UNIVERSITY OF ILLINOIS EXTENSION
College of Agricultural, Consumer, and Environmental Sciences

Illinois Fruit and Vegetable News

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A newsletter for commercial growers of fruit and vegetable crops

"We are what we repeatedly do. Excellence, then, is not an act, but a habit." Aristotle

Address any questions or comments regarding this newsletter to the individual authors listed after each article or to its editor, Rick Weinzierl, 217-244-2126, weinzier@illinois.edu. The ***Illinois Fruit and Vegetable News*** is available on the web at: http://www.ipm.illinois.edu/ifvn/index.html. To receive email notification of new postings of this newsletter, call or write Rick Weinzierl at the number or email address above.

In this issue ...

Upcoming Programs

- **Illinois Summer Horticulture Day, June 9, 2011.** Braeutigam Orchard, 2795 Turkey Hill Lane, Belleville, IL. Registration begins at 8:00 a.m. Program includes tours, displays, updates, and equipment demonstrations. Preregistration is $25.00; registration at the door is $30. Contact Don Naylor at 309-828-8989 or ilshortsoc@yahoo.com.
- **Dixon Springs SARE-sponsored Field Day – Efficient Techniques for High Tunnels, Vegetables, and Fruits, June 14, 2011.** University of Illinois Dixon Springs Agricultural Center, Simpson, IL. Register on-site beginning at 9:30 a.m. 10:00 a.m. to noon: high tunnels (intro, construction, irrigation, tomato varieties, training, and small fruits); noon to 1:00 p.m.: lunch on site; 1:00 to 3:00 p.m.: blueberries, apples, and peaches (production practices, varieties, pest management). The registration fee is $10 (to cover lunch and handouts). For more information, contact Rick Weinzierl at weinzier@illinois.edu or 217-244-2126.
- **"Is Entrepreneurial Farming for You?" Workshops** will be held in University of Illinois Extension offices from 5:30 p.m. to 9:00 p.m. on **June 30, July 7, and July 14** at the following locations: Sangamon County Extension Office on **June 30** (2501 North 8th Street, Illinois State Fairgrounds, Bldg #30, Springfield), McLean County Extension Office on **July 7** (402 North Hershey Road, Bloomington) and the Peoria County Extension Office on **July 14** (4810 North Sheridan, Peoria). Registration for each workshop is $30 and includes a light supper. Payment can be processed online at http://central.illinoisfarmbeginnings.org or by contacting The Land Connection at 217-688-2570.

Regional Updates

In northern Illinois, the cool temperatures that prevailed through late May gave way to much warmer weather in the last few days (highs in the 90s on some days), and crop development and field work in the area have sped up as well.

Most parts of the region received 2-4 inches of rainfall during from May 23 through June 5, so soil moisture levels are very high – hindering field work for parts of the last couple of weeks.

Early strawberries have begun ripening, and later varieties are still in full bloom, as are blackberries, particularly Illini Hardy, and some summer-bearing raspberries. Grape shoots are extending, with some shoots more than 1 foot long, and flower clusters will start blooming very soon. Apples are marble-sized. And peaches are completely out of the shuck. The cold and rainy weather that occurred during the bloom period led to light fruit set in some apple varieties, but thinning is underway in many orchards. Tart cherry fruits are sizing well.

Growers are applying first cover sprays on apples, and codling moths will soon begin to indicate that pest's status in individual orchards. I have received reports of peach leaf curl on peach leaves (remember that the timing for control of this disease is in the fall or very early spring) and plum curculio damage on apple fruits. Due to frequent recent rainfalls, apple growers need to be very diligent with spray programs for apple scab control.

Sweet corn planting continues, and harvest of cool season vegetables such as lettuce and spinach will begin soon. Flea beetles have been a problem on leafy greens in some areas – control is necessary for most growers whenever infestations cause enough defoliation (little holes in leaves) that buyers are discouraged by the appearance of the leaves. Transplanting of tomatoes, peppers, cucumbers, muskmelons, and watermelons continues on many farms, as does planting of pumpkins and winter squash.

