Sherrie Smith
Keiddy Urrea

Issue 26, August 26, 2019

Arkansas Plant Health Clinic Newsletter

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Cucurbits

Bacterial Spot of pumpkin and other cucurbits, caused by the bacterium *Xanthomonas campestris* pv. *cucurbitae*, can be a serious disease of pumpkins, cucumbers, gourds, and squash. Yield losses more than 50% have been recorded in severely infested fields. Leaf symptoms appear as small, dark, angular lesions, with the centers of the lesions becoming translucent with age. However, the most damaging symptoms appear on the fruit. Fruit lesions begin as small, slightly sunken, circular spots, 1/16 to 1/18 inch in diameter. As the lesions enlarge the cuticle and epidermis crack. Larger lesions may have a scabby appearance with tan, raised blisters. Saprophytic fungi often colonize the older lesions, giving them a pinkish-white or green color depending on the species of saprophyte involved. The unsightliness of the lesions diminishes the marketability of the fruit as well as leading to significant rot in the field and in storage. The pathogen is seedborne and can also survive in crop residue. Bacterial spot is more of a problem during high temperatures coupled with rainy weather or overhead irrigation. Inoculum is splashed onto young fruit before it develops its protective waxy cuticle. Good sanitation and crop rotation with non-cucurbit crops helps limit inoculum in the field. Only clean seed should be used. Therefore, it is advisable to not save seed from a previous crop. Copper fungicides may be applied during early formation and fruit expansion to protect developing fruit. Once bacterial lesions are observed on mature fruit there is nothing to be done except to practice ruthless culling of diseased fruit.

Cucurbit Bacterial Spot- *Xanthomonas campestris* pv. *cucurbitae*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Sherrie Smith
Keiddy Urrea

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Cucurbit Bacterial Spot-

Xanthomonas campestris* pv. *cucurbitae

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Cucurbit Downy Mildew

The unusually cool, moist weather conditions have been favorable for the development of Downy Mildew of cucurbits, caused by *Pseudoperonospora cubensis*. This is a devastating fungal disease of cucurbits including cucumber, squash, pumpkin, and watermelon. On all hosts, upper leaf symptoms begin as chlorotic flecks or spots on the surface of the leaves. Gray, brown to purplish-black downy sporulation occurs on the corresponding spots on the underside of the leaves. Downy mildew can progress extremely rapidly within a field, causing the leaves to turn brown, necrotic, and curl upwards. Older leaves are typically infected first. As the disease progresses, they become burned looking, shrivel and die. Although fruit and blooms are occasionally infected, the leaf loss results in reduced yields. Misshapen fruit and damaged fruit from sunburn occur as the leaves die and the fruit lose their protective shade. It is important to begin control measures as soon as Downy Mildew is confirmed in your field. Homeowners may use Bonide Mancozeb Flowable w/Zinc in rotation with a vegetable fungicide containing chlorothalonil. The use of resistant cultivars helps delay infection. Commercial growers may use Reason 500 SC (fair), or Cabrio 20EC, or Flint 50 WG, or Pristine 38 WG, or Ranman 400 SC (good), Curzate 60 DF, or Previcur Flex 6 F, or Omega 500 F, or Aliette 80 WDG, or Forum 4.18 F, or Revus 2.08 S, or Presido 4 F, or Dithane DF (fair), or Tanos 50 WP (fair), or Ridomil Gold Bravo SC, or Gavel 75 DF, or Orondis Opti 3.37 SC (good, or Orandis Ultra 2.33 SC (good).

Cucurbit Downy Mildew-

Pseudoperonospora cubensis

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Sherrie Smith
Keiddy Urrea

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Cucurbit Downy Mildew-
Pseudoperonospora cubensis

