Countering Common Fungi

By Al Whitcomb, Consulting Rosarian

Wouldn't it be nice if all our roses and their foliage were as clean and free from fungal infection as this photo of Gartendirektor Otto Linne? Unfortunately, our climate provides ideal conditions for fungal growth. If your rose garden is anything like ours, you are likely to find an array of harmful fungi trying to establish a foothold. Our growing season temperatures, heavy dew, rainfall and overhead watering systems provide ideal environments for leaf spot, mildew, botrytis and cankers.

Gartendirektor Otto Linne - Photo by Al Whitcomb

You might ask yourself, why you should be concerned about fungi. After all, most fungi lack any ability to propel themselves like mites, caterpillars, beetles or thrips. Also, mobility from growth into adjacent areas is quite slow. However, fungal spores do have other characteristics that allow them to flourish in your garden. They are very small and easily transported by wind, splashing water, rain and insects. Their ability to produce offspring in large numbers is phenomenal. These traits more than make up for their innate mobility shortcomings. A wide variety of fungal spores can be found on plants, suspended in the air and floating on the surface of water. Our gardens are continuously exposed to the threat of fungi.

So how do fungi damage our roses? Many fungi infect the epidermal or outer surface cells of the host plant cells. They have a high demand for the nutrients necessary for growth and spore production. Fungi obtain nutrition from host plant cells by means of small, root-like organs, known as haustoria, which feed within the epidermal layer of the plants. They rob our roses of water, organic carbon and other vital nutrients required for plant vitality and bloom production. In part, fungi effectiveness is increased by the inability of roses to repair damaged epithelial tissues ("skin") in the same manner as animals. Animals quickly replace tissues infected by fungi with healthy tissue once fungicides are applied. The scenario is quite different for plants. Once fungal damage occurs, the protective plant skin layer is permanently destroyed. Fungi continue to rob plants of vital nutrients necessary for plant growth, bloom production and disease resistance. Severe infestations can in some cases lead to dieback and eventual plant death.

Characteristics

Leaf Spot Fungi

In the Deep South our rainfall levels and periods of high humidity provide ideal conditions for leaf spot fungi. Blackspot (*Diplocarpon rosae*), anthracnose (*Sphaceloma rosarum / Elsinoe rosarum*) and cercospora leaf spot (*Cercospora rosicola*) are the most common culprits in our area and they share many common traits. They require leaf surfaces to remain wet for 7-8 hours to establish a foothold. Left untreated, fungi will weaken plants, increase susceptibility to other diseases and eventually defoliate plants.

Blackspot's near circular shape, feathery edges and its black or dark brown colored spots can be seen in these photos. Spots may grow across leaf veins and be visible on tops and bottoms of leaves. As is the case with many diseases, tender new growth is most susceptible, but plants can be infected at any stage of their development. Evidence of blackspot usually begins on lower leaves and will move upward through the plant as the season progresses. As infection progresses, spots grow larger and more numerous. Blackspot can also develop on canes. Infected canes develop raised, purplish-red spots or blotches, which eventually blacken and appear blistered. These lesions seldom kill affected branches, but do serve as an overwintering site for blackspot. That's why it's important to apply a fungicidal spray like lime sulfur on roses in conjunction with spring pruning. All three of these fungal infections can cause leaves to turn yellow (chlorosis) and eventually fall from the plant.

