

## IPM Series: Eggplant

Symptoms	Possible Causes	Notes
<b>LEAVES/WHOLE PLANT</b>		
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”).  Symptoms appear similar to spider mite injury.
Leaf scorch	Flea beetles  Moisture extremes	Tiny holes in scatter-shot pattern. Small, shiny dark insects that jump when disturbed.
Leaf spots and blotches	Early blight  Phomopsis Phytotoxicity Eggplant lace bug	Dark, leathery spots begin on lower leaves; concentric rings within lesions. 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  Moisture extremes  <i>Verticillium</i> and <i>Fusarium</i> wilt disease	More likely on sandy soil; small growths (“root-knots”) form on roots. Each plant should receive 1-2 gallons of water per week during dry weather. Wilting starts at bottom of plant. Slice epidermis of wilted stems. Brown streaking will be seen in infected plants.
Holes chewed in leaves	Flea beetles  Colorado potato beetle	Tiny holes in scatter-shot pattern. Small, shiny dark insects that jump when disturbed. Yellow and black striped beetles and grub-like larvae chew entire leaves.
Poor growth/stunting	Root-knot nematodes  Flea beetles  Poor growing conditions	Progressive stunting as nematodes inhibit uptake of water and nutrients. Check for root galls (round growths). High populations can stunt young plants. Found mostly on leaf undersides. Weak transplants, cool weather, heavy clay or infertile soil, inadequate sunlight.

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Plants fall over (lodging)	Insufficient support Poorly developed root system Water-logged soil	Large, healthy plants often require support. Poor soil; check for nematode galls on roots. Poor soil drainage prevents strong root development.
Branch breaking	Harvesting technique	Cut fruit stems with sharp knife or pruners.
<b>FRUIT</b>		
Failure to flower and fruit	Low temperatures Inadequate sunlight Poor pollination  Spacing too close	Night temps. below 55°F. Less than 6 hrs. daily direct sunlight. Eggplant only partially self-fertile. Insect pollinators necessary for high yields of well-formed fruit.
Holes chewed in fruit	Hornworms Colorado potato beetle Various fruit worms and cutworms	Large green caterpillars with a black or red horn; handpick them. Yellow and black striped beetles and grub-like larvae. Cause minimal damage.
Spots on fruits	Phomopsis Anthracnose Early blight Sunburn	Pale, sunken fruit spots begin at stem end. Sunken leathery spots. Small, dark, greenish-brown, leathery lesions with concentric rings. Caused by intense sunlight on exposed fruit.
Small or distorted fruits	Poor pollination  Low soil fertility	Insufficient insect pollinators. Avoid spraying insecticides during bloom period. Side-dress plants with balanced fertilizer every two weeks after first fruits form.

## TRANSPLANTS AND SEEDLINGS

Symptoms	Possible Causes	Notes
White-tipped leaves	Frost damage	Plants insufficiently hardened; planted too early.
Purple leaves	Cold damage Phosphorous deficiency	Best to transplant eggplant into warm soil, 2 weeks after last frost Low temperatures prevent phosphorous uptake.
Wilted	Wind burn Water stress	Leaves may become pale and dry. Lack of adequate water; related to wind burn.
Plants fall over and die	Damping-off Cutworms	Tap root and lower stem shrivel and darken. Night feeders; plants cut off at soil line.
Leaves and stems chewed	Slugs and snails Colorado potato beetle Cutworms	Night feeders; slimy trails may be seen.  (See above)
Plants cut off at soil line	Cutworms  Slugs and snails	Plants sometimes “disappear”; dragged into underground burrow by cutworm  (See above)
Small holes	Flea beetles	Small, dark, shiny beetles that jump when disturbed; “shotgun” feeding pattern.
Pale green leaves	Lack of nitrogen Lack of sunlight	Cool soils contribute to poor nutrient uptake. Eggplant requires a minimum of 6-8 hours sunlight.
Leaf yellowing	Spider mites Whitefly	Fine stippling, especially in warm weather. Tiny, white insects fly up when plant is disturbed; usually from greenhouse where plants were grown.

The **integrated pest management** 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.).



*Neon Eggplant*

## 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.
- 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.

## 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.)



*Flea beetles and injury on eggplant*



*Eggplant leaf dusted with wood ash*

## 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 wood ash, 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 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. 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 lacey, 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.

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