Photo by David Freeze, University of Arkansas Cooperative Extension

Cucurbit Downy Mildew spores-
Pseudoperonospora cubensis

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Cucurbit Gummy Stem Blight

Gummy stem blight caused by *Stagonosporopsis curcubitacearum,* teleomorph synonym *Didymella byroniae* is a serious disease of cucurbits, affecting melons, squash, and cucumbers. Early leaf symptoms are water-soaked gray-green spots on cotyledons and leaves. Spots enlarge, become irregular and dark brown. Small black fruiting bodies may be seen in the spots. Lesions on stems are oblong water-soaked areas that turn brown to dark brown and can eventually girdle the stem causing the collapse of the plant. Brown sticky exudates often ooze from the lesions. The disease is sometimes called black rot when fruit is infected. Initial symptoms on fruit are water-soaked spots that enlarge, become dark, and have the typical oozing from the lesions. Under moist conditions white mycelium will form. Fruit can rot completely in 2-3 days under conditions favorable for disease development. Black fruiting bodies may be found on infected fruit as well as stems and leaves. Fruit injured by insects or poor cultural practices are more vulnerable. The fungus can survive on seed, crop debris, and in soil. A two-year crop rotation with non- cucurbits, clean seed, and chemical applications of fungicides are the best preventatives. Resistance to FRAC code 11 fungicides has become common in some fields. Luna Experience 3.3 F has proven to be a good choice. It may be used in rotation with fungicides with a different FRAC code. Homeowners must depend on fungicides containing chlorothalonil and mancozeb.

Sherrie Smith
Keiddy Urrea

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Cucurbit Gummy Stem Blight-
Stagonosporopsis curcubitacearum

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Cucurbit Gummy Stem Blight-
Stagonosporopsis curcubitacearum

Photo by Rebecca A. Melanson, Mississippi State University Extension, Bugwood.org

Cucurbit Gummy Stem Blight-
Stagonosporopsis curcubitacearum

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

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Keiddy Urrea

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Cucurbit Powdery Mildew

A common and widespread disease of cucurbits is powdery mildew, caused by *Podosphaera xanthi*i, previously known as *Sphaerotheca fuliginea*. *Erysiphe cichoracearum* also causes powdery mildew on cucurbits but is less common. Symptoms usually begin on the undersides of crown leaves and on shaded lower leaves as white powdery spots or patches. Often, yellow spots form on the upper surfaces opposite the powdery mildew colonies. Eventually both surfaces of the leaves become covered with powdery mildew as well as stems and petioles. Badly infected leaves wither and die. Fruit production may be reduced in both quality and quantity. Dense plant growth along with low-intensity light and high relative humidity is favorable for initial infection. Dry conditions favor sporulation. The best defense is the use of resistant cultivars and the use of fungicides. Fungicide applications must begin at the first sign of disease. Ralley 40 WSP, or Velum Prime, or Fontelis 1.67 SC, or Quintec 2.08 SC, or Bravo Weatherstick, or Torino 0.85 SC, or Gatten, or Inspire Super 2.82 SC, or Luna Experience 3.3 F, or Switch 62.5 WG, or Quadris Top 1.67 SC, or Pristine 38 WG, or Quadris Opti 1.0 SC, or Aprovia Top 1.62 EC, or Orandis Opti 3.37 SC, are labeled for treatment of Powdery Mildew in cucurbits. Homeowners must rely on fungicides containing chlorothalonil.

Watermelon Powdery Mildew-
Podosphaera xanthii

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Pumpkin Powdery Mildew-
Podosphaera xanthii

