**IPM* Series: Peppers**

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<th>Symptoms</th>
<th>Possible Causes</th>
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<tr>
<td>Leaf yellowing</td>
<td>Older leaf drop</td>
<td>Normal for bottom leaves to yellow and drop as plant ages</td>
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<tr>
<td></td>
<td>Root knot nematode</td>
<td>Plant becomes yellow and stunted; small nodules cover roots-</td>
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<tr>
<td></td>
<td>Verticillium</td>
<td>Leaves yellow, wilt and curl upward</td>
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<tr>
<td></td>
<td>Fusarium wilt</td>
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<td>Aphids</td>
<td>Chlorosis and leaf drop from severe infestations</td>
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<tr>
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<td>Whitefly</td>
<td>Small, transparent oval insects on leaf undersides. Tiny, white</td>
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<td></td>
<td>Spider mites</td>
<td>Yellow stippling; leaves may appear dirty on undersides</td>
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<td></td>
<td>Nitrogen deficiency</td>
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<td>Leaf spots and blotches</td>
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<td>Cercospora</td>
<td>blottches</td>
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<td></td>
<td>Phytophthora blight</td>
<td>Circular spots with gray centers and dark brown borders</td>
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<td></td>
<td>Powdery mildew</td>
<td>Dark green, water-soaked areas</td>
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<td>Viruses</td>
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<td>Chemical injury</td>
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<td></td>
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<td>Leaf and stem distortion</td>
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<td>Mosaic viruses</td>
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<td>Thrips or cyclamen mites</td>
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<td>Leaf curling</td>
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<td>See above</td>
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<td></td>
<td>Viruses</td>
<td>See above</td>
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<td>Leaf scorching</td>
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<td>Leaf margin burn</td>
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<td>Chemical burn</td>
<td>Random, irregular spots up to entire leaf burned</td>
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<tr>
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<td>Fertilizer burn</td>
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<tr>
<td>Leaf and stem browning</td>
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<td>Leaves die and eventually drop; may progress to stems appearing</td>
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<td></td>
<td>Phytophthora blight</td>
<td>as long, brown streaks</td>
</tr>
<tr>
<td></td>
<td>Southern blight</td>
<td>Black lesions on stems at plant base or on upper branches</td>
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*Integrated Pest Management (IPM): The balance approach to pest problems*
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<tr>
<th>Entire plant wilts</th>
<th>Fusarium wilt</th>
<th>Begins with slight yellowing and wilting of <strong>upper</strong> leaves</th>
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<td>Verticillium wilt</td>
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<td>Bacterial wilt</td>
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<td>Southern blight</td>
<td>Sudden wilt, lower stem with tan lesion, white strands of fungal growth and mustard seed-sized, tan sclerotia present (fungal survival structures)</td>
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<td>Phytophthora blight</td>
<td>Black lesion at base of plant and occasionally on stem</td>
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<td>Moisture extremes</td>
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<td>European corn borer in stem</td>
<td>Hole in stem with sawdust-like excrement</td>
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<tr>
<td>Leaves with holes</td>
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<td>Tiny holes in shotgun pattern. Small, dark shiny insects that jump when disturbed</td>
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<td></td>
<td>Colorado potato beetle</td>
<td>Rare feeder on peppers</td>
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<td>Caterpillars</td>
<td>Armyworms and other occasional feeders</td>
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<td>Leaves chewed</td>
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<td>Slow growth</td>
<td>Inadequate sunlight</td>
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<td>Poor soil conditions</td>
<td>Tight clay soil; low soil fertility; poor drainage</td>
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<td></td>
<td>Low temperatures</td>
<td>Some chiles, like habanero, require up to 120 days to ripen from transplanting</td>
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<td>Varietal characteristic</td>
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<tr>
<td>Plants fall over (lodging)</td>
<td>Lack of plant support</td>
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<td>Poorly developed roots</td>
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<td></td>
<td>Waterlogged soil</td>
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<td>Brittle branches</td>
<td>Drought stress</td>
<td>Remove pods by cutting</td>
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<td></td>
<td>Harvesting techniques</td>
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<tr>
<td></td>
<td>Varietal characteristic</td>
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<tr>
<td><strong>FRUIT</strong></td>
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<tr>
<td>Failure to fruit or flower</td>
<td>Temperature extremes</td>
<td>Temperatures over 90° F. and below 50° F.</td>
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<tr>
<td></td>
<td>Moisture extremes</td>
<td>Too much or too little water</td>
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<td>Low or high soil pH</td>
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<td>Low fertility soil</td>
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<td>Planted too late</td>
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<td></td>
<td>Inadequate sunlight</td>
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<td></td>
<td>Tarnished plant bug</td>
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<td>Blossom drop</td>
<td>Temperature extremes</td>
<td>See above</td>
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<tr>
<td></td>
<td>Moisture extremes</td>
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<tr>
<td></td>
<td>Tarnished plant bug</td>
<td>See above</td>
</tr>
<tr>
<td>Large holes chewed in fruit</td>
<td>Various caterpillars (see text)</td>
<td></td>
</tr>
<tr>
<td>Small holes in fruits</td>
<td>Pepper maggot</td>
<td>Very small holes or dimples</td>
</tr>
<tr>
<td></td>
<td>European corn borer</td>
<td>Hole near stem end; fruit soon collapses</td>
</tr>
<tr>
<td>Spots on fruits</td>
<td>Bacterial spot</td>
<td>Raised, wart-like brown lesions</td>
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<tr>
<td></td>
<td>Anthracnose</td>
<td>Water-soaked sunken lesions that expand</td>
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<tr>
<td></td>
<td>Stink bugs</td>
<td>Cloudy, yellow blotches directly below skin</td>
</tr>
<tr>
<td></td>
<td>Blossom-end rot</td>
<td>Dark leathery spot on blossom-end</td>
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<tr>
<td></td>
<td>Gray mold (botrytis)</td>
<td>Small pale halos- “ghost spots”</td>
</tr>
<tr>
<td></td>
<td>Alternaria</td>
<td>Small, brown, leathery lesions with concentric circles</td>
</tr>
<tr>
<td>Large discolored areas on pods (cont’d next pg.)</td>
<td>Blossom-end rot</td>
<td>See above; lesion can enlarge and may extend to sides</td>
</tr>
<tr>
<td></td>
<td>Gray mold (botrytis)</td>
<td>Light-colored, soft rot</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Possible Causes</td>
<td>Notes</td>
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<tr>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>--------------------------------------------------------------</td>
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<tr>
<td>Large discolored areas on pods (continued)</td>
<td>Phytophthora blight</td>
<td>Water-soaked, dull green spots covered with cream-colored mold growth</td>
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<tr>
<td>Sunscald</td>
<td>Thrips or cyclomen mite feeding</td>
<td>Sunken, light-colored lesions on exposed fruits</td>
</tr>
<tr>
<td>Thrips or cyclomen mite feeding</td>
<td>Varietal characteristic</td>
<td>Brown russetting in streaks or patches</td>
</tr>
<tr>
<td>Poor pollination</td>
<td>Viruses</td>
<td>Green, immature pods may develop black streaks prior to ripening</td>
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<tr>
<td>Soft rots</td>
<td>Bacterial soft rot</td>
<td>Pods soften and quickly collapse</td>
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<td>Gray mold</td>
<td>Chilling injury</td>
<td>See above</td>
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<tr>
<td>Failure to ripen</td>
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<td>May be observed after frost or freeze</td>
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<tr>
<td>Uneven ripening</td>
<td>Viruses</td>
<td>Yellow spots or concentric rings</td>
</tr>
<tr>
<td></td>
<td>Cold temperatures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Varietal characteristic</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSPLANTS AND SEEDLINGS**

