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report on
PLANT
DISEASE

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BACTERIAL SPOT OF STONE FRUITS

Bacterial spot–also known as bacteriosis, bacterial shot-hole, black spot, and bacterial canker–is caused by the bacterium *Xanthomonas campestris* subsp. *pruni* (formerly named *X. pruni*). The disease is widely distributed on susceptible cultivars of peaches, nectarines, almonds, apricots, plums, prunes, and cherries in all fruit-growing states east of the Rocky Mountains. Bacterial spot is less severe on domestic (European-type) plums and on sweet and sour cherries.

Figure 1. Peach tree severely infected with bacterial spot.

The bacterial spot organism attacks leaves, twigs, and fruit–reducing both fruit quality and yield. Early and frequent defoliation by bacterial spot weakens the tree, predisposing it to winter injury and subsequent attack by canker fungi. Vigorous trees are less susceptible to the disease than devitalized, neglected trees.

The disease is favored by stormy, rainy weather during June and July. It has caused the most serious damage in areas where the soil is sandy and where the sand is blown by strong winds. In a bad bacterial spot year, 15 to 50 percent or more of the fruit of susceptible varieties may have to be discarded. Fruit infection is the most serious on late-maturing varieties.

SYMPTOMS

Leaves. Numerous, small spots or lesions form (1/25 to 1/5 inch, 1 millimeter to 5 millimeters) in the leaves. These spots are at first circular, and watersoaked, but soon enlarge, become angular to somewhat irregular, and deep purple to rusty brown or black. The centers often dry and tear away leaving ragged "shot-holes." Several spots may merge to give the leaves a scorched, blighted, or ragged appearance (Figure 1). Severely infected leaves soon turn yellow and drop early. On sensitive varieties, a few lesions cause severe defoliation; tolerant varieties require many more. Defoliation is most common on trees deficient in nitrogen or where the disease is further complicated by pesticide injury. Heavy defoliation early in the summer reduces fruit size and weakens the tree.

The symptoms of nitrogen deficiency on individual leaves are very similar to those for bacterial spot. In both cases, for example, the leaves turn yellow and drop prematurely. Other factors that can be confused with bacterial leaf spot include X-disease, water stress, and spray injury. Care must be taken to avoid an

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incorrect diagnosis. Bacterial spot infections are more likely to occur at the tip of the leaf than elsewhere (Figure 2). Nitrogen-deficiency symptoms, on the other hand, are most evident along the midrib of the leaf. Leaf tissues surrounding shot-holes caused by a nitrogen deficiency are more likely to have a reddish color than when bacterial spot is involved. Bacterial spot can usually be distinguished from other problems by the symptoms on the fruit.

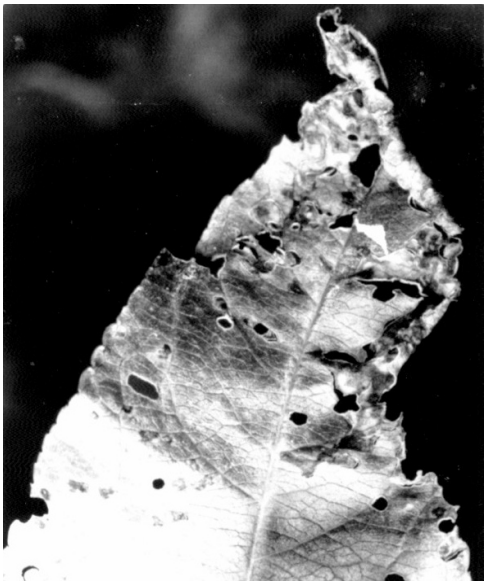

Figure 2. Close-up of bacterial spot on a peach leaf. Note the numerous "shot-holes" and the ragged appearance of the leaf.

Fruit. Small spots form that are round, olive-brown to black, and slightly sunken–frequently with water-soaked margins. These spots form on **peach** fruit, usually on the side exposed to the sun. The lesions may slowly enlarge and merge to cover large, irregular areas (Figure 3). Numerous types of skin cracking, checking, and deep pitting occur near the spots during natural fruit enlargement. The lesions on some cultivars frequently exude a yellowish gum after rainy periods. The fruit infected at an early age of development are usually the most malformed. Late-season infections are superficial, giving the fruit a mottled appearance.

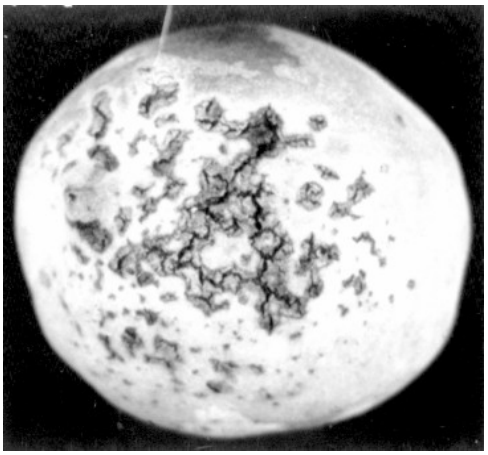

Figure 3. Severe bacterial spot infection on a peach fruit. Note the merging and cracking of the lesions.

The symptoms on **plum** fruit are quite different from those on peach. Large, circular, sunken, greasy spots which darken to black lesions may form on some varieties; on others, small pitlike lesions are common. The large lesions may later crack open.

