## IPM Series: Eggplant

**Table:** Symptoms, Possible Causes, Notes

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Possible Causes</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td><strong>LEAVES/WHOLE PLANT</strong></td>
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</tbody>
</table>
| Leaf stippling            | Spider mites  
Eggplant lace bug         | Yellow stippling; leaves may appear dirty on undersides.   
Symptoms similar to spider mite injury. |
| Leaf yellowing            | Spider mites  
Early blight  
Moisture extremes  
Low soil fertility  
Eggplant lace bug         | Yellow stippling; leaves may appear dirty on undersides.   
Advanced symptom of early blight infection (see “leaf spots”). |
| Leaf scorch               | Flea beetles  
jump when disturbed.  
Moisture extremes         | Tiny holes in scatter-shot pattern. Small, shiny dark insects that |
| Leaf spots and blotches   | Early blight  
Phomopsis  
Phytotoxicity  
Eggplant lace bug         | Dark, leathery spots begin on lower leaves; concentric rings within  
Circular gray spots with light-colored centers.  
Pesticide or fertilizer residue may burn foliage.  
White spots or blotches appear on leaf surface. |
| Whole plant wilts         | Nematodes roots  
Moisture extremes weather  
Verticillium and Fusarium stems | More likely on sandy soil; small growths (“root-knots”) form on  
Each plant should receive 1-2 gallons of water per week during dry  
Wilting starts at bottom of plant. Slice epidermis of wilted  
infected plants. |
| Holes chewed in leaves    | Flea beetles  
jump when disturbed.  
Colorado potato beetle leaves | Tiny holes in scatter-shot pattern. Small, shiny dark insects that  
Yellow and black striped beetles and grub-like larvae chew entire |
| Poor growth/stunting      | Root-knot nematodes nutrients. Check for root galls (round growths).  
Flea beetles undersides.  
Poor growing conditions | Progressive stunting as nematodes inhibit uptake of water and  
High populations can stunt young plants. Found mostly on leaf  
Weak transplants, cool weather, heavy clay or infertile soil, inadequate sunlight. |
<table>
<thead>
<tr>
<th>Plants fall over (lodging)</th>
<th>Insufficient support</th>
<th>Large, healthy plants often require support.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorly developed root system</td>
<td>Poor soil; check for nematode galls on roots.</td>
<td></td>
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<tr>
<td>Water-logged soil</td>
<td>Poor soil drainage prevents strong root development.</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Branch breaking</th>
<th>Harvesting technique</th>
<th>Cut fruit stems with sharp knife or pruners.</th>
</tr>
</thead>
</table>

**FRUIT**

<table>
<thead>
<tr>
<th>Failure to flower and fruit</th>
<th>Low temperatures</th>
<th>Night temps. below 55°F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate sunlight</td>
<td>Less than 6 hrs. daily direct sunlight.</td>
<td></td>
</tr>
<tr>
<td>Poor pollination</td>
<td>Eggplant only partially self-fertile. Insect pollinators necessary for high yields of well-formed fruit.</td>
<td></td>
</tr>
<tr>
<td>Spacing too close</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Holes chewed in fruit</th>
<th>Hornworms</th>
<th>Large green caterpillars with a black or red horn; handpick them.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado potato beetle</td>
<td>Yellow and black striped beetles and grub-like larvae.</td>
<td></td>
</tr>
<tr>
<td>Various fruit worms and cutworms</td>
<td>Cause minimal damage.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spots on fruits</th>
<th>Phomopsis</th>
<th>Pale, sunken fruit spots begin at stem end.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracnose</td>
<td>Sunken leathery spots.</td>
<td></td>
</tr>
<tr>
<td>Early blight</td>
<td>Small, dark, greenish-brown, leathery lesions with concentric rings.</td>
<td></td>
</tr>
<tr>
<td>Sunburn</td>
<td>Caused by intense sunlight on exposed fruit.</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Small or distorted fruits</th>
<th>Poor pollination</th>
<th>Insufficient insect pollinators. Avoid spraying insecticides during bloom period.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low soil fertility</td>
<td>Sidedress plants with balanced fertilizer every two weeks after first fruits form.</td>
<td></td>
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</tbody>
</table>