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<tr>
<th>Symptoms</th>
<th>Possible Causes</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>White-tipped leaves</td>
<td>Frost damage</td>
<td>Peppers insufficiently hardened; planted too early</td>
</tr>
<tr>
<td>Purple leaves</td>
<td>Cold damagePhosphorous deficiency</td>
<td>See aboveLow temperatures prevent phosphorous uptake</td>
</tr>
<tr>
<td>Wilted</td>
<td>Wind burn</td>
<td>Leaves may become pale and dry</td>
</tr>
<tr>
<td>Water stress</td>
<td></td>
<td>Lack of adequate water; related to wind burn</td>
</tr>
<tr>
<td>Plants fall over and die</td>
<td>Damping-off</td>
<td>Tap root and lower stem shrivel and darkenNight feeders; plants cut off at soil line</td>
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<tr>
<td></td>
<td>Cutworm</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Leaves and stems chewed</td>
<td>Slugs and snails</td>
<td>Night feeders; slimy trails may be seen</td>
</tr>
<tr>
<td>Plants cut off at soil line</td>
<td>Cutworm</td>
<td>Plants sometimes “disappear”; dragged into underground burrow by cutworm</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Small holes in leaves</td>
<td>Flea beetles</td>
<td>Small, dark, shiny beetles that jump when disturbed; “shotgun” feeding pattern</td>
</tr>
<tr>
<td>Pale green leaves</td>
<td>Lack of nitrogen</td>
<td>Cool soils contribute to poor nutrient uptake</td>
</tr>
<tr>
<td></td>
<td>Lack of sunlight</td>
<td>Pepper plants require a minimum of 6 hours of direct sunlight</td>
</tr>
<tr>
<td>Leaf yellowing</td>
<td>Spider mites</td>
<td>Fine stippling, especially in hot, dry weather</td>
</tr>
<tr>
<td></td>
<td>Whitefly</td>
<td>Tiny, white insects fly up when plant is disturbed; usually from greenhouse where plants were grown</td>
</tr>
</tbody>
</table>
The integrated pest management (IPM) approach to preventing or managing pepper problems is recommended and can be summarized as follows:

