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report on
PLANT
DISEASE

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TWO BACTERIAL DISEASES OF WATERMELON

I. BACTERIAL FRUIT BLOTCH OF WATERMELON

Bacterial fruit blotch of watermelon, caused by the bacterium *Acidovorax avenae* subsp. *citrulli*, is an important disease of watermelon. This pathogen also infects cantaloup and pumpkin. Bacterial fruit blotch is a relatively new disease of cucurbit crops in the United States. The disease was first reported in the Mariana Islands in 1988. It appeared in commercial watermelon fields in Florida in the spring of 1989. Following that, the disease was observed in several other states. Bacterial fruit blotch was first diagnosed in Illinois in the summer of 2001. The disease occurred in several watermelon fields in central Illinois.

Figure 1. Bacterial fruit blotch of watermelon (courtesy R.X. Latin).

SYMPTOMS

Characteristic symptom of bacterial fruit blotch of watermelon is dark, gray-green stains or "blotches" on the upper surface of the fruit (Fig. 1). The blotch is first noticeable as a small water-soaked area, less than one-half of an inch in diameter, but within 7 to 10 days the blotch rapidly enlarges so that much of the fruit surface (not in contact with the soil) is covered by the lesion. As the blotch increases in size, the area around the initial infection site becomes necrotic. In advanced stages of the disease, the rind epidermis ruptures or cracks (Fig. 2) and oozes a sticky, amber-colored substance. Fruit lesions rarely extend into the flesh, but when this occurs, the bacteria contaminate the seeds. Secondary rotting organisms cause decay and collapse of the fruit. Rapid expansion of fruit lesions usually occurs during the few weeks prior to harvest.

Figure 2. Blotch and cracks on watermelon, caused by the fruit blotch bacterium.

The pathogen also infects watermelon seedlings (Fig. 3). First symptoms on the seedlings appear as dark, water-soaked lesions on the undersides of cotyledons. As the cotyledons expand, the lesions become necrotic

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and often extend along the length of the midrib. On young true leaves dark brown lesions develop which may have chlorotic halos. Fruit-blotch-infected seedlings usually do not collapse and die, but foliar lesions will increase slowly in a warm, moist environment.

Leaves are also infected. Leaf lesions are small, dark brown, somewhat angular, and often inconspicuous. The severity of symptom expression on individual leaves is slight. Infection does not result in wilt, defoliation, vine blight, or vine collapse. In wet or humid weather, lesion margins appear water-soaked.

Figure 3. Watermelon seedling infected with the fruit blotch bacterium (courtesy R.X. Latin).

DISEASE CYCLE

The bacterial fruit blotch pathogen is seedborne. Contaminated seeds give rise to infected seedlings, which serve as an important source of secondary inoculum. In the field, the bacteria produced on lesion surfaces are rain-splashed onto newly developed leaves and neighboring plants. Leaf lesions are important as a primary source of inoculum for fruit infection. Bacteria associated with infected rind, move down into the flesh and become associated with the seeds.

In addition to overwintering contaminated seed, the pathogen may overwinter in infested crop residue, volunteer watermelon plants from contaminated seed, and infected wild cucurbits, especially wild citron, and provide primary inoculum in a subsequent crop season.

Development of bacterial fruit blotch and spread of the disease are favored by moist, warm conditions. The pathogen is splash-dispersed. Once the bacterium is present in the field, it can be spread by wind-driven rain, and mechanical means. A few primary infection sites in a field may result in infection of all plants by the time of harvest.

DISEASE MANAGEMENT

The strategies for management of bacterial fruit blotch of watermelon should focus on preventing the introduction of the pathogen into the field. The following practices can help to minimize the damage caused by bacterial fruit blotch.

1. Plant uncontaminated seed. Hot water and bleach treatments are not effective in eliminating the contamination from infested seed.

