

Poor David's Almanac
by Dave Ingram, Master Rosarian
A Revised White Paper on Black Spot
Part 1 - What is it?

*A garden my friends all thought was hot,
Dropped leaves and declined, because of black spot.*

Throughout the world, black spot is considered the most damaging fungal disease of roses, and has been for over 200 years. In this three-part article, I'll share what I've learned about this disease (both from various authorities and my own experience) and why here in Colorado, we have an advantage in managing black spot.

Black spot is caused by a fungus, generally known as *Diplocarpon rosae* (relax, no test on this!). This disease presents on your rose leaves as roughly circular black spots on the upper leaf surface. The spots have fringed or feathery edges, and range from 1/16 to 1/2 inch across (although I've seen spots the size of a quarter on 'Lady X'). The spots often run together, forming a mass that might cover a third or more of the leaf surface. Less frequently, the spots appear on the bottom of the leaf.

In most cases, the growing spots induce the leaf to produce ethylene. This water-soluble plant hormone produces the diffuse borders of the spot, and begins to yellow the leaf by interfering with chlorophyll production, causing premature aging of the leaf. Eventually an abscission layer forms between the leaf and stem, and the leaf falls off the plant to the ground, suffering Deadly Death (cue in the sad violins).

Black spot, by itself, will not kill your roses. Why is it so dreaded around the world? This disease can spread rapidly in the right weather conditions. A happy case of black spot can quickly defoliate a rosebush, which shuts down the plant's food production. The rose must use stored energy to grow new leaves, which will also become infected (black spot loves new leaves and canes). Repeat this process of depletion until winter sets in. A stressed and exhausted rose is a prime candidate to die from our Colorado winters (cue in the funeral music). It is important to understand this enemy of our favorite flower, and to learn what we can do to keep our plants healthy.

Key: Water is integral to the infection process. A black spot infection begins as microscopic, colorless, two-celled spores called *conida*. One source I consulted claims that black spot spores are present in all gardens all the time. They are spread by water (from rain, overhead watering, or hose spraying), as well as contact with insects and gardeners. Fallen infected leaves, with spores attached, may be blown to other plants, but splashing water is needed to spread the spores onto a new rose leaf.

Key: Once on the leaf, the spore will germinate when **two factors** are in place:

1. The spore must be immersed in water (not just humidity) for a minimum of **7 hours**.
2. The temperature must be between 59 and 80 degrees F. Above 65 degrees, the germination rate skyrockets, and at 75 degrees, your little black spot party may resemble Times Square on New Year's Eve. Temperatures above 85 degrees, however, appear to hamper or halt the progress of the disease.

Once germinated, the spore puts out a germ tube that pushes between the surface cells and spreads within the top layer of leaf cells. The distinctive black spots form in as little as 72 hours. The spots represent permanent damage to the leaf.

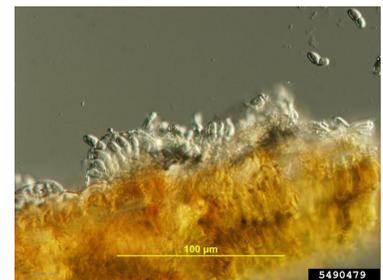
(conida). One source claimed that two spots 1/2 inch in diameter produce over 2.5 million spores in 30



Black spot infection. Ethylene production beginning,
© Eco Organic Garden



Two-celled conida spores ©
Bruce Watt, bugwood.org



Acervuli releasing conida spores,
© Bruce Watt, bugwood.org

The spots are actually black, blister-like acervuli - also known as fungal fruiting bodies (isn't that a disgusting term, "fruiting bodies?" gross). Beginning around 10 days, the acervuli are ready to release new spores (*conida*). One source claimed that two spots 1/2 inch in diameter produce over 2.5 million spores in 30 days. Black spot spores cannot survive for long in soil (although they may survive on your tools for up to a month), but attached to their fruiting bodies (Ugh!) on young canes, as well as living on fallen leaves, they can lurk in wait to hitchhike on any source of water.

Black spot is most visible on the leaves, but can also infect the petioles (the short stems that join the leaflets together to form the leaf), as well as the stipule that joins the leaf to the stem. Lesions may also show up on the sepals, peduncles and hips of the bloom. Flower petals may show red dots and some distortion. **Take note:** the fungus also produces lesions on young, first-year canes (it particularly loves basal breaks in the fall: another reason, besides looming winter frost damage, to remove these growths after mid-August). Cane lesions are usually purplish-red, raised and irregular, and turn black in the fall. They are important for winter survival of the fungus in our area.



Cane lesions © Walter Reeves

While black spot only infects roses, it is genetically diverse and adaptable. At least 54 different strains are known, and many roses that used to be resistant have become helpless hosts. Because of this, some roses now being touted as disease resistant may not be able to stay that way. And roses that show resistance in one member's garden may succumb in another's. Black spot has also demonstrated the ability to develop resistance to fungicides, particularly those known as single-site fungicides.

Just to keep the drum-roll of depressing news flowing here, the black spot fungus has a special technique to overwinter in cold climates. The conida spores mentioned above are a summer form, very virulent in the right conditions, but susceptible to cold and drying. These spores can't survive our tough winters. So in its black-hearted wisdom, once the nights turn cold, the black spot fungus overwinters as mycelia in cane lesions and on fallen leaves (think resting structures, like Can-cun for black spot). In the spring, the mycelia are able to grow new acervuli that produce conida spores. In Colorado, this is the main way that black spot overwinters.



Developing acervuli on leaf bottom © Penn State University, bugwood.org

Key: Because of this survival mechanism on both cane lesions and fallen leaves, it may not be enough to only clean up fallen leaves each winter. Cane lesions will also bring the disease storming back in the spring. If you can identify purple or black raised pustules on stems of your plants, consider pruning and destroying those stems now, during winter. For those battling an ongoing infection, remove and destroy hanging leaves, then consider adding the use of a dormant spray, either of horticultural oil or a fungicide, to slow cane lesion infections until all sources can be identified and pruned out during spring pruning. It's smart to begin control efforts early, before new spores can re-emerge in the spring.

Tip: Don't discard infected leaves or stems into a compost pile. Temperatures are rarely hot enough to kill the spores. Don't let your beautiful new compost become a source of re-infection.

So what about the climate advantage I mentioned at the beginning? Consider this: black spot is known to be less severe in semi-arid climates. Here in the Denver area, we average a low 14 inches or so of moisture each year. If you combine this advantage with careful watering practices to keep your foliage dry, you can limit your exposure to black spot in ways other areas of the country cannot. In my garden, it is most common to see black spot infections emerge from late summer into the fall. But keep in mind: black spot can show up any time that conditions are right, starting in early spring as new leaves emerge. A smart gardener is on year-round alert.

Next month, we'll talk about ways to effectively manage black spot disease through cultural controls.