Maurice Ogutu (708-352-0109; ogutu@illinois.edu)

Notes from Chris Doll

Green, growing, and drying out … that's the story of the day. The last few rains have all been grass-wetters without any accumulation, so the current stretch of 90-plus-degree temperatures has allowed tillage and other soil-related activities to proceed. The cicadas have emerged and are mating, which means that the damage from egg-laying will show soon. Luckily they are low in numbers in this neighborhood.

Strawberry season is rapidly closing, and raspberries are coming. The first picking of Prelude red is in, and the blackcaps are showing light red. Thornless blackberries are past full bloom and will come on soon. For these crops, renovation of matted row systems should be done as soon as possible to get the next crop started growing. For black raspberries and the thornless blackberries, tipping of primocanes to force side branching at your desired height is a timely activity.

Apple and peach fruits are sizing nicely and making the crop appear to have potential except on the trees that were light in bloom. For these crops I see the need for continued control of insects and diseases, maybe some hand thinning to eliminate defective and small fruits in addition to load reduction, sucker removal on older apple trees, and scaffold selection plus crotch angle improvement on younger trees.

No Japanese beetles have been seen yet, but notes from a year ago included the first siting. Unfortunately, the concept of trap crops for this insect includes most of what all of us are growing, so use a control program that fits the crop and the preharvest intervals that is needed for upcoming fruit harvest. One observation I have on this pest is that the adult or beetle stage seems to be around much longer than it was a few years ago. Early on, they were feeding for four weeks, and now it seems to stretch five to six weeks. San Jose scale crawlers were on the move on May 31. A brief study under a microscope showed that one crawler moved one-half inch per minute, which could be extrapolated to 30 inches an hour.

No significant mite populations have been observed, but I did see some early codling moth eggs. On the disease side, cedar apple rust lesion on leaves has been the most obvious. Some powdery mildew was seen on newly planted apple trees, and some bacterial spot observed on peach.

The Illinois State Horticulture Society Summer Horticulture Day is scheduled for Thursday, May 9 at Braeutigam Orchard east of Belleville. This family operation of a smaller-scale direct market fruit and vegetable farm has many fruits in production as well as numerous vegetables. Apple and peach trees of various ages are present, as is a relatively new planting of blueberries and one of the area's oldest plantings of thornless blackberries (1974). This farm has

produced lots of blue and purple winners for tree fruits at the Illinois State Fair during the 45 years that I have been associated with it. Tom and Pat Range and their family will give a warm welcome to all, and I hope to see many readers there.

Chris Doll

Specialty Crops and Local Foods Issues

A New E. coli

A new strain of the bacterial disease *Escherichia coli* has recently been found in Germany and China. During the last few days, an outbreak of food poisoning caused the sickness of more 1,500 people in Europe, with 17 fatalities (16 in Germany and one in Sweden). Initially, the German government suggested the outbreak was from contaminated cucumbers imported from Spain, but that claim has not been substantiated. German authorities are still looking into the cause of the infection. Laboratory analysis of the bacteria showed that it is a new strain referred to as *E. coli O-104,* possibly with an acquired ability to infect large numbers of people. The World Health Organization and scientists at the Beijing Genomics Institute have said that the new strain "has never been seen in an outbreak situation before" and that it is "highly infectious and toxic."

The familiar *E. coli O157 H7* was first discovered in California in the mid 1980's when a women ate an insufficiently cooked hamburger from a fast food restaurant. Since then, this bacterium has caused millions of infection and hundreds of fatalities around the world, with billions of dollars in economic losses. If this variant is new and can cause large numbers of infections, as has been suggested, then it will have a huge impact on food industries worldwide. *E. coli* travels very fast in contaminated foods, especially raw foods such as fruits and vegetables, because it can be killed only by heat and chemical treatment. With food commerce being more global than ever before, it is expected that the new strain may reach the U.S. within a few months. This new discovery highlights the need for everyone in the produce industry to be more vigilant about food safety and good agricultural practices. It is not too late for this season to evaluate your operation and to look at where you can improve food safety. Here are a few areas that may be of concern.