1. Correctly identify the problem; if insect or disease, learn the life cycle and habits.

2. Learn to anticipate and prevent problems; reduce plant stress.

3. Monitor the problem for worsening symptoms.

4. If the level of damage becomes unacceptable, choose the least toxic control.

**Cultural/Environmental Problems**

Pepper plants are frost-sensitive perennials grown as annuals in temperate climates. Plant stems become semi-woody when mature and the growth habit may be compact, erect or prostrate. For best results, pepper plants should each be given 3-5 sq. ft. of growing area and a minimum of 6 hrs. of direct sunlight. The soil should be well-drained and amended with organic matter and have a pH in the 6.0-7.0 range. All bell pepper and most chile pepper plants are members of *Capsicum annum*. Some chile types (e.g. habanero, aji, rocoto) belong to other species. Pepper plants are largely self-fertile but insects may be responsible for considerable crossing within and between species. Therefore, saving seed from year to year can lead to unpredictable results unless plants are screened from insects or separated by 500 ft.

**Nutritional**

**Slow, early season growth** can usually be attributed to growing plants under cool conditions or purchasing overgrown, stressed transplants. Planting before soil temperature reaches 65°F will cause plants to “just sit there.” It is better to pot plants up into a larger container and grow them indoors until the ground has warmed. Fertilizing with a high phosphorous, soluble fertilizer, setting plants through a black plastic-mulch and covering plants with a floating row cover can help encourage early growth. Pinching off early buds and flowers will accelerate root development and improve yields.

Pepper plants require a supply of nutrients throughout the growing season, particularly during fruiting. **Small peppers** may result from inadequate fertilization. Feed plants lightly with a balanced fertilizer every 2-3 weeks after fruiting begins.

**Blossom-end rot** is a physiological disorder that results from a lack of calcium in enlarging fruits. The fruit tissue disintegrates on the blossom or bottom end of the fruit producing a sunken, leathery, dark brown lesion. Symptoms appear when there is insufficient calcium in the soil or when plants can’t move calcium to the enlarging fruit due to a lack of water. Affected fruits should be pulled immediately and discarded because they will continue to use up valuable water and nutrients.

Plants tend to “grow out of the problem”. Calcium chloride may be sprayed on affected plants but this will not reverse existing damage. **You can reduce blossom-end rot by:**

- Adding calcitic or dolomitic lime in the fall to maintain proper pH.
- Mixing in a handful of ground limestone with your garden soil from each hole when transplanting.
- Mulching your plants to conserve soil moisture.
- Watering deeply and regularly.
- Avoiding high nitrogen fertilizers.

**Fruit Set**

Growth, blossom set and fruiting can be quite variable through the season and are particularly affected by temperature. **Night temperatures below 60°F and above 75°F cause blossoms and small fruits to drop.** Day temperatures above 95°F can also lead to blossom drop. Keep in mind that some blossom drop is to be expected on healthy plants growing under near-ideal conditions. Planting peppers so they receive afternoon shade, cooling plants off with a water spray and covering plants with a shade cloth or floating row cover can help to combat problems associated with high temperatures.

