

Vegetable Diseases

Five Steps for Healthy Garden Tomatoes

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For many Indiana gardeners, summer really doesn't start until the harvest of that first ripe tomato. Unfortunately, there are many infectious diseases and noninfectious disorders that can reduce the yield and quality of tomatoes from the home garden.

This publication briefly describes some common tomato diseases and disorders, and then provides five steps home gardeners can take to minimize yield loss. The steps are:

1. Diagnose the problem correctly.
2. Plant resistant varieties.
3. Practice crop rotation, fall tillage, and sanitation.
4. Maintain plant vigor.
5. Use fungicides as needed.

Infectious Diseases

Early Blight and Septoria Leaf Spot

Perhaps the most common disease symptom homeowners mention is "My tomato plants are turning brown, starting with the bottom leaves and working toward the top of the plant."

This description fits the symptoms of two diseases: early blight and Septoria leaf spot. Both diseases cause lesions that initially appear on lower leaves (Figure 1). And both diseases can progress rapidly from lower foliage to new growth during wet weather. Early blight lesions have target-like rings or concentric circles within the brown area — a bull's-eye pattern (Figure 2). Septoria leaf spot causes small, chocolate brown, circular spots that are 1/10 to 1/8 inch in diameter (Figure 2). Both diseases attack less vigorous plants and plant parts. The fungi responsible for these diseases overwinter in infested crop residue in the garden.

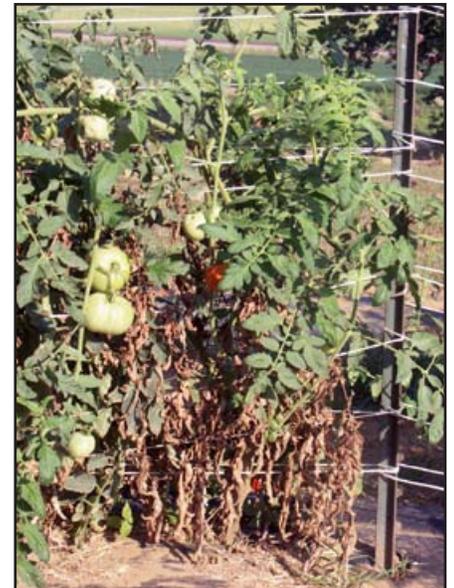


Figure 1. Necrosis on the lower leaves of tomato plants is a symptom of both early blight and Septoria leaf blight.

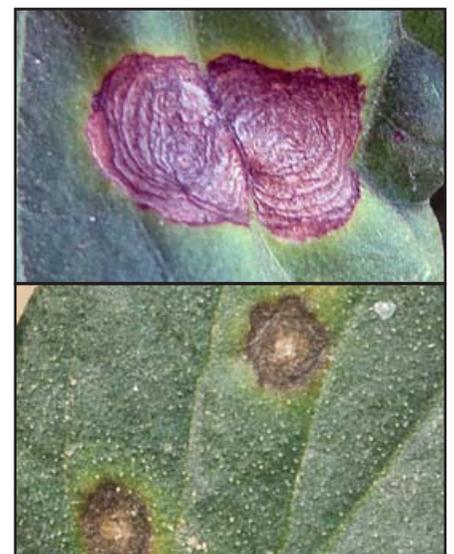


Figure 2. When viewed close up, early blight lesions (top) typically have ridges in a bull's-eye pattern. Septoria leaf blight lesions (bottom) are chocolate brown with light grey centers.



Photos by
Daniel S. Egel (Figures 1-3) and
Elizabeth Maynard (Figures 4-5)

Fusarium Wilt and Verticillium Wilt

Yellowing and wilting lower leaves is the first noticeable symptom of Fusarium wilt and Verticillium wilt. The wilt may affect one side of a leaf.

Fusarium wilt may cause a seedling disease, whereas Verticillium wilt usually does not. Fusarium wilt is usually more severe on plants grown in light sandy soil. The fungi that cause these diseases survive for many years in the soil, even in the absence of tomato plants.