1. **Water and water sources.** It is highly recommended that you send samples for analysis at the beginning of the growing season, in the middle, and at the end. Have the samples evaluated for total coliform, fecal coliform, and *E. coli*. Run the analysis even if you use city water, and remember that you cannot use surface or pond water to wash produce unless it has been properly cleaned and tested. Chlorinate well water if needed, and use the information below in the equipment sanitation section.
2. **Worker hygiene.** Workers need to be trained on how to follow good agricultural practices. They need to wash their hands with soap (anti-bacterial soap works best; or use unscented soap) and potable water and dry their hands with disposable paper towels. Train workers to lather their hands, their nails, and between their fingers for at least 15 seconds; they must wash their hands every time they leave their work place, even if they did not go the restroom. Also make sure that there is adequate signage in the washing area in the language that the workers can read and understand.
3. **Equipment sanitation.** Wash equipment at the end of each work day with a chlorine solution or other sanitizers followed by water only to prevent rust formation. To sanitize equipment, you may use hot water first, then wash with a 200 ppm chlorine solution. For fruits and vegetables, use 50 to 100 ppm chlorine solution followed by potable water wash. Make sure to check water pH and water temperature. Chlorine works best at pH lower than 7.4 because chlorine forms mostly hypochlorous acid at low pH and hypochlorite ions at high pH above 7.8. Hypochlorous acid is the more effective sanitizer, whereas the ions are more oxidizers. Also, high organic matter reduces chlorine concentration, so check the level of chlorine every two to four hours, depending on the crop you want to sanitize. Temperature also affects chlorine levels in solution. High temperatures increase chlorine volatility, so your water temperature should be around 50 to 55 ^{o}F for better chlorine effectiveness and for keeping the produce relatively cool.
4. There are many other areas in your operation that may need attention, such as compost, grazing animals, your neighbors' raw sludge runoff, or other factors that may affect the safety of the produce you grow.

Remember an ounce of prevention is better than a pound of cure.

Mosbah Kushad (217-244-5691; kushad@illinois.edu)

Notes on Upcoming Programs

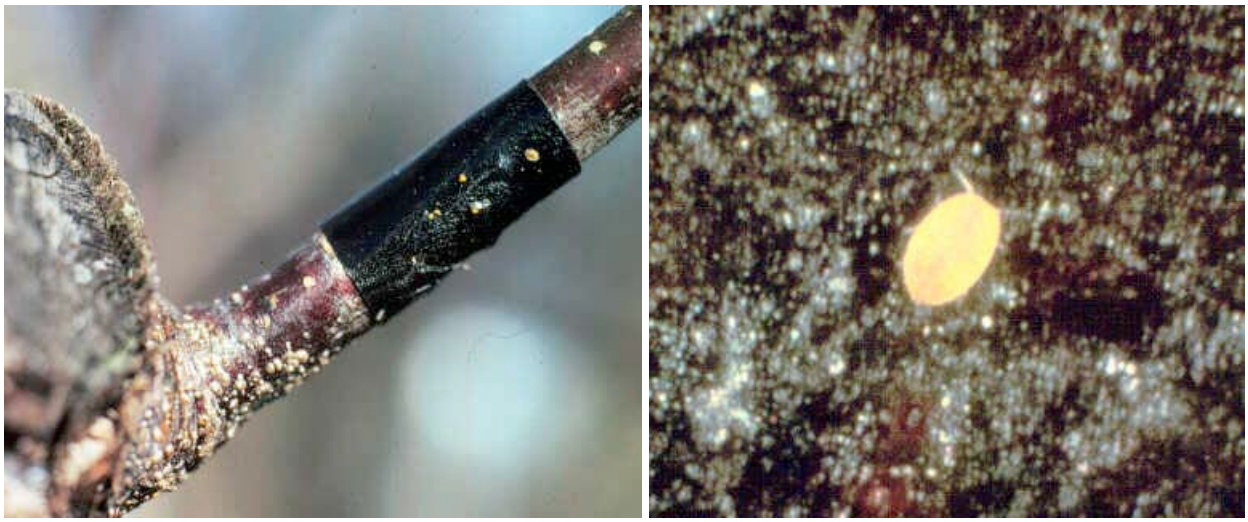
The Dixon Springs SARE-sponsored Field Day on efficient techniques for high tunnels, vegetables, and fruits, scheduled for June 14, 2011, is the first of a few programs to held in the next several months to provide more chances for direct observations of some of the work that's going on at the three University of Illinois research stations where we work with fruit and vegetable production – Dixon Springs, Urbana, and St. Charles. The June 14 program at Dixon Springs begins with registration from 9:30 to 10:00 a.m. From 10:00 a.m. to noon, we'll concentrate on high tunnels, providing a general introduction, then focusing on construction, irrigation, tomato varieties, training, and small fruits. We'll break for lunch (provided on site) from noon to 1:00 p.m., then look over and discuss the research plantings of blueberries, apples, and peaches at the Dixon Springs station (production practices, varieties, pest management). The registration fee is $10 (to cover lunch and handouts). To reach the Dixon Springs station, take Exit 16 from I-24 at Vienna, and go east about 10 miles on IL 146 to IL 145. Go north on IL 145 (the turn off of 146 loops around to the south, so the intersection can seem a little confusing), then go north on 145 about 5 miles. The Horticulture facilities are located on the west side of the road – look for the small greenhouse and two high tunnels. For more information, contact Rick Weinzierl at weinzier@illinois.edu or 217-244-2126. Pre-registration is not required … but we'll order lunch for registrants by 10:00 a.m., so please arrive by then.