**Fruit Ripening / Pungency**

Almost all pepper varieties produce green pods that change color as they ripen. Some varieties may go through 2 or 3 color changes (e.g. jalapeno goes from green to black to red.) Bell peppers may reach a mature green stage 70-80 days after transplanting and require an additional 2-3 weeks to fully ripen. Some types of chiles take 110-125 days to fully mature. Late-maturing varieties may not produce ripe pods if planted too late. Furthermore, pods are more vulnerable to diseases, insect pests and environmental disorders as they approach full ripeness. Longitudinal and concentric growth cracking, or “rain checking”, is a common but not very serious condition resulting from soil moisture fluctuations, rainy weather and heavy dew.
**Sunscald** of pods occurs when pods are exposed to direct sunlight. Sunscald often results from defoliation and appears as light tan or white areas that feel soft or papery.

Pungency seems to increase with ambient temperatures, length of time growing and thinness of the pod wall. Typically, one finds genetic variability in pungency between plants grown from the same seed packet and even between different pods from the same plant. This is especially true for less domesticated, non-hybridized types of chiles (e.g. ancho, mulatto, pasilla and numex types). Always wear rubber gloves when processing chiles or cleaning seeds. Pepper branches tend to become brittle and may break under a heavy fruit load or in a strong wind. Support your pepper plants with cages or trellises and consider cutting pods with a knife or scissors rather than twisting them off the plant.

**Diseases Affecting Foliage, Stems and Roots**

**Bacterial Spot (Xanthomonas campestris pv. vesicatoria)**

The symptoms of bacterial spot disease begin as small circular pimples on leaf undersides and as small water-soaked lesions on the upper leaf surface. Spots enlarge during warm, wet and humid weather and turn brown. Leaves will drop with severe infections, resulting in sunscald. The bacteria over-winter on crop residue and are seed-borne. The disease is spread by splashing rain and working with wet, infected plants. Hot, dry weather will slow the spread of this disease. This is one of the most common diseases of peppers in Maryland.

Control: Select resistant cultivars. Jalapeno and serrano chiles seem to be less susceptible to bacterial spot than other types. Treat seeds prior to planting by soaking them for 2 minutes in a 10% chlorine bleach solution (one part chlorine bleach to 9 parts water). Rinse with water for 5 minutes and thoroughly dry seeds. Cover the soil around pepper plants with a mulch and don’t crowd plants together. Avoid overhead watering and working with plants when foliage is wet. Fertilize plants to support new growth. Spray with a labeled copper fungicide*, when symptoms are first observed. Remove and hot compost all crop residues. Where bacterial spot is a perennial problem consider covering the soil with black plastic or landscape fabric.

**Viruses (Cucumber Mosaic, Potato Y and X, Tobacco Mosaic and Tobacco Etch)**

Specific virus diseases are difficult to distinguish and produce a wide range of symptoms including stunted, slow growing plants, twisted, crinkled, cupped or deformed leaves, and leaf discoloration (yellow mottling and mosaic patterns, ringspots and dark-green banding). Aphid, thrips and leafhopper feeding transmit most viruses common in Maryland. Tobacco mosaic virus (TMV) is mechanically transmitted by tools and handling plants. Viral diseases are systemic and symptoms tend to progress and worsen through the season.

Control: Remove and discard plants that display severe viral symptoms. Control weeds around the garden and insect pests that suck plant sap. Grow or purchase transplants resistant to TMV.

**Blight and Wilt**

**Phytophthora blight, Fusarium wilt and southern blight** are soil-borne diseases that produce cankers on plant stems near the soil line and cause plants to wilt. Phytophthora also causes water-soaked leaf lesions, black stem lesions at branches and root rot. Fusarium causes a browning of internal stem tissue.

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* Denotes an organic fungicide
Control: Select resistant cultivars. When symptoms are widespread it is best to remove and discard plants. These diseases are long-lived in the soil and resistant varieties are not available. Avoid poorly drained soils. Plant peppers on ridges or beds and irrigate when necessary around the base of the plants. Rotate peppers to a different area next year.