Blackspot – Photo by Al Whitcomb

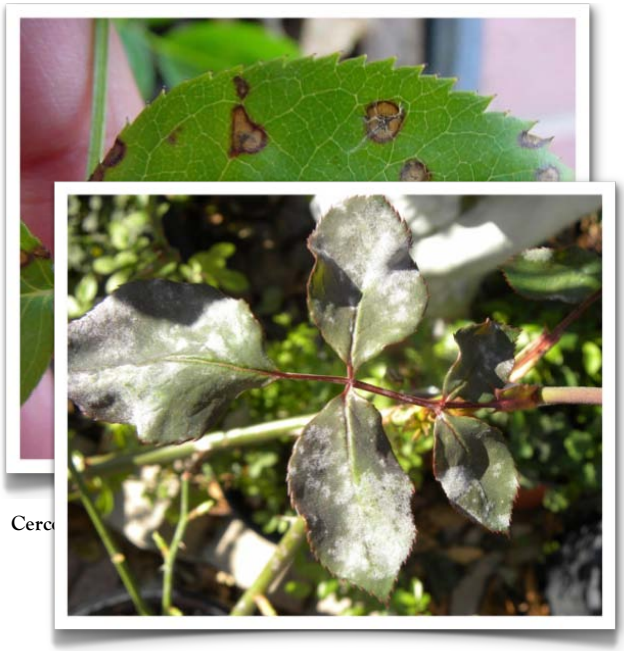
Purple spotting or spot anthracnose (*Elsinoe rosarum, aka: Sphaceloma rosarum*) appearance is quite different from blackspot. At first, new leaves and sometimes stems may appear with small, round, reddish-purple spots. As the disease develops, centers of the spots eventually turn gray or white with red margins. Affected tissue may drop out or crack in the center of the spots, giving infected leaves a speckled appearance. Leaves may turn yellow and drop.

Lesions can also develop on petioles, the small stalk attaching the leaf blade to the stem. Similarly to many fungal infections, anthracnose can overwinter on infected canes. Leaf spot fungi seldom kill a rose, but they all will reduce the over all health and productivity of the bush.

Anthracnose – Photo by Al Whitcomb

Cercospora (*Cercospora rosicola*) is similar in appearance to anthracnose. Like blackspot and anthracnose, infections are primarily found on plant leaves, but may also infect pedicels, stems and bracts. Spots start as purplish circular areas gradually turning brown, and then become more defined while growing to be as large as 10 mm in diameter. Infections may lead to chlorosis and in extreme cases plant death.

No matter what type leaf spot fungal infection your roses are experiencing, remove affected leaves from plants and leaf litter from areas under plants to help limit further infection. Infected debris should be completely removed from your yard.



Cerc

Mildew Fungi

Powdery mildew (*Sphaerotheca pannosa var. rosae*)

infections begin as discrete circular powdery white spots. White spots will join together to form a dust like cover of foliage, buds and canes. Powdery mildew does cross over leaf veins, so this characteristic can be used to distinguish it from some other fungal infections.

Powdery Mildew Bud – Photo by Al Whitcomb

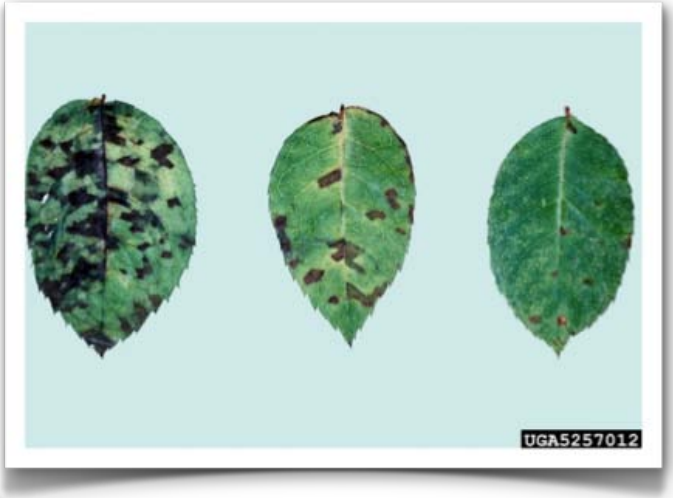
Roses are most susceptible to powdery mildew infection in the spring and fall when humid overcast days are warm and nights are cool. Leaves can become distorted, turn yellow and fall prematurely. Infected flower buds may appear distorted and produce poor quality flowers. With the onset of hot summer weather and heavy rainstorms or cold winter weather, symptoms usually disappear on their own. There is some evidence that glossy-foliaged roses may have better natural resistance to powdery mildew.