Fruit Production and Pest Management

Notes on Fruit Insects

San Jose Scale

Chris Doll noted that San Jose scale crawlers are active now at Edwardsville (on apples, peaches, and other susceptible trees and perennial fruits). The same should be true from southern Illinois through central Illinois about as far north as Urbana. To make scouting most efficient, look for them in areas of orchards where scales were present on fruit last year at harvest. Insecticides that are effective against San Jose scale at this stage include Diazinon, Esteem, Movento, and Centaur; Assail and Provado also give some control. These insecticides will also provide some degree of control of woolly apple aphid. See page 15 of the ***2011 Midwest Tree Fruit Spray Guide*** and product labels for rates and restrictions.



San Jose scale crawlers (photos from West Virginia University)

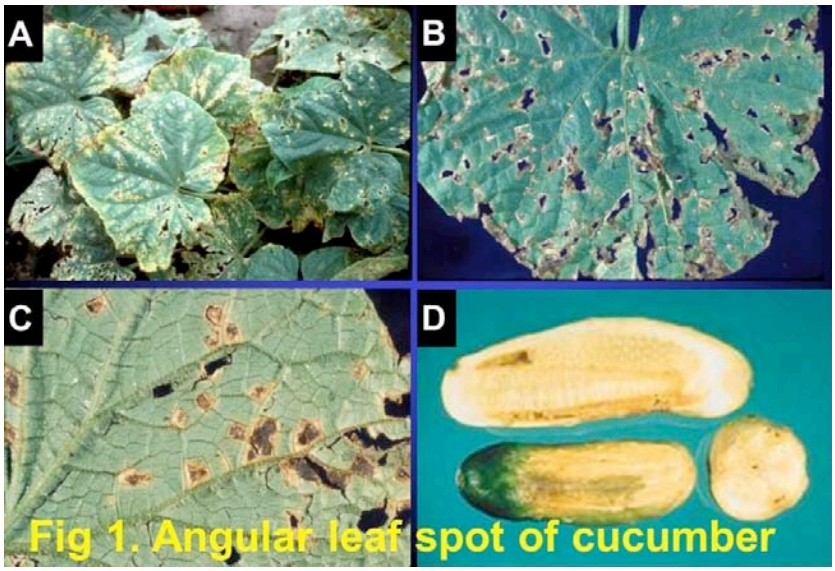
San Jose scale on apples (Photo from West Virginia University).

