margins of leaflets may curl upward in the young leaflets and downward in the older leaflets. Source of inoculum: Bud nematodes live from year to year on infected daughter plants and in the soil. Control: Fumigate fields where the disease has occurred, and obtain disease-free plants. There is no satisfactory eradicant treatment for infected plants.</p>		

^a Trade name (chemical name)

^b Efficacy ratings are on a 1-5 scale where 5 (+++++) is the most effective and 1 (+) is the least effective. Ratings are taken from the 2007 Southeast Regional Strawberry Integrated Management Guide of the Southern Region Small Fruit Consortium (<http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>)

Fruit Crops Strawberries

Fungicide Spray Schedule for Strawberries^a

Developmental Stage	Timing	Disease(s)
Pre-plant	Fumigation & Fungicide dip ^b	Anthracnose & Phytophthora crown rots
Post-plant to Pre-bloom	Early post-planting	Anthracnose, Powdery mildew & Phytophthora crown rots
	Warm periods following frost	Botrytis crown rot
	New growth	Leaf spots (fungal & bacterial), Powdery mildew & Phytophthora crown rots
Bloom to Harvest	Every 7-10 days	Gray mold , Anthracnose, Phytophthora crown rots, Leaf spots (fungal & bacterial) & Powdery mildew

^a For more information, see the 2007 Southeast Regional Strawberry Integrated Management Guide of the Southern Region Small Fruit Consortium (<http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>).

^b Bare-root strawberry plants may be dipped in a fungicide suspension prior to planting to provide early-season control of root and crown rot diseases. Prior to dipping, the plants should be washed free of any adhering soil. The entire plant should then be dipped in the fungicide solution for 2-5 minutes or 15-30 minutes depending upon the fungicide used (check the label). Plants should then be set in the field as soon as possible.

Fruit Crops Strawberries

Fungicides Labeled for Use on Strawberries

Common Name	Trade Name	Formulation(s)	Rate(s) (per Acre)	Comments	FRAC Group	PHI (days)
aluminum tris	Aliette, Legion	80 WDG	2.5 lb (in 100 gal) ----- 2.5-5 lb	Pre-plant dip: 15-30 min ----- Spray: 7- to 14-day interval; no more than 30 lb/A/season; do not mix with copper fungicides; The maximum rate for any single application is 3.75 lb in <u>Livingston & Rapides</u> parishes	33	0
azoxystrobin	Abound, Heritage, Quadris	2.08 F 50 W	5-8 fl oz (in 100 gal) ----- 6.2-15.4 fl oz 3.2-8 oz	Pre-plant dip: 2-5 min ----- Spray: 7- to 10-day interval; no more than 2 sequential applications; no more than 1.92 qt or 2 lb/A/season	11	0
boscalid + pyraclostrobin	Pristine	38 WDG	18.5-23 oz	7- to 14-day interval; no more than 2 sequential applications; no more than 115 oz/A/season	7 + 11	0
captan	Captan, Captec	50 W 80 WDG 4L	3-6 lb 1.88-3.75 lb 1.5-3 qt	7- to 14-day interval; no more than 48 lb, 30 lb or 24 qt/A/year, respectively	M4	1
captan + fenhexamid	Captevate	68 WDG	3.5-5.25 lb	7- to 1-day interval; no more than 2 consecutive applications; no more than 21 lb/A/season	M4 + 17	0
copper hydroxide	Champ, Champion, Kocide, Stretch	Metallic copper equivalent 2.16% 15% 24.4% 30% 35% 37.5% 40% 50%	2-6 pt 2.75-4 pt 1.33-2 pt 0.75-1.25 lb 1.5-2.25 lb 1.33-2 lb 2-3 lb 2-3 lb	Apply weekly; discontinue if injury appears; do not use in spray solution with pH less than 6.5	M1	1-2
copper sulfate	Cuprofix Disperss,	Metallic copper equivalent 20%	2.5-5 lb 1.25-2.5 lb	Apply weekly; discontinue if injury appears; do not use	M1	0.5