Powdery Mildew Foliage– Photo by Al Whitcomb

Downy Mildew

(*Peronospora sparsa*) can appear on leaves, canes, and peduncles. Signs of infection usually begin as irregularly shaped purplish red to dark brown spots on leaves. Elongated, discolored spots on leaves continue to grow and may form on canes.

It can be confused with other maladies that share its symptoms. Damage on leaves can resemble chemical overspray. Downy mildew does not cross leaf veins so patches have straight sides and appear angular. As infection progresses, dark brown areas enlarge on tops of leaves.



Gray-white mycelium may appear on their undersides and sometimes may be confused with botrytis. As with other fungal infections, downy mildew can overwinter on your roses.

Both Downy Mildew photos courtesy the Florida Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services, Bugwood.org.

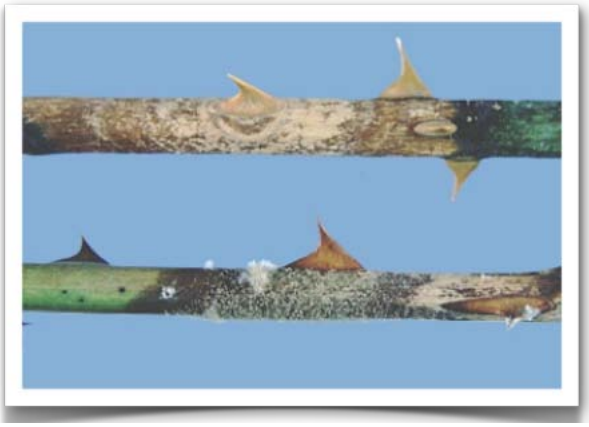
Botrytis

Botrytis cinerea, sometimes referred to as botrytis blight, thrives in high humidity climates and can infect blooms, leaves and canes. Infected areas are most obvious on lighter colored blooms where lesions first appear as perforations or yellowing spots surrounded by dark to light pink halos.

Botrytis Petal – Photo by Al Whitcomb

As infection spreads, it quickly covers buds with a gray-tan mold. Blooms become rotting masses and usually will not fully open. Left untreated, infection can spread to leaves and eventually to canes. Die back or target-like splotches can form on canes. Severe infections can kill entire canes. Botrytis may be spread from use of contaminated tools when cutting or pruning roses. If fungicides used in your garden aren't effective against botrytis, you may want to try chemicals containing hydroxyanilides or a biological agent like Bacillus Subtilis

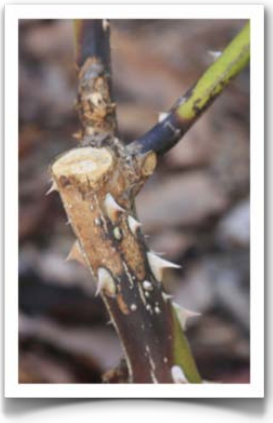
Botrytis Bloom – Photo by Al Whitcomb



Botrytis Cane – http://www.ces.ncsu.edu/depts/pp/notes/Ornamental/odin002/rosebbs1.jpg