Rick Weinzierl (217-244-2126; weinzier@illinois.edu)

Vegetable Production and Pest Management

Bacterial Diseases of Cucurbits

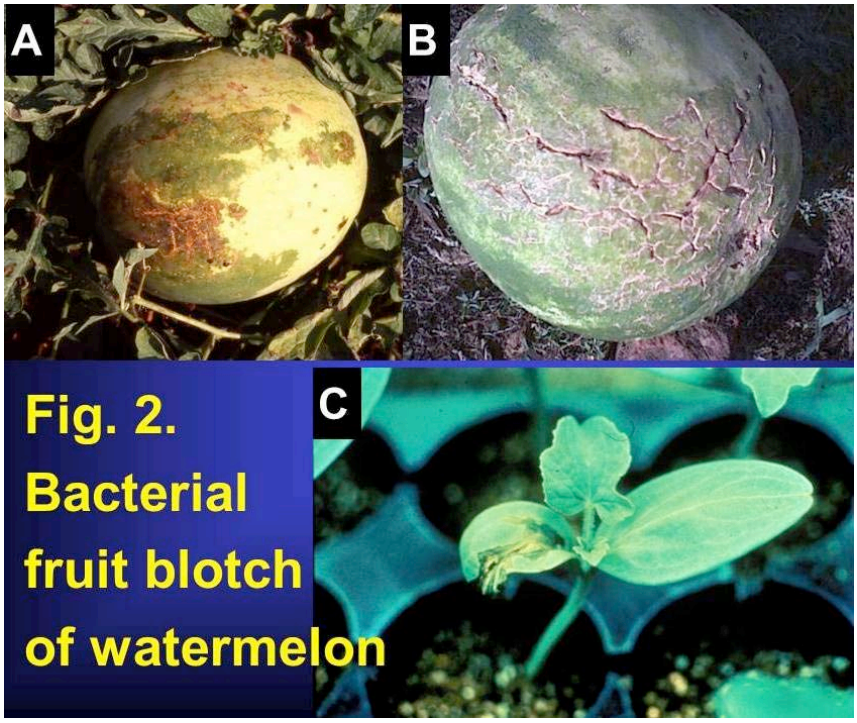
Three are six bacterial diseases of cucurbits in Illinois: angular leaf spot (*Pseudomonas syringae* pv. *lachrymans*), bacterial fruit blotch (*Acidovorax avenae* subsp. *citrulli*), bacterial spot (*Xanthomonas cucurbitae*), bacterial rind necrosis (*Erwinia* spp.), bacterial wilt (*Erwinia tracheiphila*), and cucurbit yellow vine (*Serration marcencens*).

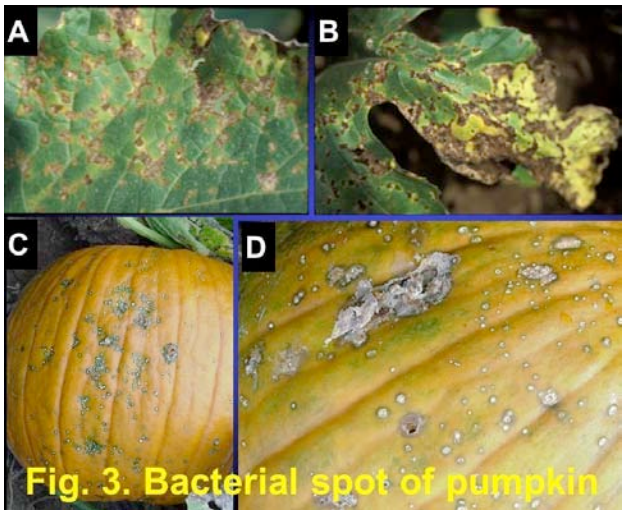


Angular leaf spot first appears as small, water-soaked lesions on leaves (Fig. 1A). The lesions usually expand until they are limited by larger secondary veins, which give the lesions an angular appearance. The lesions become dry, turn brown, and may drop out (Figs. 1B, C). Lesions also develop on petioles, stems, and fruit. Fruit rot can penetrate deeply, causing an internal rot (Fig. 1D). Primary control of angular leaf spot is with the use of pathogen-free seed. Treatment of cucurbit seed for 20 min with water at 122 °F (50 °C) containing tartaric acid or acidic cupric acetate reduces but does not entirely eliminate bacteria from the seed. Crop rotation with noncucurbit crops for at least 2 years is effective as well. Cultivation of soil when it is dry is effective in reducing bacterial survival. Overhead irrigation, irrigation from surface drainage water near cucurbit fields, and working in the field when the

foliage is wet should be avoided. Copper sprays as a foliar protectant can reduce disease development. Some cucumber cultivars are resistant to angular leaf spot but should be used with combination of other management practices.

