

# Rethinking Management for Black Spot

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ROSARIANS IN AREAS WITH ABUNDANT SPRING/SUMMER RAIN have complained that their standard management protocols for black spot have not worked as satisfactorily as in previous years even when using varieties with resistance claims. For many rosarians, the standard practice is using fungicides on a regular schedule to prevent the disease and/or manage it to minimal levels. In this article, we will rethink black spot control with the reliance on cultural controls first, spraying second.

The fungus *Diplocarpon rosae* causes black spot. Plant diseases are dynamic – they occur over time and all diseases follow a disease cycle. The key for successful management of a disease is to understand the steps (stages) of a disease cycle and to look for “weak links” where the cycle can be interrupted. With black spot, the fungus overwinters on infected plants and on debris discarded from the previous season (i.e. leaves that fell to the ground during previous black spot outbreaks). In the spring, spores are splashed from this leaf debris to new leaves and/or spores are splashed from stem lesions that developed in the previous season. When spores land on foliage and stems of a susceptible rose, infection requires at least six hours of free moisture and seasonably warm temperatures (above 60°F or 15.5°C) (Fig. 1). Secondary inoculum (spores produced on the new lesions) is splashed by rain and irrigation water and also moved around by humans and air currents. The severity of a black spot outbreak can be mediated by the genetics of the rose, how the rose is maintained horticulturally and by the environmental conditions.

Traditionally, the use of resistant roses has been the best line of nonchemical defense when dealing with black spot (Fig. 2). However, a rose that has proven resistant in another part of the country may not be resistant in your garden. Disease resistance effectiveness can be reduced by changes in the environment (e.g. a heat intolerant rose grown in the South may have its resistance compromised due to heat stress that was caused by physiological changes in the stressed plant). Resistance can also be challenged (reduced benefit) if environment conditions become very conducive for black spot over prolonged periods (extended periods

of rainfall may cause roses that appear to be resistant in most years to look very average in their black spot susceptibility). Changes in the genetics of the black spot fungal pathogen, *D. rosae*, may also result in a change in levels of a rose’s resistance to black spot. Resistance to black spot is controlled by up to four currently known genes in roses; these cause changes in the rose’s physiology that confers resistance to black spot. However, through recombination of genes and/or mutations in the pathogen’s genome, some isolates of *D. rosae* have overcome one or more mechanisms of resistance in some resistant roses. When a new strain of *D. rosae* appears that is able to overcome a mechanism for resistance, the new strain is referred to as a new race of the pathogen.

From 2004 to 2012, roses were screened for black spot resistance in Poplarville,

Mississippi, Crossville, Tennessee, and Jackson, Tennessee. Using a race differential scale (created by scientists at the University of Minnesota), we estimated at the beginning of the resistance studies there were two races of *D. rosae* at each study site. Within four to five years, as many as seven races were detected in each field and race composition was not the same for all fields. The different race composition in the different fields made comparisons of resistance data between fields problematic. New races of *D. rosae* may be introduced into the garden at any time on new roses, via foliage or cane infections. To date, more than a dozen races of *D. rosae* have been documented in North America.

Many rosarians enjoy growing either heirloom roses or modern roses that grow vigorously, bloom well and maintain green foliage throughout the growing season even though infected by *D. rosae*. These roses are 'tolerating' black spot by basically growing faster than the disease can develop. Tolerance is not equivalent to resistance. A tolerant rose is susceptible to black spot (foliage has many leaf spots) but still appeals to many rose gardeners because of foliage retention and prolific bloom. Resistance relates to how successful the pathogen is at infecting the host and reproducing on the host. Tolerance to plant diseases is thought to be controlled by many genes. Plant breeders find it difficult to breed for tolerance and the genetics is poorly understood. During a disease outbreak, an intolerant rose is defined as a rose that performs poorly (reduced vigor, foliage defoliates and bloom number and size are reduced). In a mixed garden of tolerant and intolerant roses, if tolerant roses are not sprayed with fungicides on a regular basis, the inoculum level of *D. rosae*, on the tolerant roses, may overwhelm the intolerant roses and render cultural control methods and fungicides ineffective for disease control. If tolerant and intolerant roses are grown together, it is necessary to treat all roses as intolerant and spray all roses with fungicides to prevent the intolerant roses from being overwhelmed by the disease.