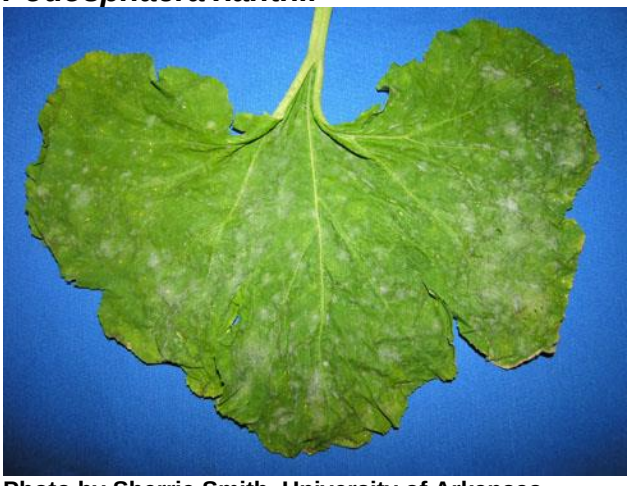

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

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Sherrie Smith
Keiddy Urrea

Cucurbit Anthracnose

Anthracnose of cucurbits is found wherever cucurbits are grown. Cucumber, watermelon, squash, and gourds are all susceptible. *Colletotrichum obiculare*, synonym *C. lagenaria* is the causative agent of this fungal disease. All parts of the plant may be infected, including leaves, petioles, stems, and fruits. Lesions begin as yellowish water-soaked spots that turn brown to black. The spots enlarge and dry out. The centers of older lesions fall out leaving a shot hole effect. Infected fruit have sunken circular black spots of different sizes. Crop rotation and destruction of old vines go a long way toward controlling this problem. Fungicide applications of Topsin, or Quadris 2.08 SC, or Cabrio 20 EC, or Bravo Weatherstick, or Dithane, or Aprovia Top 1.62 EC, or Inspire Super 2.82 SC, or Luna Experience 3.3 F, or Luna Sensation 1.67 F, or Switch 62.5 WG, or Quadris Top 1.67 SC or Pristine 38 WG, or Tanos 50 WP, or Quadris Opti, or Gavel 75 DF, or Orondis Opti 3.37 SC, or Orondis Ultra 2.33 SC. Homeowners may use Fertilome Broad Spectrum Lawn and Garden Fungicide, (chlorothalonil), or Hi-Yield Vegetable, Flower, Fruit, and Ornamental Fungicide,(chlorothalonil) or Garden Tech Daconil Fungicide,(chlorothalonil), or Bonide Fung-onil Multipurpose Fungicide, (chlorothalonil).

Cucumber Anthracnose-
Colletotrichum obiculare

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Watermelon Fruit Blotch

Watermelon Bacterial Fruit Blotch, caused by *Acidovorax avenae* subsp. *citrulli,* can attack all members of the cucurbit family, including honeydew, musk melons, cantaloupe, pumpkin, citron, squash, and watermelon. However, watermelon is the primary host for Bacterial Fruit Blotch. Symptoms on cotyledons are irregularly shaped, water-soaked lesions that become red brown with age. Infection can cause seedlings to collapse and die, Leaf lesions begin as small, water-soaked, irregular spots that enlarge, and turn brown to black with

Sherrie Smith
Keiddy Urrea

angular edges. The fruit develop irregularly shaped water-soaked lesions that are dull gray green to dark green that rapidly enlarge to cover most of the fruit. Older lesions may become brown to red-brown, and necrotic with white colored bacterial oozing from the lesion. These areas may turn black as secondary decay organisms colonize the fruit. Watermelon cultivars with dark green striped rinds tend to have smaller lesions on the lighter green stripe. This is a seedborne pathogen. Only seed that has been tested and found to be free of the fruit blotch bacterium should be planted. Transplants with suspicious symptoms should be destroyed. Practices in the greenhouse should include hand washing before and after handling plants; decontamination of plant containers, and tools; and avoidance of overhead irrigation. Greenhouses with contamination should be disinfected with a 10% bleach solution and remain empty of plants for a minimum of two to three weeks. All plant debris in the field should be plowed under. Wild cucurbits and volunteer watermelons should be destroyed. Working in the field while foliage is wet must be avoided. Fungicide applications of copper have reduced the incidence of Bacterial fruit blotch symptoms when applications were started prior to fruit set. At least two to three copper applications and thorough coverage of the foliage are essential for good disease control. Applications should begin at first flower, or earlier, and continue until all fruit are mature. Fungicides applied after fruit is infected are ineffective. Include symptomatic leaves when submitting a sample to the Plant Health Clinic.