Fruit Diseases

In addition to blossom-end rot and sunscald, several fungal and bacterial diseases attack pepper pods. Anthracnose appears on mature green and ripening pods as small, shrunken lesions. Dark-colored concentric rings may be observed with masses of salmon-colored spores. Alternaria rot produces small brown lesions that also contain concentric rings and is associated with sunscald. Bacterial soft rot causes pods to become soft and watery and usually appears after harvest. Botrytis, or gray mold causes light-colored soft spots to form which can quickly enlarge. Phytophthora will cause large, water-soaked spots covered with a cream colored mold. Virus diseases may cause fruits to be small, deformed, spotted or discolored.

Control: Keep plants supported and mulched. Provide adequate spacing. Remove affected pods immediately. Control diseases that may defoliate plants.

Pests

Aphids

Aphids are small, soft-bodied insects, usually green or pink, with long, slender mouthparts which they use to suck out plant fluids. This feeding causes curling and wilting of the leaves. They excrete honeydew, which makes the leaves sticky and supports the growth of sooty mold. Two species of aphids attack peppers in Maryland, the green peach aphid (most common) and the potato aphid.

Control: Aphids are generally more of a problem May through June and again in the fall. Control is often not necessary because predator and parasite activity. Common predators are green lacewing larvae, lady beetles, hover fly larvae and predatory bugs. Several small wasps also parasitize aphids. Parasitized aphids turn brown and remain on the leaves. If necessary, aphids may be controlled with an application of insecticidal soap.

Greenhouse Whitefly, (Trialeurodes vaporariorum)

Whiteflies infest many vegetables during the summer. Adults are small, white, moth-like insects that may fly from the plants when disturbed. The immature whiteflies are tiny, scale-like insects that feed on the undersides of leaves. Both the adults and nymphs (immatures) suck the sap from leaves. Heavy infestations cause leaves to turn yellow or appear dry. Whiteflies secrete honeydew, which causes the leaves to become sticky and supports the growth of black sooty mold.

Control: Whiteflies are attacked by parasites and predators which normally keep them under control. If additional measures are needed, insecticidal soap, pyrethrum or a commercial blend of both is effective for control. They must be sprayed on the undersides of the leaves to contact the whiteflies and only sprayed when temperatures are cool. Insecticidal soaps and other insecticides can burn plants when temperatures are above the low 80’s°F. Check container labels for precautions.

Flea Beetles, Epitrix sp.

Flea beetles are small beetles with enlarged back legs that enable them to jump. The most common species on peppers is the potato flea beetle, which is 2 mm long, black, and has yellow rear legs. The adult beetles chew small, round holes or pitted areas in leaves. The larvae feed on roots, but cause no damage.
Control: To manage flea beetle problems, protect young plants with floating row cover. Older plants can usually tolerate heavy feeding. Flea beetles overwinter in plant debris and weeds. Remove these refuges by removing or rototilling the weeds and debris in the fall.

**Colorado Potato Beetle**  
*Leptinotarsa decemlineata*

The Colorado potato beetle prefers potato and eggplant but will attack peppers if preferred hosts are not available. The adult beetle is stout, about 3/8 of an inch long, and has yellow wing covers with black stripes. The larvae are red to orange, stout, with 2 rows of black spots along their sides. Both adults and larvae feed on the leaves, leaving only veins and stems.

Control: If only a few are present, hand pick and destroy them. A B.t. product called “M-Trak” may be used to control young larvae in heavy infestations. There are up to 3 generations of this beetle in Maryland each growing season.

**Stink Bugs**

**Southern Green Stink Bug, (Nezara viridula)**

**Brown Stink Bug, (Euschistus servus)**

Stink bugs are shield shaped insects with long, sucking mouth parts and long jointed antennae. Their name comes from the fact that they give off an offensive odor when disturbed. The most common species that cause damage to peppers in Maryland are the brown and southern green stink bugs. On pepper fruit, damage appears as dark pinpricks surrounded by light discolored areas that may be as large as 1/2 inch in diameter. The spots become white and pithy, but remain firm as the fruit ripens.

Control: Stink bugs are attacked by parasitic wasps and flies and several predatory beetles and bugs. In the vegetable garden look for stink bug egg masses and removes them. The eggs are barrel or keg shaped with distinct circular lids and laid in groups of 10 or more on leaf surfaces. Remove or rototill crop debris at the end of the season and control weeds to help reduce hibernating sites of adults.