Bacterial Spot and Bacterial Speck

Bacterial spot and bacterial speck infections result in dark brown spots on leaves that are often smaller than those caused by early blight or Septoria leaf spot. The spots may occur on younger leaves and may occur along leaf veins where water collects. Severe infections may cause dark scabby-like lesions on fruit (Figure 3).

Root-knot Nematode

Plants affected by root-knot nematodes may appear stunted or wilted. If you dig up the roots, you may observe round galls on the roots. The galls are caused by microscopic nematode “worms” that prevent the roots from functioning properly.

As with Fusarium wilt and Verticillium wilt, the organism responsible for these symptoms may survive for many years in the absence of a host plant. Root-knot nematodes affect many diverse plants.

Other Diseases

There are, of course, other infectious diseases and disorders of tomatoes than the ones discussed here. Experienced gardeners may have heard of bacterial canker, buckeye rot, gray leaf spot, late blight, and tobacco mosaic virus (TMV). These diseases probably occur in isolated areas of Indiana every year but are not normally widespread.

Noninfectious Disorders

Blossom-end Rot

Blossom-end rot is a disorder of tomato fruit that usually occurs after rapidly growing plants endure a prolonged dry spell or after a period of unusually abundant rainfall. It is not caused by a disease or other pest (that is, it is noninfectious). Blossom-end rot most often affects the first set of fruit produced. Heavy application of nitrogen fertilizer also tends to promote blossom end rot.

Although the cause of this disorder is calcium deficiency within the fruit, environmental conditions can lead to blossom-end rot even when the soil has sufficient calcium. Adding calcium fertilizer after this disorder appears is unlikely to help. Symptoms occur on green or ripe fruit and appear as dry, leathery areas on the blossom end of the fruit (Figure 4). The leathery areas are generally concave and are usually larger than a quarter but can be as wide as the fruit itself.

