

## Herb Bedding Plants Grown in Greenhouses

### Scouting guidelines and biological control options for herb bedding plants

<b>Pest</b>	<b>How To Monitor</b>	<b>Signs and Symptoms</b>	<b>Biological Control Options</b>
Aphids	Monitor weekly. Look on the underside of leaves and along stems on tips of new growth for small (1/16 inch long) aphids with 2 cornicles or “tailpipes” at the rear of their bodies. Identification to species is needed to determine which host specific aphid parasite to release. If uncertain, mixes of different species of parasitic wasps are available.	Distorted young growth (will vary depending upon type of aphid). Shed white skins of aphids that have molted. Honeydew and sooty mold.	<i>Adalia bipunctata</i> (ladybird beetle larvae) <i>Aphidoletes aphidimyza</i> (aphid midge, predator) <i>Aphelinus abdominalis</i> (aphid parasite) <i>Aphidius matricariae</i> (aphid parasite) <i>Aphidius colemani</i> (aphid parasite) <i>Aphidius ervi</i> (aphid parasite) <i>Aphelinus abdominalis</i> <i>Chrysoperla spp.</i> (green lacewing, predator) <i>Hippodamia convergens</i> (lady bird beetles)
<b>Bacterial Diseases</b> Bacterial Fasciation  Pseudomonas Leaf Spot  Bacterial Blight	Look for abnormal branching near the base of scented geraniums.  Inspect basil and other small plugs during routine monitoring.  Test plants prior to use as stock plants. Grower friendly test kits for Xanthomonas are available from Agdia (www.agdia.com)	Plants are stunted with short, swollen, fleshy and misshapen leaves.  Look for water-soaked, dark-brown to black leaf spots especially on young plugs. Confirm diagnosis through a plant diagnostic laboratory.  Scented geraniums may be carriers of disease without showing symptoms: wilting, small leaf spots, v-shaped angular lesions.	None.
Beetles	During routine inspection, look for chewed holes or pinholes in leaves especially on herbs grown outdoors.	Chewed holes or pinholes in leaves.	None.

Botrytis Blight	Concentrate scouting in areas where crop is closely spaced with poor air circulation, and on tender crops. Look for dieback, stem cankers (especially near a wound), and powdery gray fuzzy appearing spores during humid conditions.	Leaf blights, stem cankers, damping off and occasionally root rots.	<i>Bacillus subtilis</i> <i>Streptomyces griseoviridis</i> <i>Streptomyces lydicus</i>
Caterpillars	If adult moths or butterflies are seen in the greenhouse, look for eggs and young caterpillars. Look for fecal droppings and bites taken out of leaves.	If damage is observed, look under pots or in planting medium just around the base of the plants. Many caterpillars hide during the day and feed at night.	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> <i>Trichogramma spp.</i> (egg parasite)
Crown and Root Rots	Inspect plants weekly for signs of disease: wilted off-colored plants with discolored root systems. Pay particular attention to media that stays wet. Monitor fungus gnats and shore flies, especially in propagation houses. Monitor soluble salt levels.	Leaves turn yellow and wilt. Plants are stunted and off-color. Roots are discolored and may turn brown or black.	Biological fungicides: <i>Bacillus subtilis</i> <i>Streptomyces griseoviridis</i> <i>Streptomyces lydicus</i> <i>Trichoderma harzianium</i> (soil applications only)
Downy Mildew	Inspect basil leaves, especially underside of leaves during humid conditions.	Look for yellowing between the veins. (Maybe confused with nutritional deficiency). Look on underside of leaves for dark purple-brown sporangia (fungal sporulation).	None.
Damping Off	Monitor weekly. Scan flats for signs of seedlings that do not emerge or collapse at the soil line. Disease often spreads from a central point. Discard heavily infected flats to avoid future problems..	Seeds do not germinate or collapse with dark, necrotic stem canker at soil line. Infected plants may later develop crown and root rots.	<i>Trichoderma harzianium</i> (soil applications only)
Fungus Gnats	Use sticky cards to monitor for adults. Place cards at base of plants at soil line. Place potato chunks on soil surface to monitor for larvae. (Check every two	On cuttings, fungus gnat larvae may feed on callus, slowing down rooting. Larvae feed upon roots and may tunnel into stems causing plants to wilt and die.	<i>Atheta IDalotia coriaria</i> (rove beetle, predator) <i>Hypoaspis miles</i> (mite predator) <i>Steinernema feltiae</i> (nematodes)