**TRANSPLANTS AND SEEDLINGS**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Possible Causes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>White-tipped leaves</td>
<td>Frost damage</td>
<td>Plants insufficiently hardened; planted too early.</td>
</tr>
<tr>
<td>Purple leaves</td>
<td>Cold damage</td>
<td>Best to transplant eggplant into warm soil, 2 weeks after last frost</td>
</tr>
<tr>
<td></td>
<td>Phosphorous deficiency</td>
<td>Low 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></td>
<td>Water stress</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 darken.</td>
</tr>
<tr>
<td></td>
<td>Cutworms</td>
<td>Night feeders; plants cut off at soil line.</td>
</tr>
<tr>
<td>Leaves and stems chewed</td>
<td>Slugs and snails</td>
<td>Night feeders; slimy trails may be seen.</td>
</tr>
<tr>
<td></td>
<td>Colorado potato beetle</td>
<td>(See above)</td>
</tr>
<tr>
<td></td>
<td>Cutworms</td>
<td></td>
</tr>
<tr>
<td>Plants cut off at soil line</td>
<td>Cutworms</td>
<td>Plants sometimes “disappear”; dragged into underground burrow by cutworm</td>
</tr>
<tr>
<td></td>
<td>Slugs and snails</td>
<td>(See above)</td>
</tr>
<tr>
<td>Small holes</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>Eggplant requires a minimum of 6-8 hours sunlight.</td>
</tr>
<tr>
<td>Leaf yellowing</td>
<td>Spider mites</td>
<td>Fine stippling, especially in warm weather.</td>
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<tr>
<td></td>
<td>Whitefly</td>
<td>Tiny, white insects fly up when plant is disturbed; usually from greenhouse where plants were grown.</td>
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The integrated pest management (IPM) approach to preventing or managing eggplant 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 level of damage becomes unacceptable choose a least toxic control.

The severity of some common problems is closely related to the weather (some diseases are worse in “wet” years) and to your gardening decisions (selected varieties, spacing, etc.).

• Eggplant is a heavy feeder that grows best in deep, fertile well-drained soils amended with organic matter. Soil pH should be in the 6.0 to 6.8 range.
• Early season leaf yellowing can be caused by a lack of nitrogen or potassium while purplish leaves indicate a phosphorous deficiency. Cool soil will limit the uptake of plant nutrients. Apply a soluble fertilizer after transplanting (seaweed extract, compost tea, or starter fertilizer high in phosphorous) to help alleviate early season nutrient stress.
• Sidedress plants with a balanced fertilizer every two weeks after the first fruits form. Keep soluble and granular fertilizers off foliage to prevent leaf scorch.
• Eggplant is only partially self-fertile. Insects, primarily bumble bees, are important pollinators of eggplant. To protect these pollinators, avoid spraying insecticides during the bloom period.
• Harvest the first fruit when it is only 4-6 inches long and the seeds are still light colored or have not yet formed.
• Harvest eggplant with a sharp knife or pruners. Be cautious of the sharp spines on the calyx (where the fruit attaches to the stem).
• Twisting fruits off will result in broken branches.
• Some gardeners pinch off flowers that open in late summer to direct the plant’s energy into ripening the remaining fruits.
• Success with eggplant depends on warm soil, sufficient water and nutrients, and preventing or controlling flea beetles.

Cultural/Environmental Problems

Eggplant, Solanum melongena, is a bushy, semi-woody, erect perennial that originated in Africa and is grown as a tender annual in Maryland.

• Eggplant is a full-sun plant (6-8 hours direct sunlight) that requires 4-6 sq. ft. of growing space per plant.
• Direct seeding into the garden results in small fruits and low yields. Always start with 6-10 week old, healthy transplants. Avoid buying root-bound, stressed plants.
• Eggplant is more frost-sensitive than tomato or pepper, and transplants should only be set out when they have 6-8 open leaves and night temperatures are above 60°F. Cool weather at planting time may limit plant growth and yield for the entire season.
• Black plastic mulch laid on the ground one month prior to transplanting will warm the soil and promote strong, early growth.
• Plants often fall over (lodge) in a wind storm when the fruit load is heavy. Supporting plants with string and stakes or cages is essential to avoid this problem.
**Foliar Diseases/Plant Wilts**

Minor foliar diseases may appear on eggplant.

**Control:** Remove infected leaves, avoid overhead watering, provide adequate space between plants.

Severe water stress caused by a lack of water, poorly developed root system or poorly drained soil will produce wilt symptoms. The soil-borne diseases Verticillium and Fusarium occasionally infect home plantings. Wilted plants should be examined for signs of vascular discoloration, a sign of these diseases.