**Tarnished Plant Bug, *Lygus lineolaris***

The tarnished plant bug is an occasional pest on peppers. Adults are about 1/4 inch long, mottled brown, with long, segmented antennae. They are mainly a problem during hot weather. They feed on blossoms and buds causing them to drop. This damage may be confused with drop from high temperatures.

**Spider Mites**

Spider mites can be a very serious problem on pepper plants during hot, dry weather. Spider mites are very tiny with 8 legs. They vary in color from light green with two dark spots to red. To the naked eye they look like tiny moving dots. The mites feed on the undersides of leaves and damage appears as fine stippling on the upper surfaces. Lower leaf surfaces appear dirty and may or may not have webbing. Heavy mite infestations cause leaves to turn yellow and eventually brown. To monitor for spider mites, examine the leaves closely with a hand lens, if necessary. If damage is seen, but no mites are found, check leaves higher up on the plant. A simple technique for sampling is to tap a few terminal leaves over a piece of white paper. Wait a few seconds and watch for movement.

Control: Because spider mites feed on lower leaf surfaces, they are difficult to control by spraying. All lower leaf surfaces must be contacted with the spray to kill the mites. Insecticide sprays also easily damage plants that have had heavy mite feeding. This is especially true of insecticidal soap during hot, dry weather. Predatory mites are an excellent option. They will hunt down and kill the spider mites and provide long-term control. They are available through mail-order sources.

**Caterpillars**

**Hornworms (Manduca spp).**

Hornworms grow up to 4 inches long, are green with diagonal stripes and have a horn at the rear end. They may strip individual branches of a pepper plant. To find the hornworms look in areas of the plant that are being
defoliated and on the ground for the presence of large, black droppings. Remove the caterpillars by handpicking. It is not necessary to spray for them.

**Armyworms (Spodoptera species)**

Armyworms have distinct lengthwise stripes, are smooth, and can reach up to 1 1/2 inches long. They primarily damage the fruit and are best controlled by hand picking and removing damaged fruit.

**Thrips**

Thrips are very tiny insects, 1-2mm long. They are slender with narrow wings fringed with hairs. They may be white, yellow, brown or black. The immatures are smaller and usually white or yellow. There are several generations. Some species overwinter in the soil; others die in winter are replaced in the spring by populations migrating in from the south. Some thrips may feed on only one plant species, while others are general feeders on the flowers and leaves of tree, shrubs and perennials.

**Tomato Fruitworm (Heliothis zea)**

Tomato fruitworms usually only damage the pepper pods. The caterpillars vary in color from greenish-yellow, reddish or brown, have yellowish heads, distinct stripes along the sides, and short, whisker-like spines over the body. They may reach 1 5/8 inches when mature. Fruitworms normally begin feeding near the stem end and eventually enter the fruit. To control handpick the caterpillars and remove infested fruit.

**Cutworms**

**Black cutworm (Agrotis ipsilon)**

The primary cutworm that causes damage to pepper plants is the black cutworm. The caterpillar is gray to black, with a lighter stripe down the middle of its back. Other species are a dull brownish color. Mature caterpillars can reach 1 3/4 inches in length and curl up into a C-shape when disturbed. Cutworms are generally a problem during May and June. The caterpillars clip off pepper transplants at or just below the soil level and are active at night. Look for cutoff seedlings and dig around the base of the plant for the caterpillars.

**Control:** To protect seedlings and transplants from cutworm damage, wrap them with cardboard collars. A simple collar can be made from a paper cup with the bottom removed. Push the cup into the soil to hold it in place. Cardboard tubes from paper towels or toilet tissue can be cut to size for collars.

**Thrips on pepper**

Some thrips species feed only on pollen and cause no damage. Others suck plant juices in a linear pattern that looks like irregular white streaks and give a silvery appearance to damaged leaves. Some species may deposit minute black fecal spots on leaves.

Thrips can cause damage to peppers in the garden. Feeding on leaves results in thickened, distorted leaves. Damage on the fruit appears as brown or silver colored areas near the cap. This damage closely resembles that caused by cyclamen mites. Thrips can also vector tomato spotted wilt virus and impatiens necrotic spot virus.