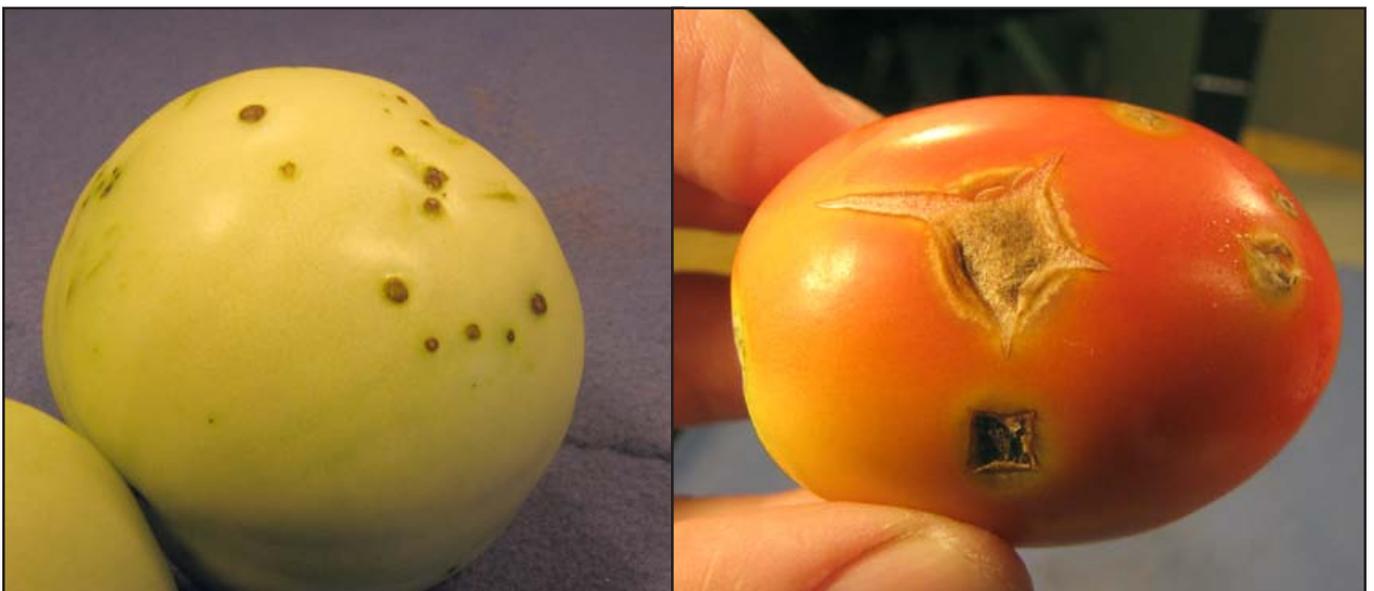


Figure 3. Bacterial spot or bacterial speck lesions range from round, scabby lesions (left) to very large, cracked lesions (right).



Figure 4. Blossom-end rot is a noninfectious disorder that causes leather-like lesions on the blossom end of tomatoes. The disorder is caused by calcium deficiency.

Catfacing

This disorder, which is also noninfectious, can be recognized by the malformed tomato fruit it causes (Figure 5). Catfacing often occurs when the flower buds were exposed to cold. Heirloom varieties exhibit a high proportion of fruit with catfacing; thus, catfacing may not detract from the marketability of these varieties. Variety selection is the most practical way to limit this problem — larger varieties tend to be more prone to catfacing.



Figure 5. Catfacing of tomatoes is often associated with cold weather during flowering.

Herbicide Injury

Being exposed to growth-regulator herbicides is one of the most common sources of tomato plant damage. Herbicide exposure is usually caused by drift (when the wind blows the herbicide away from the target area) or volatilization (when herbicide turns to a gas due to improper application). Apply liquid dandelion killers with care and when the wind is not blowing. Also, keep granular applicators away from the garden.

For more information, see *Diagnosing Herbicide Injury on Garden and Landscape Plants* (Purdue Extension publication ID-184-W), available from the Education Store, www.the-education-store.com

The Five Steps

You can increase the odds of growing tomato plants successfully if you follow these five steps.

1. Diagnose the Problem Correctly

Before you can treat any disorder, you have to identify the problem correctly. The photographs in this and other resources may help you diagnose tomato diseases. However, it may be wise to test a sample for an accurate diagnosis. You can bring a sample to your Purdue Extension county office (or educator), or you can send a sample to the Purdue Plant and Pest Diagnostic Laboratory.

Instructions on how to prepare and send a sample may be found on the Purdue Plant and Pest Diagnostic Laboratory website, www.ppdl.purdue.edu.

2. Plant Resistant Varieties

Whenever possible, choose varieties that have resistance to diseases. For example, tomato varieties are available that are resistant to *Verticillium* wilt, *Fusarium* wilt, and root-knot nematode — thus, the letters VFN are often associated with tomato varieties that have such resistances. There are no other practical means of controlling these diseases except for resistant varieties.

Some varieties also may have partial resistance to leaf (foliar) diseases such as early blight. Heirloom varieties will likely lack resistance to any diseases, so if you grow heirlooms, closely follow the remaining suggestions listed here.

When purchasing seedlings, inspect the plants and choose only green, vigorous looking seedlings. Avoid wilted plants and those with yellow leaves or brown spots on the leaves. Although no tomato variety is resistant to blossom-end rot, experienced gardeners will begin to recognize that some varieties are more prone to this disorder than others.

3. Practice Crop Rotation, Fall Tillage, and Sanitation

Whenever possible, do not plant tomatoes in the same place year after year. Many pathogens, such as the ones that cause early blight, survive from year to year in crop debris. Planting a crop unrelated to tomato for three or four years will allow the crop debris to break down and make it less likely for pathogens to survive. Crop rotation is particularly important for heirloom varieties since they are susceptible to a greater number of diseases.

If it is not possible to rotate to a different plot of ground each year, remove tomato plants from the garden as soon as you complete harvest. Plants that are not removed provide a winter haven for all sorts of tomato pathogens. You can compost or simply discard dead plants. Do not use composted tomato plants in tomato production.