	days.) Scout favorable habitats including areas with standing pools of water, dirt floors or spilled media and weeds.		
Fungal Leaf Spots	Scan the crop for leaf spots. With a hand lens, look for small, fungal fruiting bodies. To confirm, send sample to diagnostic laboratory.	Alternaria leaf spots are generally dark brown to black with a yellow border. Septoria leaf spots are small, grayish-brown with a dark brown edge.	Biological fungicides: <i>Bacillus subtilis</i> <i>Streptomyces lydicus</i>
Fusarium Wilt on Basil	Scan the crop for symptoms. The first symptom is a downward bending or cupping of the leaves. May be confused with water stress, root rot diseases or <i>Botrytis</i> stem canker. To confirm, send sample to diagnostic laboratory.	Leaves may cup downward or the top of the stem will bend like a shepherd's crook. On large-leaved cultivars, defoliation may occur. In later stages, brown streaks can be seen on the stem.	None. Use resistant varieties.
Mealybugs	Inspect herbs propagated by cuttings. Look for small, oval, soft-bodied insects covered with a white, wax-like layer especially along stems, and on underside of leaves.	White, cottony residue may be seen.	<i>Cryptolaemus montrouzieri</i> (predatory beetle) is used against citrus mealybug but is ineffective against long-tailed mealybugs that give birth to live young.
Plant Bugs	Monitor herbs outdoors and those in greenhouses especially if weeds are nearby.		Naturally occurring predators include big-eyed bugs and damsel bugs.
Four-lined plant bugs	Look for signs of feeding activity - small, yellow spots on upper leaf surface. Four-lined plant bugs tend to be secretive and drop off the leaf or run around the leaf.	Round, brown, dead leaf spots that may be confused with fungal leaf spot disease.	
Tarnished plant bugs	Look for signs of feeding injury on youngest growth and buds.	Look for death of tender young, growth, dead spots and badly	

		distorted buds.	
Powdery Mildew	Scout weekly. Inspect susceptible crops. Scout areas near vents, hanging baskets or any location with a sharp change between day and night temperatures. Use a hand lens to see white fungal threads and spores.	White powdery fungal growth can occur on upper or lower leaf surfaces. If severe, white coating can be seen on the foliage.	Biological fungicides: <i>Bacillus subtilis</i> <i>Streptomyces lydicus</i>
Rhizoctonia Web Blight	Scout susceptible crops, especially when they are closely spaced. Look for cobweb-like growth that mats leaves together (web blight) especially during humid conditions.	Stems and leaves collapse rapidly and turn mushy with fine, web-like fungal strands present.	None.
Rusts	Look for yellow spots on the upper leaf surface and rusty brown spots on the lower leaf surface during routine foliage inspections.	Rusty brown spots or stripes especially on the lower leaf surface.	None.
Scale -: Brown Soft Scale	Look for yellow-brown, to dark brown scale insects along veins and stems.	Honeydew and sooty mold are additional signs of infestation.	<i>Cryptolaemus montrouzieri</i> (prefers mealybugs) <i>Chrysoperla carnea</i> (green lacewing)
Slugs	Look for chewed holes in leaves and shiny patches of slime. Slugs hide under dense foliage, beneath pots and benches and in other protected spots.	Chewed, irregular holes with smooth edges in leaves and slime that dries into silvery trails on foliage.	
Two-Spotted Spider mites	Look on leaf undersides, especially along the veins, for all stages of mites, empty eggshells and webbing. Look near hot, dry areas of greenhouse near furnace and near entranceways. Tap foliage over sheet of white paper to look for mites and faster-	Light flecking, and discolored foliage. Leaf drop and webbing may occur during outbreaks.	<i>Amblyseius californicus</i> (predatory mite) <i>Amblyseius andersoni</i> (predatory mite) <i>Amblyseius fallacis</i> (predatory mite) <i>Feltiella acarisuga</i> (predatory midge) <i>Galendromus occidentalis</i> (predatory mite) <i>Mesoseiulus longipes</i> (predatory mite) <i>Phytoseiulus persimilis</i> (predatory mite)

	moving predatory mites. Scout mite-infested areas last.		
Thrips	Rely on sticky cards (placed just above crop canopy) and foliage inspection to track population trends and to evaluate treatments.	Distortion of flowers, buds and tender young growth. White scarring on expanded leaves and flowers. Transmission of tospoviruses.	<i>Amblyseius cucumeris</i> (predatory mite) <i>Amblyseius swirskii</i> (predatory mite) <i>Hypoaspis miles</i> (predatory mites) <i>Orius spp.</i> (minute pirate bug, predator) <i>(Steinernema.feltiae)</i> (nematodes)
Viruses	Scan crops weekly. Inspect incoming plants. Look for mosaic patterns, leaf crinkle or distortion, chlorotic streaking, ringspots, line patterns and stunted plants	For confirmation, send sample to diagnostic laboratory.	None.
Whiteflies	Use sticky cards to monitor for adults. Inspect plants for scale-like immature stages found on underside of leaves.	When high populations develop, honeydew and sooty mold may be seen.	<i>Amblyseius swirskii</i> (predatory mite) <i>Chrysoperla spp.</i> (green lacewing) <i>Delphastus pusillus (catalinae)</i> (predatory beetle) <i>Encarisa formosa</i> (greenhouse whitefly) <i>Eretmocerus eremicus and mundus</i>

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