In some parts of the country, environmental conditions that are conducive for disease development are prolonged by a long growing season. In these areas, cultural control methods alone may not supply acceptable levels of control and fungicides are required for growing good roses. There are many fungicides labelled for black spot

control for homeowners and most are effective for *protecting* roses. By *protectants*, we mean the fungicides are effective in controlling black spot when the fungicides are applied before the disease is detected. In some parts of the country, biorational products (soft pesticides) may also be used as *protectants*, although the use of biorational products in areas with high black spot pressure for extended periods often yields unsatisfactory results. In a Texas A&M study, a rotation of *Daconil/Mancozeb* and potassium bicarbonate (a biorational – baking soda) was effective in controlling black spot in the Dallas, Texas area. Fungicides often yield unsatisfactory results if used in a curative fashion (i.e. use of fungicides to stop a black spot outbreak after the disease is already ravaging roses in the garden). Once the disease obtains a firm foothold in the garden, you will be 'fighting an uphill battle' even with fungicide use.

Dr. George Philley (now retired and growing some of the best peaches in Texas) worked on black spot control for many decades at the Texas A&M AgriLife Research and Extension Center in Overton, Texas. Dr. Philley observed that tebuconazole (the active ingredient in the old fungicide *Lynx* and currently the active ingredient of *BioAdvanced Disease Control for Roses, Flowers and Shrubs®*) was superior for black spot control (used as a foliar spray) when compared to other sterol inhibiting fungicides such as propiconazole or myclobutanil. Although Dr. Philley found tebuconazole to be effective as a drench for black spot control, we did not find the *BioAdvanced 3-in-1* product, with tebuconazole used as a drench, to be as effective for controlling black spot as the *BioAdvanced* foliar spray product. The difference in these findings may be due to Dr. Philley's use of a higher rate of tebuconazole than what is recommended for the 3 in 1 product. We have not worked with the granular combination products that are now on the market and do not know how their efficacy compares to the drench or foliar spray products. Tebuconazole as a foliar spray is highly effective in preventing black spot and has some curative properties when disease pressure is low. However, its efficacy is likely to be unsatisfactory if the black spot pressure is already severe.

In addition to caring for their own roses and roses in public gardens adopted by rose societies, members of rose societies constantly share their knowledge on rose disease control with novice rose growers. For the novice grower, a black spot management plan must be simple to understand and “not break the bank” or he or she will likely walk away from roses. Our proposed management plan for black spot has elements to address black spot issues with experienced rosarians and novices alike. In our plan, the goal of fungicide usage was to keep the fungicide strategy as simple as possible by minimizing the number of fungicides in the rotation. The selected products had to have a proven record in controlling black spot and be available to novices at box stores and garden centers.

# The Disease Management Plan.

Successful management of black spot takes commitment. Other than rose rosette, there is no disease more likely to damage your roses and be as hard to control for most of the season than black spot. Our proposed management plan requires a knowledge of environmental conditions that favor black spot, knowing which roses are susceptible, accepting that you may have to thin your rose inventory if bushes are overcrowded, and a willingness to use fungicides if you live in an area where the season for black spot is prolonged.

## Step 1.

### THE CORRECT IDENTIFICATION OF BLACK SPOT.

The most likely plant health issues that rosarians or novices are likely to confuse with black spot are downy mildew, cercospora leaf spot, and anthracnose. However, with knowledge of the morphology of the leaf lesions, these diseases can be identified correctly (Fig. 3).

## Step 2.

### TAKE AN INVENTORY OF YOUR ROSES.

Divide them into three groups: A) roses that require little care for black spot – resistant roses, B) roses that require care, but the disease is manageable – tolerant roses, and C) roses whose disease is likely to be out of control – susceptible, intolerant roses. You likely already know which rose falls into which group by having observed your roses over years. If you do not know their black spot susceptibility, you may want to grow the new roses as container plants for one to two seasons to determine if this rose will interfere with your ability to control black spot in your rose beds.

## Step 3.

### INSPECT YOUR GARDEN OFTEN AND USE PRUNING AS A CULTURAL CONTROL STRATEGY.

Look for bushes that are touching each other. Are there larger bushes shading smaller bushes? Prune to increase distance between bushes and to eliminate shading. When doing spring pruning and deadheading, prune bushes to open bush centers to enhance air circulation within bushes. Prune out leaflets with black spot. Do not let them drop to the ground. Bag the discarded foliage (will not be much if you catch the disease early due to frequent inspection) and throw the discards away. If shading of a smaller bush continues from larger bushes even with pruning, you should consider moving and segregating smaller sized roses to prevent shading.