Some residue can be expected to remain in the garden. Tilling the soil in the fall to a depth of 4 to 8 inches will bury this residue and hasten its decomposition.

Use clean stakes or cages each year. You should remove plants or fruit suspected of disease well away from the production area. This cleanup should be routine with all garden vegetables. You should also destroy all weeds because they can harbor tomato pathogens until spring.

4. Maintain Plant Vigor

Healthy plants tend to resist diseases better than plants that lack water or nutrition. Tomatoes planted in well-tilled, well-drained, and properly fertilized soil, will be less prone to early blight and Septoria infection. Tomatoes will grow in many different soil types, but a deep, loamy, well-drained soil is ideal. They grow best in a slightly acidic soil, pH 6.2 to 6.8. You should till the soil in spring prior to transplanting.

In the absence of a soil test, apply a complete fertilizer at 2 to 3 pounds per 100 square feet to supply the needed nitrogen, phosphorus, and potassium.

Complete fertilizers include products that are labeled 5-10-10, 10-10-10, or 8-16-16. Follow fertilizer label directions carefully. Excess nitrogen promotes heavy foliage, reduces fruit yield, and increases the chance for blossom-end rot. Nitrogen deficiency predisposes plants to early blight and Septoria leaf spot.

If soil fertility is adequate before transplanting, apply material that contains nitrogen at a rate of 0.1 to 0.2 pound of nitrogen per 100 square feet. Then after fruit set, side dress with 0.1 pound of actual nitrogen per 100 square feet, and then again four weeks later (if needed) to keep plants vigorous throughout the season.

Water stress usually precedes blossom-end rot and can make plants more susceptible to early blight and Septoria leaf spot infection. At midseason, full-grown tomato plants require about 1 inch of water a week. Add water gradually and allow it to soak into the soil. Avoid overhead irrigations, which can lead to an increase in foliar diseases. Do not allow the soil to become so hard and dry that plants wilt. Avoid fluctuations of too much and then too little water. Adding a layer of mulch can reduce evaporation and help reduce weeds. Remember to avoid using clippings from a lawn recently treated with herbicide.

5. Use Fungicides as Needed

Regardless of the efforts to prevent disease, many tomato gardens will have sufficient foliar disease to compromise yield or fruit quality. If you decide to apply fungicides, the following checklist might be helpful:

- **Be safe.** Before you purchase a fungicide, check the label to be sure that it will control the diseases your plants have, and that it is safe to use on tomatoes. By law, all fungicide labels are required to list such information. Use the rate on the label and always wear the proper protective wear. Remember that a pesticide label is the law.
- **Use a pressure sprayer for best results.** Compared to dusting plants, mixing fungicides with water and applying them with a pressure sprayer allows much better coverage and distribution of the fungicide on the plant. Fungicide products vary in effectiveness against these diseases and are available at most

garden stores or nurseries. Products that contain the active ingredient chlorothalonil are preferred, but fungicides that contain copper as the active ingredient also can be effective, especially if disease pressure is low. Copper products may be successfully used for managing bacterial spot/bacterial speck.

- **Apply fungicides before disease symptoms occur or in the early stages of the disease.** These applications will be more effective than applications made after the disease is well along. Begin sprays when plants approach 10 to 12 inches tall and continue spraying at 7- to 14-day intervals throughout the season, especially if disease has been severe in recent years. Providing good coverage over the entire season means that fungicide applications must be repeated.
- **Choose nonsynthetic products if you want to produce organic tomatoes.** Although there is no organic certification for homeowners, products with active ingredients such as copper or sulfur will allow you to produce organically.

More information about garden tomatoes are available in the following Purdue Extension publications (available from the Education Store, www.the-education-store.com):

- *Tomatoes* (HO-26-W)
- *Organic Vegetable Production* (ID-316-W)

To see other publications in the *Vegetable Diseases* series, visit the Purdue Extension Education Store, www.the-education-store.com.

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