Watermelon Bacterial Fruit Blotch-*Acidovorax avenae* subsp. *citrulli*

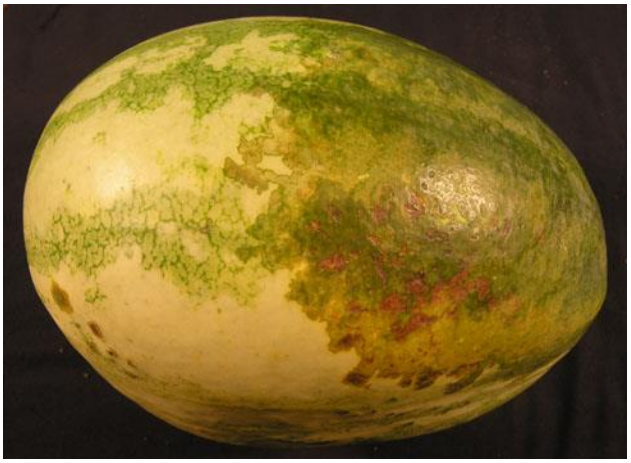

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Watermelon Bacterial Fruit Blotch-*Acidovorax avenae* subsp. *citrulli*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

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Keiddy Urrea

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Watermelon Bacterial Fruit Blotch-*Acidovorax avenae* subsp. *citrulli*

Photo by David Freeze, University of Arkansas Cooperative Extension

Cucurbit Angular Leaf Spot

Most seasons Cucurbit Angular Leaf Spot, caused by *Pseudomonas syringae*, pv. *lachrymans* is not a serious problem. However, during seasons with prolonged wet conditions, crop losses can be substantial. All cucurbits are susceptible, including watermelon, cantaloupe, cucumbers, and gourds. This is a seed-borne pathogen that infests seed beneath the seed coat, resulting in infection of the cotyledons upon germination. On the leaves, Angular leaf spot first appears as small water-soaked lesions. The lesions expand, usually along a vein. During periods of high humidity, a clear to milky bacterial exudate appears on the surface of the lesions. Lesions later turn tan to brown, dry up and sometimes fall out, giving a tattered appearance to the leaves. Petioles, stems, and fruit may also become infected. Infection of watermelon fruit causes large water-soaked brown areas on the fruit. Infected fruit may become deformed, or completely rotted. The bacterium is carried from leaf to leaf and plant to plant by rain or irrigation splash, wind, or on equipment and field workers. It overwinters on crop debris and can persist for several years on dried leaves and stems. Starting with clean seed and practicing crop rotation away from cucurbits for three years is the best way to minimize Angular Leaf Spot. Seed treatment in water containing calcium propionate at 4.4 oz/gal water; or acidic cupric acetate at 6.7 oz/gal water) for 20 minutes at 50°C kills much but not all the bacteria. Repeated applications of a copper fungicide can be helpful to protect young plants. Sprays are generally ineffective once an epidemic is full-blown.

Cucurbit Angular Leaf Spot-*Pseudomonas syringae*, pv. *lachrymans*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

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Sherrie Smith
Keiddy Urrea

Cucurbit Bacterial Wilt

Bacterial Wilt of cucurbits, caused by the bacterium *Erwinia trachiphilea*, occurs throughout the United States. It affects all cucurbits including cucumbers, muskmelons, squash, pumpkins, white gourds, wild gourds, wild cucurbits, and watermelon. Cucumbers and melons are the most susceptible with watermelon rarely seriously affected. Bacterial wilt is principally spread by the striped cucumber beetle, *Acalymma vittata*, and the spotted cucumber beetle, *Diabrotica undecimpunctata howardi*. Both species of cucumber beetle are common in Arkansas. Cucumber beetles have an enormous host range, attacking over 270 plants in 29 families. For example, they feed on asparagus, broad beans, eggplants, potatoes, certain fruit trees, tomatoes, peas, squash, corn, cucumbers, potatoes, and fruits, as well as cucurbits. Overwintering beetles already contaminated with the bacterium transmit it to uninfected plants during feeding in the spring. Wilting of individual leaves or entire vines is the most obvious symptom. Affected leaves become a characteristic dull green. Sticky, stringy, sometimes milky sap is exuded when infected stems are cut. Bacterial wilt is not curable. Fields and gardens should be scouted twice a week for the beetles, especially when plants have less than five leaves. Be sure to check the underside of the leaves. Admire applied as a pre-plant soil drench is highly effective against cucumber beetles. Foliar treatments of Sevin, or Karate Z, or Hero, or Lannate, or Mustang Maxx may also be used for control. Follow the label as there are certain crop restrictions with some of these compounds. Homeowners have fewer options, but may use Sevin, or sticky traps. Sevin is highly toxic to bees so care must be taken to apply during late afternoon or evening when bees are less likely to be foraging. Wilted plants should be destroyed to prevent beetles from feeding on them and spreading the disease to healthy adjacent plants.