## Step 4.

### AVOID OVERCROWDED ROSE BEDS.

Most rose gardens we visit are overcrowded. Rosarians are often finding new roses they want in their gardens but do not wish to make new beds. To compensate for overcrowding, rosarians increase watering and fertilizing regimes to maintain vigorous plant growth. However, this type of regime makes black spot control more difficult. Roses should be spaced in beds so that you can move between your roses easily without being scratched by thorns (prickles). Adequate spacing promotes good air circulation and rapid drying of foliage; it also prevents plants from shading each other. If your roses are overcrowded, it may be time to “thin the herd”. Reducing rose inventory is often a difficult thing for a rosarian because rosarians are invested economically and emotionally in their plants. If you must eliminate bushes in your garden to reduce overcrowding, we suggest you use the lists you created in Step 2. We suggest roses from Group

C and maybe a few that barely made the list for Group B be considered for elimination. If reducing inventory at one time is unpalatable, overcrowding can be lessened gradually by eliminating two bushes each time a new bush is obtained for your garden.

## Step 5.

### DO NOT PROLONG LEAF WETNESS.

Shorten the length of time that foliage is wet so that conidia of *D. rosae* have less time to germinate and the fungus has less time to penetrate the leaflet surface. Allow foliage to dry in the morning, after a heavy dew, before watering your plants. Set irrigation timers to turn irrigation on after dew has dried in the morning and to turn the irrigation off for sufficient time for foliage to dry – at least one hour – before dew forms in the evening. An example of use of irrigation to promote foliage drying is in Fig. 4. An alternative would be to water at night *after* dew has formed on the rose foliage. Nighttime irrigation should not extend the time that foliage is wet from dew – make sure dew has formed before applying irrigation.

## Step 6.

### REDUCE INOCULUM LOAD FROM DEFOLIATED FOLIAGE.

Attach the bag and the seldom-used nozzle (the big one) to your leaf blower and turn your blower into a vacuum. Now that you have space around your plants from reduced crowding, vacuuming up detached leaflets will be an easy chore. Bag up the trash and discard. This is the only way we suggest using a leaf blower near your rose garden. The use of leaf blowers (for blowing leaves) can enhance the spread of eriophyid mites (the vector of rose rosette disease) in your garden (Tom Evans, University of Delaware, personal communication). The use of the blower as a vacuum, while pointing the nozzle at the ground, should not enhance eriophyid mite dissemination. An alternative is to rake up defoliated leaves and bag them manually. Since the fungus often overwinters on defoliated debris resting on the rose bed surface, adding 2-3 inches of mulch in the spring to cover the debris before rose foliage emerges, would reduce the effectiveness of primary inoculum (the spores used by the pathogen to fuel disease outbreaks in the spring).

## Step 7.

### KEEP A LOGBOOK.

The late Mr. Archie Cultra, co-owner of Morning Star Nursery that was located near Rives, Tennessee

(nursery had hundreds of acres of field grown stock) had reoccurring issues with spirea leaf spot in multiple fields of *Spirea japonica* and *S. vanhouttei*. Archie kept a logbook for each field, dating back more than 20 years. The logbook contained information for date of transplanting plants into the field, when the leaf spot disease was first detected each year, fertilization regimens and what pesticides were used (including application dates, pesticide rates, and if rain occurred within 48 hours after chemical application). No guesswork was required to determine the timing of the first fungicide application. In your logbook, keep times for when roses leaf out in the spring, when roses begin to bloom, the first killing frost, when you detect diseases such as downy mildew, blackspot, powdery mildew, etc., outbreaks of insect pests, and when you applied fertilizers, insecticides and herbicides (including which ones and how much). The log is also an excellent place to keep maps of your garden in case you lose tags that identify your plants. Your logbook will not only be a valued resource for determining first application dates for pesticides, but will also serve as a valued resource if other plant health issues arise in your garden.

## Step 8.

### USE FUNGICIDES IF CULTURAL CONTROLS DO NOT GIVE SATISFACTORY CONTROL OF BLACK SPOT.

Satisfactory control of black spot is not the same for all rosarians. Some growers tolerate considerable disease as long as their roses thrive and have adequate bloom. Other rosarians will not tolerate damage to foliage that would be on a rose stem to be exhibited at a rose show. Therefore, need for chemical control will vary dependent on grower goals.