Bacterial fruit blotch of watermelon is characterized by dark, gray-green stains or "blotches" on the upper surface of the fruit (Fig. 2A). Areas within older lesions may turn brown and crack (Fig 2B). The pathogen also infects watermelon seedlings, causing dark, water-soaked lesions on the undersides of cotyledons (Fig 2C). Strategies for management of bacterial fruit blotch of watermelon should focus on preventing the introduction of the pathogen into the field. Control of this disease is achieved by planting pathogen-free seed or transplants, residue management, and crop rotation. Fields with the fruit blotch pathogen should be plowed after harvest. Volunteer watermelon seedlings from previous crops should be controlled. Fields should be rotated out of cucurbits for 3 years or more.

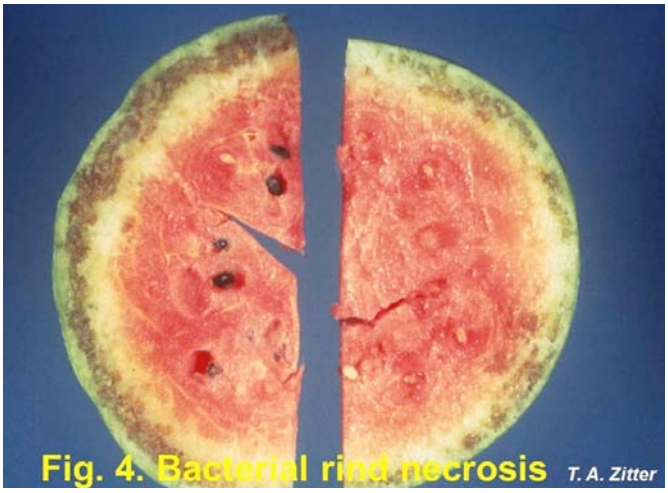


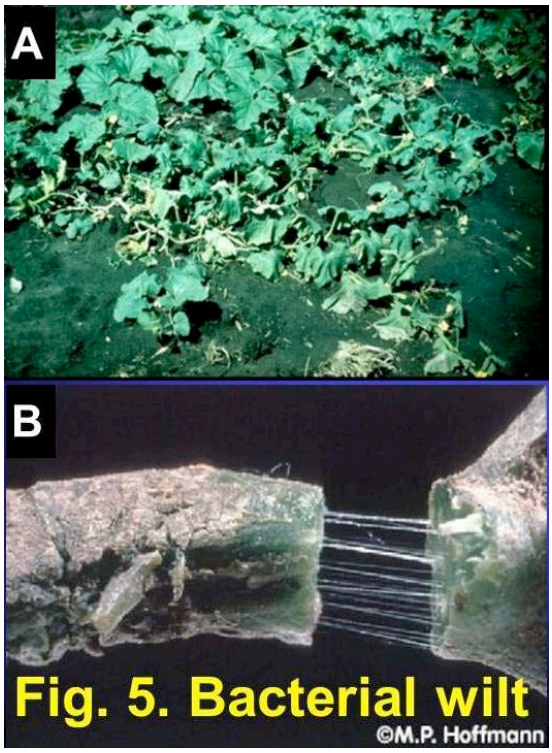


Bacterial spot symptoms develop on leaves and fruit. Small, dark lesions develop on leaves (Fig. 3A), which may coalesce to form larger necrotic areas (Fig. 3B). The most readily identifiable symptoms occur on fruit. Initial lesions are small, slightly sunken, circular spots, with a beige center and a dark- brown halo (Fig. 3C). On mature fruit, saprophytic fungi often colonize the dead, tan tissue at the center of the lesion (Fig. 3D). The most effective

method for control of the disease is planting pathogen-free seed. Rotation with noncucurbit crops also is effective in management. Application of copper compounds during early formation and expansion of fruit may result in substantially fewer symptomatic pumpkins. Copper sprays, however, are ineffective once an epidemic is underway.