2. Use transplants from greenhouses in which there were no seedling symptoms of the fruit blotch disease.

3. Standard greenhouse sanitation procedures should be employed, especially in structures where outbreaks of fruit blotch have occurred. Destroy any flats containing seedlings with suspicious symptoms, and immediately separate flats adjacent to those with symptoms from healthy plants. Decontaminate hands, plant containers, and tools after contact with plants. Close sides of transplant house during windy period. Spread of the pathogen can be minimized by low humidity, low

temperatures, and bottom watering. Irrigation with an overhead boom may result in splash dispersal of the pathogen. Decontaminate transplant house that had infected seedlings. A 0.5% sodium hypochloride solution (1 part bleach to 9 parts water) can be used for decontamination.

4. Plow infected fields with fruit blotch pathogen in the fall.

5. Control volunteer watermelon seedlings from previous crops to eliminate inoculum sources.

6. Eliminate wild and volunteer cucurbits near transplant house and production fields.

7. Do not plant cucurbit crops in the infested fields for 3 years.

8. Select fields that are well isolated from infested fields with the fruit blotch bacterium.

9. Plant resistant varieties, if available. It appears that most of available commercial watermelon cultivars are susceptible to the fruit blotch disease.

10. Application of copper containing fungicides may reduce the incidence of fruit blotch symptoms. A minimum of two to three biweekly copper applications and thorough coverage of the foliage are essential for disease control. Application should begin at first flower, or earlier, and continue until all fruit are mature. Copper spray, however, may be of minimal value under conditions highly favorable for disease development. Copper application may also cause some marginal yellowing of the foliage.

II. BACTERIAL RIND NECROSIS OF WATERMELON

Bacterial rind necrosis is caused by an *Erwinia* species. This disease has been reported from Hawaii, Texas, Florida, and California in watermelon. The disease has also been reported in melon in Texas. Bacterial rind necrosis was first observed in Illinois in 2000.

SYMPTOMS

Characteristic symptom of bacterial rind necrosis of watermelon is a brown, corky, dry necrosis of interior of the rind, which rarely extends into the flesh (Fig. 4). The affected area may vary from a single small spot (1/8 inch in diameter) to the entire rind. There are rarely any external symptoms on watermelon. In the case of severe internal necrosis, the fruit may be misshapen. No symptoms on the foliage have been reported.

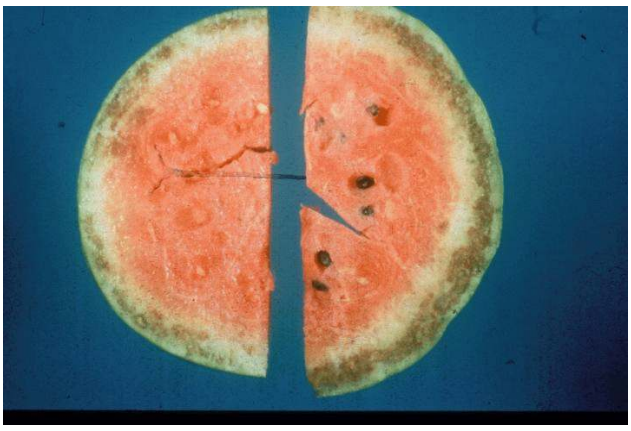

Figure 4. Bacterial rind necrosis of seeded and seedless watermelon, caused by an Erwinia sp (courtesy T.A. Zitter).

In melon, the internal symptoms are similar to those in watermelon. But external symptoms also appear in the form of circular, dark, water-soaked depressions in the surface of the fruit.

DISEASE CYCLE

Little is known about the disease cycle and epidemiology of bacterial rind necrosis of watermelon. The studies indicate that the rind necrosis is incited by bacteria that are normally residents of the healthy host. Under some predisposing environmental conditions, these resident bacteria multiply to a population high enough to cause disease.

DISEASE MANAGEMENT

Growing cultivars that are less susceptible to bacterial rind necrosis is the only known control. Watermelon varieties vary both in incidence of disease and severity of symptoms.