Fruit Crops Strawberries

Common Name	Trade Name	Formulation(s)	Rate(s) (per Acre)	Comments	FRAC Group	PHI (days)
	Cuprofix Ultra 40 Disperss	40%		in spray solution with pH less than 6.5		
cyprodinil + fludioxonil	Switch	62.5WG	5-8 oz (in 100 gal) ----- 11-14 oz	Pre-plant dip: 2-5 min; no more than 50 oz/A/year ----- Spray: 7- to 10-day interval; no more than 2 consecutive applications; no more than 56 oz/crop; follow rotational crop restrictions	9 + 12	0
dodine	Syllit	3.4 FL	2.4-3 pt	7-day interval	M7	14
fenhexamid	Elevate	50 WDG	1-1.5 lb	7- to 14-day interval; no more than 2 consecutive applications; no more than 6 lb/A/season	17	0
iprodione	Iprodione, Nevado, Rovral	50 W 75WG 4FL	2 lb 1.33 lb 2 pt (in 100 gal) ----- 1.5-2 lb 1-1.33 lb 1.5-2 pt	Pre-plant: dip 2-5 min ----- make only 1 (dip or spray) application/season; DO NOT APPLY AFTER FIRST FRUITING FLOWERS!	2	NA
mefenoxam	Ridomil	4 EC 4 SL	1 pt	No more than 3 applications or 1.5 qt/A/season	4	0
myclobutanil	Nova, Rally	40W	2.5-5 oz	14- to 21-day interval; no more than 30 oz /A/year; 30-day plant-back restriction following last application	3	0
phosphite (phosphorous acid salts)	Fosphite, Fungi-phite, Helena Prophyt, Phostrol, Rampart, Topaz	Phosphorous acid equivalent (lb/gal) 3.35 3.9 4.2 4.32	1 qt 2 qt 2 pt 2.5 pt (in 100 gal) ----- 1-2 qt 1-3 qt 2-4 pt	Pre-plant dip: 15-30 min ----- Spray: 7- to 14-day interval	33	0

Fruit Crops Strawberries

Common Name	Trade Name	Formulation(s)	Rate(s) (per Acre)	Comments	FRAC Group	PHI (days)
2.5-5 pt						
propiconazole	Bumper, Orbit, Tilt	41.8 EC	4 fl oz	7-day interval; no more than 2 consecutive applications; no more than 16 fl oz/A/season	3	0
pyraclostrobin	Cabrio	20 EG	12-14 oz	7- to 14-day interval; no more than 2 sequential applications; no more than 70 oz/A/season	11	0
pyrimethanil	Scala	600 SC	18 fl oz (alone) 9 fl oz (tank mix)	7- to 14-day interval; no more than 54 fl oz/A/season; use lower rate only when tank-mixed with another product labeled for Botrytis control	9	1
quinoxifen	Quintec	2.08 F	4-6 fl oz	10- to 14-day interval; no more than 2 sequential applications; no more than 24 fl oz/A/crop	13	1
sulfur	IAP Dusting Sulfur, Liquid Sulfur Six, Microthiol Disperss, Super-Six Liquid Sulfur, Thiolux Jet, 80% Thiosperse, Wettable Sulfur, Yellow Jacket Dusting Sulfur, Yellow Jacket Wettable Sulfur	53% L 80% 90% 98%	1-2 pt 5-10 (3-15) lb 3-10 lb 3-50 lb	Do not use when hot or when temperatures are expected to be above 90° over the next three days; do not use within 2 weeks of an oil spray; see label for application intervals	M2	1
thiophanate-methyl	Thiophanate-methyl, Topsin,	4.5 FL 70 WP 85 WDG	15-20 fl oz 0.75-1 lb 0.6-0.8 lb	7- to 10-day interval; no more than 80 fl oz, 4 lb or 3.21 lb/A/season,	1	1

Fruit Crops Strawberries

Common Name	Trade Name	Formulation(s)	Rate(s) (per Acre)	Comments	FRAC Group	PHI (days)
	T-Methyl			respectively; should be tank-mixed with another registered fungicide		
thiram	Thiram	75 DF	3.4-4.4 lb	10-day interval	M3	3
trifloxystrobin	Flint	50 WG	2.0-3.2 oz	7- to 14-day interval; no more than 2 sequential applications; no more than 6 applications or 19.2 oz/A/year; follow plant back restrictions	11	0
triflumizole	Procure	50 W 480 SC	4-8 oz 4-8 fl oz	14-day interval; no more than 32 oz or 32 fl oz/A/season; follow rotational crop restrictions	3	1