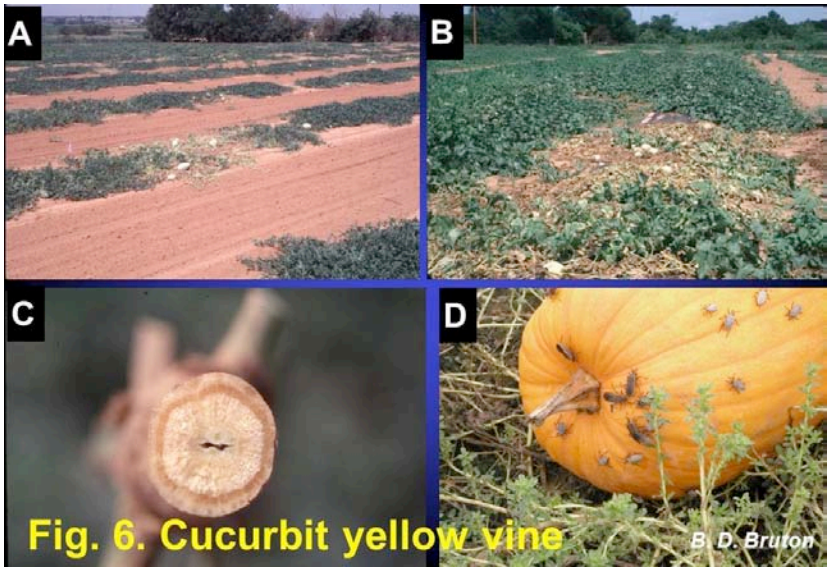
Bacterial rind necrosis of watermelon is characterized by a brown, corky, dry necrosis of interior of the rind, which rarely extends into the flesh (Fig. 4). The affected area may vary from a single small spot (1/8 inch in diameter) to the entire rind. There are rarely any external symptoms on watermelon.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





Bacterial Wilt symptoms may occur at all stages of plant development, but wilting is most severe early in the season. Plants may wilt dramatically during the heat of the day (Fig. 5A), but partially recover by morning. Affected plants will eventually die. A diagnostic test for bacterial wilt involves cutting a wilted runner close to the crown of the plant, rejoining the cut surfaces for a moment, and then slowly drawing apart the cut ends. The presence of bacterial slime extending from one cut surface to the other is a positive indication for bacterial wilt (Fig. 5B). The bacteria are transmitted by the striped cucumber beetle (*Acalymma vittatum*) and the spotted cucumber beetle (*Diabrotica undecimpunctata bowardi*). Control of bacterial wilt depends on control of the cucumber beetle vectors. Applications of contact or systemic insecticides are needed for control of the beetles, thus control of bacterial wilt disease.

Cucurbit yellow vine symptoms appear during fruit set. Leaves near the crown of the plant or entire plants turn pale green and then bright yellow. Yellowing and leaf death generally progress outward from the crown. Eventually, entire plants are killed (Fig. 6A, B). The key diagnostic feature for yellow vine is a light brown discoloration of phloem visible in cross section of the lower stem and roots (Fig. 6C). The squash bug (*Anasa tristis*) has been identified as a vector of the yellow vine bacterium (Fig. 6D). At present, there are no satisfactory measures available for control of yellow vine of cucurbits. Controlling squash bug is beneficial.



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More on Water Management in Specialty Crop Production

In a previous article I talked about the critical role of water in the physiology of plants and production of specialty crops. Water plays an integral role in plant structure, transpiration, nutrient transport, photosynthesis and other critical plant functions. Failure to manage water in specialty crop production can lead to breakdown or reduced efficiency of these functions. The cost to the grower is that the crop may not reach optimum return on investment. Sometimes the cost of doing nothing can be greater than cost of management.

The goal for a grower in water management is maximize return on investment in water management. It is a business practice that must be rewarding to justify investment. To be rewarding, the grower must realize a return on the crop that justifies the expense of managing water. So water must be delivered efficiently and used well by the crop. Otherwise, the expense increases without delivering sufficient return through improved quantity or quality of yield.