**Control:** Thrips generally do not require control in the home garden. They often become pests in June when weeds dry down and come in to well-watered, flower borders. Thrips are usually controlled by predatory insects such as minute pirate bugs and predatory mites.

**Cyclamen Mites**

Cyclamen mites are tiny, pests that attack a wide range of flowers, usually in spring and late summer or fall when humidity is high. Cyclamen mites can be a minor pest of pepper and tomato. The mite injects a growth regulator into foliage while feeding that causes leaves to twist and crinkle and sometimes become very large. The symptoms mimic virus injury.
Fruit feeding produces a dramatic russetting - usually at the stem end. Fruits appear to be covered with a very fine, brown netting that feels slightly rough. Cyclamen mites usually come in on greenhouse plants or migrate in from strawberry plantings and are difficult to control when conditions favor their growth.

**Control:** Remove distorted leaves and injured fruit.

Cyclamen mite damage on peppers

Pepper Maggot (*Zonosemata electa*)

The pepper maggot fly is yellow, 3/8 inch long, and has clear wings with brown bands. The maggot is whitish, turning yellow as it matures, pointed at the head end, and 1/2 inch long when fully grown. The adult fly emerges in July and lays eggs just under the skin of young pepper pods. The egg punctures are elliptical and become shallow depressions as the fruit enlarges. The maggots feed on the core inside of the fruit for about 16 days. They usually leave the peppers and drop to the ground to pupate before the pods are harvested. Damaged peppers turn red prematurely and rot.

**Control:** Monitor pepper pods for the egg punctures. Pick and destroy any infested pods. Remove any rotting pods as these attract fruit flies.

European Corn Borer (*Ostrinia nubilalis*)

Corn borer larvae may damage pepper pods and stems. The larva is flesh colored with brown spots on each segment and a brown head. The mature larva is about 1 inch long. The larvae usually enter the fruit under the stem cap. The damage is difficult to see at first because the entry hole is very small. There may be sawdust-like excrement around the hole. The larva may also enter through the side of the pepper pod causing dimpling in that area. The larvae feed on the seed core. Infested pods ripen prematurely and often rot from disease organisms that entered through the feeding hole. Larvae may also bore into stems or branches of pepper plants. Sawdust-like excrement may be visible near the entry hole. The infested stems wilt and may break off at the entry point.

**Control:** Check pods for signs of borer activity and dispose of infested pods. Remove infested branches below the entry hole. It is not practical to spray for this pest.

**Slugs**

Slugs feed on pepper fruit that is in contact with the ground and on the leaves of transplants. Most slug feeding is done at night and the only evidence of their presence during the day may be slime trails. Keep ripening fruit picked, especially those near the ground. Dispose of any damaged fruit. Transplants can be protected from slugs with cardboard collars as for cutworms. Keep mulch away from seedlings until they are well established. Slugs hide in cool, moist, dark areas during the day. Remove debris, boards, etc. from gardens to help eliminate shelter areas for slugs.

**Control:** Barriers of diatomaceous earth around the garden have been shown to be effective. However, these barriers are difficult to maintain because they lose effectiveness after becoming wet.

**Nematodes**

**Root Knot Nematodes, (*Meloidigyne sp.*)**

Nematodes are microscopic worms of which many types feed on plant roots. The root knot nematode is a common problem on peppers. This nematode causes swellings or galls on the roots of pepper plants as well as other vegetables. Nematodes reduce the plant’s ability to take up water and nutrients.

**Control:** Barriers of diatomaceous earth around the garden have been shown to be effective. However, these barriers are difficult to maintain because they lose effectiveness after becoming wet.
Symptoms include wilting, reduced vigor, smaller fruit and leaves. The only sure way to check if a plant has root knot nematodes is to dig it up and check the root system for the galls. Root knot tends to be more of a problem in sandy soils.

**Control:** Use nematode resistant varieties of peppers in the garden. They will have an “N” on the label or seed packet indicating nematode resistance. Also, if nematodes have been a problem, move peppers or other susceptible plants to another part of the garden. Organic soil amendments such as peat, manure and compost can be added to the soil to help reduce the impact of nematodes on vegetable plants. They may contain substances that inhibit nematodes, but are most useful for their ability to increase the water-holding capacity and nutrient availability of the soil.

Artwork: USDA.

References:


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