Cankers

Common Canker (*Leptosphaeria coniothyrium*), **Cane Blight Canker** (*Botryosphaeria ribis*), **Brand Canker** (*Coniothyrium wernsdorffiae*), and **Brown Canker** (*Cryptosporella umbrina*) are some of the stem cankers we find on our roses. It is difficult at best to visually identify specific strains of canker. Cankers can gain entry into stems through cracks in canes or wounds caused by improper pruning (right photo), canes rubbing against each other or through wounds caused by pests or cultivation. In the case of Cane Blight Canker, pictured left, light tan to dark purplish brown areas of dieback will gradually expand away from points of initial infection. The canker will grow and may ultimately girdle the stem causing a complete dieback of a cane and upon reaching the crown, may destroy other canes or the entire plant. Cankers can devastate your rose garden, so it is prudent to act quickly with aggressive measures to counter them. Start by pruning out all infected plant tissues. Prune at least 2" below where there is evidence of infection. Consulting Rosarians may be able to confirm your plants have been infected by a canker, but usually a pathological evaluation will be required to confirm the specific canker. It is a good idea to save some samples of infected canes for follow up evaluation by your local extension service. If the entire plant dies, provide the extension service/plant pathologist the entire plant remains to allow complete analysis. Rid your garden of all infected refuse.



All Cane Blight Canker photos courtesy Phil Paul Bradenton Sarasota Rose Society

Prevention & Treatment

Anyone in our area of the country who says they have no evidence of fungi in their garden probably doesn't know what it looks like or may need glasses. Chances of completely eliminating all fungi in our gardens are nil. However, its effect can be limited by good garden design, accurate identification and good preventive maintenance practices. Prevention begins with design of your garden. For most fungi to establish an initial foothold, foliage must remain moist for a prolonged time. Good garden design requires selecting garden sites with at least six hours daily exposure to direct sunlight.
When selecting a planting site for a rose, visualize its mature dimensions. Allow for enough space between bushes for easy maintenance and room for good air circulation. Air flow optimizes foliage drying times and helps disrupt fungi ability to establish a foothold. Prior to purchasing a rose, it's also a good idea to ask fellow rosarians if the rose you are considering is prone to fungal attack.

While it is true that most roses are susceptible to fungal attacks, it's a good idea to avoid roses described as "blackspot magnets" by fellow rosarians. Good watering practices can also help discourage the growth of fungi. Always allow ample time for water on the surface of plants to evaporate before sundown, by scheduling overhead watering early in the day. Using drip systems helps limit water on the surface of bushes and thereby ability of fungi to develop. Minimize the spread of fungal infections in your garden. As soon as you find evidence of fungi, remove infected leaves and canes from your rose bushes. Clean cutters after pruning infected plants using a 10% solution of household bleach or a 70% alcohol solution. Don't put infected debris in your compost pile. Always destroy or dispose of infected material by putting it out with your trash.

Always use measures with the least detrimental effect on our environment, yet achieve desired control of the harmful fungi described in this article. Remember, you can't cure infected tissues. You can only prevent or stop infections, so it is paramount to identify infections accurately and to counter them quickly and persistently. Roses are pretty "tough cookies". Most will "*survive*" minor fungal attacks without chemical sprays. The operative word is "*survive*". As a first step, try to control fungi without the use of toxic chemical fungicides. In cooler weather, light horticultural oils, wetable sulfur, lime sulfur, potassium bicarbonate, and the biological fungicides can be used as alternatives to more toxic chemical agents.

If you are an exhibitor or just can't bear to live with imperfect roses, you will want to establish a spray regimen. Generally, effective fungal control programs require a combination of broad spectrum preventive systemic fungicides and fast acting contact fungicides. Frequently rotate chemicals you use to help counter fungal ability to adapt and reduce effectiveness of a single agent or mode of action (MOA). MOA may include a fungicide's capability to inhibit respiration, cell division or chemical synthesis necessary for fungi to survive. Preventative systemic agents ward off fungal attacks for a period of time, typically 1-2 weeks. Spray interval is dependent on the products you elect to use. Contact fungicides are designed to immediately kill fungal spores residing on sprayed areas. While application of horticultural oils, wetable sulfur and lime sulfur can be effective, they may damage plant tissues in hot weather. Fungicides containing dithiocarbamates can be used throughout the growing season and are effective contact fungicides.