To realize this level of management, there are many key factors that must be considered. What are the influences on water availability to a crop? There are quite a few. The kind of soil can have a major influence. Soil is complex, with much of it composed of mineral particles of varying size. There is usually a component of organic particles, plus air space and moisture. The relative size of particles and their percent of the total in a soil contribute to the ability of soils to hold moisture. Each soil can be unique in the volume of moisture it holds. Sandy soils hold least, as little as 0.5 inch per foot of soil depth. Clay soils can hold as much as 1.5 inches per foot of depth. But just as soil particle size determines how much moisture the soil can hold, it also determines how much can be released and made available to plants. Silty soils, which may hold 1.0-1.2 inches of water per foot of soil depth, can actually provide more available moisture than clay soils. Knowing your unique soils and their ability to hold moisture and release it to crops is critical to water management. Irrigation replenishes soil moisture, so decisions to irrigate must be made with knowledge of actual soil moisture status in the field.

Rain comes, and rain goes. Each inch of rain may contribute to the moisture stored in your soil. But if it comes too quickly, the moisture may run off before it infiltrates the soil and enters the soil matrix, recharging the stored soil moisture. The soil generally dries out from the top down, influenced by sunlight, temperature and air movement across the soil surface. So the soil works like a sponge, holding moisture for a time but then losing it over time. The crops we plant begin to withdraw moisture as the root systems develop. The rate of removal by crops or the environment is highly variable. Irrigation is a means of providing moisture when it is needed and Mother Nature fails to deliver rain.

It is important to know a few key figures about water in irrigation. First, while we talk about inches of rain, we often deliver water through irrigation in volumes of gallons (or thousands of gallons). How many gallons are in an inch of rain? One inch of rain on one acre of ground delivers 27,000 gallons of water. So 18,000 gallons of water applied to 1

acre of ground constitutes the equivalent of 0.67" of rain. Or does it? It depends on how much of that irrigation water actually percolated into the soil. Some of the water probably evaporated before it reached the soil and percolated into the soil moisture matrix. Irrigation engineers often refer to irrigation efficiency, or the ability of an irrigation method or system to deliver water to the soil moisture matrix. That which is lost contributes to a reduction in irrigation efficiency, usually expressed as a percent of water effectively contributing to available soil moisture. Drip irrigation is known as being highly efficient, sometimes achieving efficiencies of 95%. Older forms of sprinkler irrigation could realize low efficiencies under certain conditions, falling under 50%. Growers who pay for delivering irrigation water to their crops should understand how much of that water actually contributes to successful crop production.

Another consideration is crop root depth. This often determines how quickly available soil moisture is depleted, simply because the roots can't reach it. As evaporation and transpiration reduce available soil moisture, the profile of moisture in the soil drops down further from the soil surface. If the crop has shallow roots, like onions or strawberries, that can happen quickly during hot weather. If a soil only holds 0.7" of moisture per foot of soil, and hot weather drives consumption of moisture at a level of 0.3" per day, and the crop only reaches a rooting depth of 12 inches, the grower may need to irrigate every 2-3 days until a significant rain occurs. That's especially true when these crops are building tissue in the marketable portion of the crop, such as berries or onion bulbs. With a crop like pumpkins, where roots may reach down 60 inches, irrigation cycles are much less frequent.

I hope this helps illustrate how critical water management is to specialty crop producers. It can make a big difference in crop productivity and in the quality of the harvested crop. It can also make the difference in delivering on commitments in the marketplace. It can be complicated to understand and challenging to deliver. But it can be the difference between average and spectacular seasons. Management is like that.

Bill Shoemaker (630-584-7254; wshoemak@illinois.edu)

Less seriously …

A woman came home, screeching her car into the driveway, and ran into the house. She slammed the door and shouted at the top of her lungs, "Honey, pack your bags. I won the lottery!" Her husband said, "Oh my God! What should I pack, beach stuff or mountain stuff?" "Doesn't matter," she said. "Just get out."

Fifty-one years ago, Herman James, a North Carolina mountain man, was drafted by the Army. On his first day in basic training, the Army issued him a comb. That afternoon the Army barber sheared off all his hair. On his second day, the Army issued Herman a toothbrush. That afternoon the Army dentist yanked seven of his teeth. On the third day, the Army issued him a jock strap. The Army has been looking for Herman for 51 years.

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