Cucurbit Bacterial Wilt-*Erwinia trachiphilea*

Photo by Ron Matlock, University of Arkansas Cooperative Extension

Sherrie Smith
Keiddy Urrea

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Spotted Cucumber Beetle-
Diabrotica undecimpunctata howardi

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Striped Cucumber Beetle-
Acalymma vittata

Photo by Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org.jpg

Cucurbit Bacterial Wilt-*Erwinia trachiphilea*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Cucurbit Yellow Vine Disease versus Cucurbit Fusarium Wilt

Cucurbit Yellow Vine Disease, (CYVD), is a bacterial wilt disease of squash, pumpkin, and melon. CYVD has been confirmed in Texas, Oklahoma, Arkansas, Colorado, Kansas, Nebraska, Massachusetts, Missouri, and Connecticut. The causal agent is the bacterium *Serratia marcescens*. The phloem of the vine is plugged by the bacterium causing a brown phloem ring, yellowing of the foliage, stunting,

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wilting, and vine death. Wilting and death typically occur about 14 days before harvest. The disease is vectored by the squash bug (Anasa tristis). They are a common pest of cucurbits, often found in large groups feeding on the foliage. In areas with a history of CYVD, control must start the day of planting. Weekly foliar treatments with Pounce or other pyrethroids are recommended. Homeowners may use Malathion or Sevin. Research has been done using row covers to keep the bugs off the crop with some success. Growers in some heavily infected areas of the country have used a trap crop with excellent results. They plant the trap crop 2-3 weeks earlier than the crop they are trying to protect, using a straightheck summer squash such as 'Lemon Drop' or 'Hyrific'. The trap crop is planted in the border rows of crop being protected. The squash bugs are then killed by insecticides before they can move into the crops being protected.

Fusarium Wilt of watermelon, caused by *Fusarium oxysporum* f. sp*. Niveum,* is a serious soil borne disease of watermelon. On susceptible cultivars, yield losses may be serious. When inoculum levels are high, seedlings may wilt and die in the field (damp off). However, most symptoms occur on older plants after fruit set. Yellowing and wilting of one runner or one side of the plant, along with external lesions on the runner from the crown to runner tip are diagnostic. The tip of the runner turns bright yellow. The entire plant may have these symptoms instead of one side or one runner. A dark brown vascular discoloration occurs inside the crown and roots. The discoloration may be confused with Cucurbit Yellow Vine Disease. With Yellow Vine, the discoloration occurs in the phloem tissue. With Fusarium wilt the discoloration occurs in the xylem tissue. Vines with Fusarium wilt may wilt during the heat of the day but appear to recover in the evening. Eventually, most affected vines wilt permanently. Those that don't die are stunted and have considerably reduced yields. Diseased plants often occur in clusters in the field, corresponding to the distribution of inoculum in the soil. Melons grown in fields with light, sandy, acidic soils are most susceptible to severe outbreaks of Fusarium wilt, especially when temperatures are between 77-81°F. Higher temperatures are thought to slow the progression of the disease. Many methods of control have been tried, including soil fumigation, soil solarization, crop rotation, and the use of resistant cultivars. Crop rotations of at least 5-7 years or longer between watermelon crops are recommended, as fusarium has a long residual in the soil. Fumigation and soil solarization have some effectiveness but will not completely exclude the pathogen. The best control is choosing resistant cultivars. None are completely resistant under high disease pressure, but cultivars with resistance can often finish producing before succumbing to the wilt. There is evidence that Fusarium wilt can also be seed borne. Seedlings started in the greenhouse should be culled at the first sign of wilting or damping off. Seed trays should not be reused without sterilization.