**Control:** Remove and discard infected plants. Avoid planting strawberries, potatoes, eggplant, tomatoes or peppers in infected areas. Black plastic mulch or organic mulches (straw, grass clippings) will help conserve moisture.

**Fruit Diseases**

Several minor fungal diseases attack fruits, including anthracnose, Alternaria, Phytophthora and Phomopsis. Fruit diseases are more prevalent during wet seasons.

**Control:** Keep plants and fruits off the ground, avoid overhead watering and maintain an organic mulch around plants (unless you are using black plastic mulch.)

**Cutworms**

Cutworms are gray to black or a dull brownish color. Mature caterpillars can reach 1 and 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 eggplant 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. Climbing cutworms occasionally bore into fruit.

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

**Flea Beetles** (*Epitrix spp.*)

These insects are often the most damaging, season-long problem of eggplant in Maryland. Flea beetles are small beetles with enlarged back legs that enable them to jump. The most common species on eggplant is the potato flea beetle, which is 2 mm long, black, and has yellow rear legs. The adult beetles emerge in late spring and chew many small, round holes in leaves, eventually causing leaves to turn brown and die. The feeding damage retards growth and gives the plants a sickly, diseased look.

**Control:** Prevent flea beetle problems by protecting transplants, as soon as they are set, with floating row cover. Be sure that the row cover is secured tightly to the ground. Very lightweight floating row covers, sometimes called “insect barrier”, can be used to cover plants all season long. Eggplant is partially insect-pollinated, however, so covering the plants for an entire growing season will reduce production by as much as 50%. Older plants can usually tolerate moderate feeding and still produce a decent crop. Asian type cultivars seem to be less prone to feeding injury. A pyrethrum and soap or neem oil spray can also be used to kill flea beetles. Plants can also be dusted with woodash, flour, or Surround (a kaolin clay product). These materials create a barrier that deters feeding. Adult flea beetles overwinter in plant debris and weeds. Remove these refuges by removing or rototilling weeds and debris in the fall. Plant a trap crop of radishes 2 weeks before planting eggplant. Flea beetles prefer radish to eggplant.

**Colorado Potato Beetle** (*Leptinotarsa decemlineata*)

The Colorado potato beetle prefers eggplant over potato and can be a serious insect pest in Maryland gardens. The adult beetle is stout, about d 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. There are up to 3 generations of this beetle in Maryland each year.

**Control:** It is important to monitor plants from the time they are set out in the garden, for signs of larvae and adults. If only a few are present, hand pick and destroy them along with orange egg masses. Prevent potato beetle problems by protecting transplants as soon as they are set out with floating row cover. (See flea beetle section.) Bacillus thuringiensis var tenebrionis may be used to control young larvae in heavy infestations. A thick straw mulch placed around plants may also help to deter larvae.
SPIDER MITES

Spider mites can be a problem during hot, dry weather. They are very tiny with 8 legs and vary in color from light green (with two dark spots) to red. To the unaided eye they look like tiny moving dots. They feed on the undersides of leaves and damage appears as fine stippling (pin-point yellow spots that become bleached) 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. 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. Mite infestations can be severe during hot, dry weather.

Control: All lower leaf surfaces must be contacted with an insecticide (hort. oil or insecticidal soap) to kill the mites. Plants that have suffered heavy mite feeding are also easily damaged by insecticide sprays. This is especially true of insecticidal soap or horticultural oil applied during hot, dry weather. Predatory mites are an excellent option. They will kill the spider mites and provide long-term control. They are available through mail-order sources.

Eggplant Lace Bug

This lace bug feeds on eggplant primarily but is also occasionally found on other members of the Solanaceae family - tomato, potato, etc. It is dark brown around the head and has lacy, well-veined wings. Adults feed on leaf undersides. There are numerous over-lapping generations each summer.

Control: Monitor plants closely for sign of this insect if leaves become stippled. Apply ultra-fine horticultural oil or insecticidal soap to control damaging populations of this occasional pest. Be sure to direct the spray to the upper and lower leaf surfaces.

Root-Knot Nematodes (*Meloidogyne* spp.)

Root-knot nematodes are microscopic worms that feed on plant roots producing swellings or galls. Nematodes reduce the plant’s ability to take up water and nutrients. 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 examine the root system for galls. Root knot tends to be more of a problem in sandy soils.

Control: If nematodes have been a problem, move eggplants 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 to vegetable plants. They may contain substances that inhibit nematodes and also increase the water-holding capacity and fertility of the soil. Planting rapeseed can also help to reduce root knot nematode populations.

References:

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