There are many fungicides labelled for homeowner use. However, we are striving to minimize the number of fungicides used in rotation to make things as simple as possible for novice growers. Fungicides should be applied before black spot becomes apparent. Thus timing of fungicides will not be the same for all areas. We recommend using mancozeb (zinc and manganese ethylene bisdithiocarbamate) as the first fungicide each season. Mancozeb is very effective for black spot prevention but does nothing for controlling black spot if the fungus is already inside the leaflet. The zinc ions in the fungicide solution will also have activity for downy mildew that may be active early in the black spot season. The main ingredient in our fungicide rotation will then be tebuconazole (*BioAdvanced Disease Control for Roses, Flowers and Shrubs®*). However, we suggest using mancozeb as the third or

# Table 1.

Our simple fungicide rotation includes mancozeb & tebuconazole. However, there are other products that can be used in a fungicide control rotation.

| Fungicide<br>Common Name | Trade Name of<br>Active Ingredient |
|--------------------------|------------------------------------|
|--------------------------|------------------------------------|

|                |                                        |
|----------------|----------------------------------------|
| Chlorothalonil | Daconil   Ortho Garden Disease Control |
|----------------|----------------------------------------|

|                |                                                                         |
|----------------|-------------------------------------------------------------------------|
| Propiconazole* | Fertilome Systemic Fungicide   Bonide   Infuse Systemic Disease Control |
|----------------|-------------------------------------------------------------------------|

|               |                     |
|---------------|---------------------|
| Myclobutanil* | Spectracide Immunox |
|---------------|---------------------|

|        |                         |
|--------|-------------------------|
| Copper | Bonide Copper Fungicide |
|--------|-------------------------|

|        |                                                                           |
|--------|---------------------------------------------------------------------------|
| Sulfur | Bonide Sulfur Plant Fungicide   Safer 5456   Garden Fungicide Concentrate |
|--------|---------------------------------------------------------------------------|

\* Propiconazole and myclobutanil have similar mode of action as does tebuconazole and should not be used together in a fungicide rotation.

## FIG. 1

For black spot to occur, you must have a susceptible host, a conducive environment (minimum of six hours of leaf wetness and temperatures above 60°F (15.5°C) and a virulent strain (race) of the pathogen (*Diplocarpon rosae*).

**Spores of *Diplocarpon rosae* in drop of water**



**Cultivar 'Legends' susceptible to black spot**



**Disease**



**Black spot**

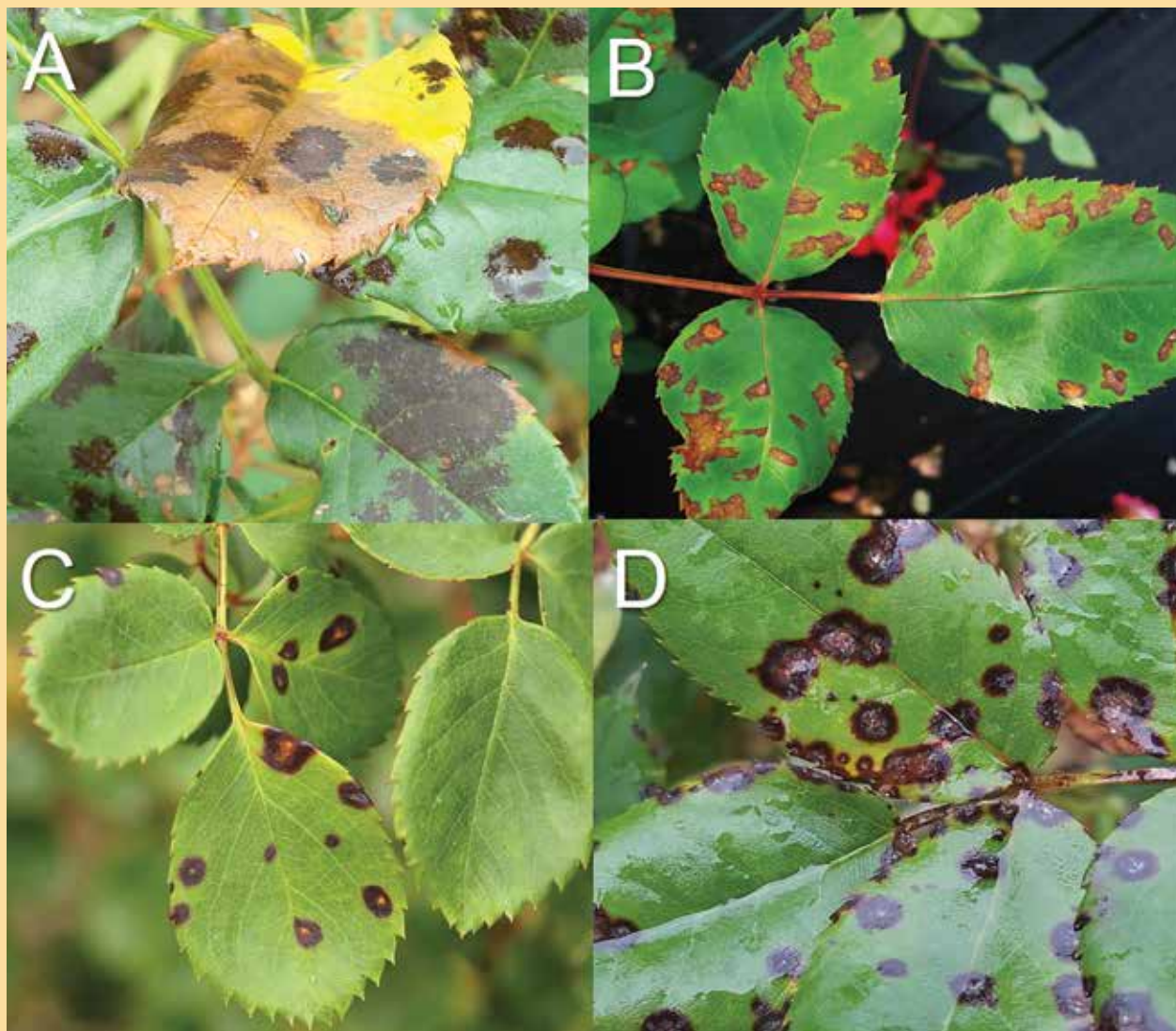
**Environment: warm, leaf wetness > 6 hr**