Sherrie Smith
Keiddy Urrea

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Watermelon Cucurbit Yellow Vine Disease-*Serratia marcescens*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Watermelon Fusarium Wilt-*Fusarium oxysporum f. sp. niveum*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Cucurbit Choanephora

Choanephora Blight, caused by the fungus *Choanephora cucurbitarum*, is associated with high humidity and injury to flowers and developing pods. The disease is also common on pumpkin, okra, snap bean, and squash. It is most prevalent during periods of large amounts of rain and high temperatures. Choanephora Blight spreads by wind, water, on clothing, tools, garden equipment, and by insects. The newest foliage, flowers, and fruits are vulnerable. Foliar symptoms begin as water-soaked areas that darken and dry out with age. A dark gray to silvery fungal growth and rot becomes apparent in a matter of hours under environmental conditions conducive for disease. Pods and flowers develop a wet rot that becomes covered with a fuzzy, silvery mass of fungal growth. The disease is most severe in dense plantings and extended wet periods. Once drier conditions prevail, new infections decline. This disease is difficult to control with fungicides. Diseased plant parts should be removed from the planting. All crop residues should be cleaned up at the end of the season. Overhead irrigation should be avoided in favor of drip irrigation. It is helpful if fruit and flowers do not touch the ground.

Sherrie Smith
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Cucurbit Choanephora Blight-
Choanephora cucurbitarum

Photo by Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org

Cucurbit Choanephora Blight-
Choanephora cucurbitarum

Photo by Jennifer Caraway, University of Arkansas Cooperative Extension

Cucurbit Choanephora Blight-
Choanephora cucurbitarum

Photo by Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

Squash

It is too late now for control of Squash vine borer in summer squash. Control measures should have been started as soon as vines began to run in spring and early summer. If you keep an eye out for the adults at that time of year, you will often see them flying through the vegetable garden in the spring looking for suitable host plants. The borers are the larvae of a clearwing moth, *Melittia satyriniformis*, which emerges from the soil in the spring and lays eggs singly on the undersides of squash and pumpkin vines, usually at the base of the plant. When the larvae hatch, they burrow into the stem and start feeding. This causes the eventual collapse and death of the vine. Growers don't notice anything wrong until the vine starts wilting. Large white worms with brown heads can be seen if stems are cut open. You can sometimes find the larvae in the squash fruit as well. Mature larvae eventually exit the plants,

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Keiddy Urrea

burrow into the soil where they pupate until the following spring. Products containing bifenthrin, or Malathion applied as sprays or dusts are effective. Continue a 7-to-10-day reapplication schedule for 3 to 5 weeks.

Squash Vine Borer in Stem-

Melittia satyriniformis

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Squash Vine Borer in Fruit-

Melittia satyriniformis

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Squash

Squash bugs, *Anasa tristis*, are possibly the most aggravating insect pest in vegetable gardens. Squash bugs feed on plant foliage using specialized mouthparts to pierce the foliage and suck plant sap. Symptoms of their feeding are brown necrotic areas on the leaves/stems, and fruit. Large numbers cause plants to wilt and sometimes die. They attack cucurbit crops, preferring pumpkin and squash. Adults overwinter in debris such as leaves, rocks, wood, and grasses. In the spring they fly to a host plant to mate and lay eggs. Their eggs are small, reddish-brown ovals laid in clusters on the underside of the leaves. The nymphs hatch and immediately start feeding on the plant. It takes 4-6 weeks for them to mature.

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Populations can skyrocket almost overnight. Sanitation is very important in squash bug control. In the fall, all garden debris as well as dead leaves should be cleaned up. Scout for the egg clusters early and squash them when found. Place a flat board in the garden next to plants. At night the squash bugs will congregate underneath it and can be easily killed. Insecticides are most effective if applied while nymphs are small. Products containing bifenthrin (Ortho), carbaryl (Sevin), or cyfluthrin (Bayer) are labeled for control. Commercial growers may use Brigade, or Thionex, or Asana XL.

Squash Bug Damage-*Anasa tristis*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Squash Bug Eggs-*Anasa tristis*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

Squash Bug Nymph-*Anasa tristis*

Photo by Sherrie Smith, University of Arkansas Cooperative Extension

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Keiddy Urrea

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Squash Bug-*Anasa tristis*

Photo by Whitney Cranshaw, Bugwood.org

This bulletin from the Cooperative Extension Plant Health Clinic (Plant Disease Clinic) is an electronic update about diseases and other problems observed in our lab each month. Input from everybody interested in plants is welcome and appreciated.

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