Twigs. Two distinct types of cankers damage peach twigs. "Spring cankers," which tend to form at buds or nodes, develop on one-year-old wood. They appear as water-soaked, slightly darkened blisters about the time the first leaves appear (Figure 4). These cankers seldom extend more than half way around the twigs, but an encircled twig will die back. As the season progresses, the epidermis over the lesion ruptures releasing the bacteria, which are then disseminated by wind and splashing rain. The lesion later heals and becomes inactive.

"Summer cankers" commonly develop between the nodes on green peach twigs later in the summer, usually after the leaf spots are evident. At first, the lesions are water-soaked, dark, purplish spots. The cankers enlarge, turn brown to purple-black, become slightly sunken, and assume a round to elliptical shape with water-soaked margins. On certain **plum** and **apricot** varieties, twig cankers survive and continue to develop in 2- and 3-year-old twigs.

DISEASE CYCLE

In Illinois, the bacterial spot organism overwinters in peach twigs infected late in the season about the time leaves are shed. The bacteria invade the twigs primarily through leaf scars, especially those left by late-maturing leaves. These cankers are **not** readily visible until the following spring, when the diseased tissue appears watersoaked and darkened (Figure 4). Survival of bacteria in summer cankers of peach is

rare in northern states but more common in the South. In plums and apricots, the causal bacteria may overwinter in the summer cankers formed on the current season's twigs. Viable bacteria have been recovered from 3-year-old plum twigs.

Figure 3. Watersoaked "spring cankers" on peach twigs.

When canker development is resumed in the spring, the bacteria ooze from the twig cankers. The ooze is disseminated by droplets of dew, fog, warm spring rains, wind-blown mist, and insects. Hard, driving rains are more important than gentle rains in initiating new infections. This explains why bacterial spot is often more severe on one side of the tree than on the other. The ooze contacts expanding healthy leaves, green fruit, and current-year twigs. Penetration of bacteria occurs through stomata, lenticels, and wounds when surface moisture is present. Bacteria multiply in the leaves and serve as inoculum for later infections of fruit, leaves, and twigs.

Repeated infections occur throughout the growing season on all susceptible parts as long as the environment is favorable for disease development. Warm (70° to 85°F, 21° to 29°C), very windy weather with frequent light rains and heavy dews is most conducive for severe bacterial spot infection. The disease makes little progress during hot, dry, summer weather.

In the late summer and fall, bacteria are blown to young and succulent stems, where penetration occurs through the leaf scars left by late-maturing leaves or through lenticels. Some of the infections initiated in the fall (which may not show signs of canker formation) serve as inoculum for early spring disease development, thus completing the disease cycle.

CONTROL

1. When planning an orchard, avoid low-lying sites with poor air and soil drainage. Destroy nearby wild or neglected stone fruits (*Prunus* species). Buy and plant **only** vigorous, disease-free fruit trees from a reputable nursery. Locate new plantings as far away as possible from older ones containing susceptible cultivars.

2. Select peach cultivars with resistance to bacterial spot. These cultivars are **somewhat resistant**: 'Belle of Georgia', 'Biscoe', 'Candor', 'Comanche', 'Dixired', 'Garnet Beauty', 'Harbrite', 'Harken', 'Jefferson', 'Late Sunhaven', 'Loring', 'Madison', 'Norman', 'Pekin', 'Raritan Rose', 'Redhaven', and 'Sunhaven'. These cultivars are **very susceptible**: 'Babygold 5 and S', 'Blake', 'Elberta', 'Golden Jubilee', 'Halehaven', 'Jersey Queen', 'Jerseyland', 'July Elberta', 'J.H. Hale', 'Kalhaven', 'Redskin', 'Rio-Oso-Gem', 'Suncling', 'Suncrest', and 'Sunhigh'.

   Most apricot varieties are susceptible, as well as many nectaring varieties. Know a variety's relative susceptibility to bacterial spot before purchasing it.

3. Prune trees annually to allow for good air circulation and to maintain tree vigor. The open-center system is suggested for peaches, nectarines, and Japanese-type and hybrid plums; the modified-leader system, for European-type plums and sweet cherries; and either system for apricots and sour cherries.

4. Fertilize where needed, based on a soil test, to maintain vigorous but not excessive shoot growth. Balanced fertility programs should be followed. Fruit trees growing in light-colored silts, clays, and sands usually need more fertilization for optimum production. Trees with sufficient nitrogen do not defoliate so readily, but excess nitrogen will aggravate the problem. Trees weakened from poor nutrition or other causes are more sensitive to bacterial spot.

5. Spray applications. **Commercial orchardists** should follow the suggested spray schedules for peaches, nectarines, apricots, plums, and cherries outlined in the Illinois Commercial Tree Fruit Spray Guide, revised annually. Growers should follow the spray schedules for peaches, nectarines, apricots, and plums outlined in the Midwest Tree Fruit Pest Management Handbook. However, **in the home orchard**, spraying for bacterial spot is not practical.

   Spray programs help to control bacterial spot by suppressing development of disease–they do **not** eliminate it. Because of the cost and uncertainty of chemical control, the best way to control bacterial spot is the use of resistant cultivars and other cultural practices outlined above (Steps 1 through 4).