## FIG. 2.

The rose on the left, 'My Girl', is resistant to many but not all races of *D. rosae*. The rose on the right, 'Peace', is susceptible to known races of black spot and defoliates rapidly. At the time of the photograph, the roses had been part of a resistant study for three years in a field located at Poplarville, Mississippi. No fungicides were used and roses were not pruned to promote optimum air circulation within plant crowns. However, roses were irrigated by drip and fertilized through the irrigation system.





### Fig. 3.

A, B, C and D are common foliar diseases of roses. Fig.3.A is black spot (caused by the fungus, *Diplocarpon rosae*). Black spot lesions range from brown to black and may coalesce to cover large areas of leaflets. Leaflets may turn yellow (chlorotic) and drop from the plant (defoliation). The key to correct identification is to note the lesion margins. The margins of black spot lesions are not discrete. This means there is no defined border between diseased and healthy tissue. The margins of black spot lesions ‘feather’ or ‘diffuse into healthy tissue. Fig. 3.b is downy mildew (caused by a fungus like organism, *Peronospora sparsa*). Downy mildew foliar lesions range from red to maroon, to purple to black. The lesions are often angular (limited by veins) and have lesions with discrete borders. If you turn leaves over and observed their backside (abaxial), you may see whitish fungal growth where lesions are on the topside (adaxial) of the leaves. Fig. 3.C is cercospora leaf spot (cause by a fungus, *Cercospora rosicola*). These lesions have reddish to purple borders and necrotic (dead tissue) centers. There are no fruiting bodies of the fungus to be observed in lesion centers with a magnifying glass. Fig. 3.D is anthracnose (cause by a fungus, *Elsinoe rosarum* - formerly *Sphaceloma rosarum*). Anthracnose lesions are similar in appearance to cercospora leaf spot lesions but have fungal fruiting bodies that are visible with a magnifying glass. The fungal fruiting bodies appear as flecks of black pepper sprinkled within the necrotic centers of the lesions. The two diseases can also be separated by noting when lesions appear on foliage. If temperatures are cool, below 70°F (below 21°C), the disease is likely to be anthracnose. If the disease appears when temperatures are warm to hot, above 85°F (29°C), the disease will be cercospora leaf spot.

## Fig. 4

### Determining watering times to prevent continuation of leaf wetness periods.

|                                           |                                                          |                                                                       |
|-------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------|
| In early morning:<br>Foliage wet with dew | Mid morning – Afternoon<br>dew had been<br>gone for 1 hr | Late afternoon:<br>Foliage should be<br>dry for 1 hr<br>before sunset |
| Do Not Water                              | Time for watering / irrigation                           | Do Not Water                                                          |

fourth spray in each fungicide rotation cycle to reduce the possibility of *D. rosae* populations developing less sensitivity to tebuconazole.

As mentioned above, our goal is to keep the fungicide rotation as simple as possible. Other homeowner fungicides labelled for homeowner use for black spot control are listed in Table 1. Use of fungicides listed in Table 1 has yielded satisfactory results in published studies. The chlorothalonil, copper, sulfur and zinc products are protectants and not systemic fungicides. New foliage that emerged after fungicide application would not be protected from *D. rosae* if a protectant fungicide was used most recently.

### Summary

Black spot will continue to be an issue with growing roses. However, with an integrated management plan that incorporates disease resistance and cultural and chemical control strategies, black spot is manageable even under adverse weather conditions.

For more information of these other foliar diseases, please download the following publication: <https://extension.tennessee.edu/publications/Documents/W833.pdf>.

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