Read chemical labels thoroughly and heed their directions. Choose chemicals that counter specific fungi that attack roses. For example, there are many varieties of anthracnose but only Anthracnose (*Sphaceloma rosarum / Elsinoe rosarum*) affects roses. If a fungicide's label only says it is effective in countering anthracnose, it may not be effective against the strain that affects our roses.

When rotating chemicals, pay close attention to their MOA. Research has shown that rotating chemical MOA is the most effective approach.

This table lists several examples of fungicides you may choose to control leaf spot fungi, mildew, botrytis & cankers on roses. Trade names are provided as information and are not endorsed, guaranteed, warranted or recommended by the author. References to fungicides in this publication do not signify approval to the exclusion of other products of suitable composition. All chemicals should be used in accordance with directions on the manufacturer's label and State laws.	Mode of Action	Blackspot (Diplocarpon rosae)	Anthracnose (Sphaceloma rosarum / Elsinoe rosarum)	Cercospora rosicola	Powdery Mildew (sphaerotheca pannosa var. rosae)	Downy Mildew (Peronospora sparsa)	Botrytis cinerea	Common Canker (Leptosphaeria coniothyrium)	Cane Blight Canker (Botryosphaeria ribis)	Brand Canker (Coniothyrium wernsdorffiae)	Brown Canker (Cryptosporella umbrina)
Systemic Fungicides											
Tebuconazole (Bayer Disease Control for Roses, Flowers & Shrubs)	Sterol synthesis	1			1						
Myclobutanil (Immunox, Eagle EW, Scott's Defender-Rose Pride 3 in 1)	Sterol synthesis	1			1						
Ferarimol (Rubigan E. C.)	Sterol synthesis				1			2			
Propiconazole (Banner Maxx & Honor Guard)	Sterol synthesis	1			1						
dimethomorph (Stature SC)	Sterol synthesis					2					
Pyraclostrobin / boscalid (Pageant)	Respiration		2	2	2	2	2		2	2	
Trifloxystrobin (Compass 0 50WDG)	Respiration	1	2		2	2	2				
Azoxystrobin (Heritage DF 50)	Respiration	1	1		1	1	1		2		
Thiophanate-methyl (Cleary 3336F)	Mitosis & cell division	1	1	1	1						
Aluminum tris (Aliette W.D.G)	Not classified					1					
Bacillus Subtilis (Rhapsody, Serernade Max,Cease)	N/A	1		2	2	2	1				
beneficial bacterium (Actonovate® SP)	N/A				2	2	2				
Contact Fungicides											
Dithiocarbamates (Dithane, Mancozeb, Pentathlon DF)	Multi-site contact activity	1	1	1			1	1	1		
Chlorothalonil (Daconil Ultrex)	Multi-site contact activity	1		2			2				
Sulfur (Thiolux , Microthiol Wettable Sulfur, Safer's Defender Garden Fungicide)	Multi-site contact activity	1			1						1
Calcium Polysulfide (High Yield Lime Sulfur	Multi-site contact activity	1			1						
"hydroxyanilides" Fenhexamid (Decree Fungicide) 2.5#	Sterol synthesis						1				
Potassium Bicarbonate (Greencure & Old Fashion Fungicide)	Not classified	2	2	2	2	2	2				
Ethanethiol (Captan)	Not classified	1									
Joboba Oil (Erase)	Not classified				2						
Neem Extract	Not classified	2	2		2		2				
Copper Hydroxide (CUPRO 2005 T/N/O)	Hostile evironment	1			1						

1 – Product label states it controls / limits specific fungi **species** affecting roses, (i.e. Blackspot or Diplocarpon rosae)
2 – Product label does not state it controls / limits specific fungi species affecting roses, but states it controls fungi with the same **common name or genus** affecting roses. (i.e. Botryosphaeria canker or Botryosphaeria spp.), not specifically Cane Blight Canker (Botryosphaeria ribis)

This article was originally published in the Rose Rambler, newsletter of the Marion County Rose Society, Carol Green Editor. (March 2011)