Pests in Gardens and Landscapes

FREESIA

Dry rot—Stromatinia gladioli

Dry rot attacks plants such as daffodils, freesias, and gladiolus. The initial infection attacks corms either in storage or in the soil. After the initial infection, decay spreads up to the leaf bases. Dry rot causes leaves to yellow and die. Plants are stunted and fail to bloom. Leaf bases or stems rot near the soil and tissue appears shredded. Very small black sclerotia are imbedded in dead tissue. Bulbs develop dark brown, sunken lesions with raised margins.

Solutions
Dry rot is favored by cool, wet soil. Don’t grow in infested soil during cool weather. Use pathogen-free bulbs or plants. Provide good soil drainage. Avoid overwatering. Remove infested plants and bulbs.
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FLOWERS NAME:

GERANIUM, GERBERA DAISY, GLADIOLUS, MARIGOLD, PANSY, PRIMROSE, SNAPDRAGON, SWEET PEA, TRANSVAAL DAISY, SNAP DRAGON, VARIOUS FLOWERS, VIOLET, ZINNIA

Leaf spot diseases

Many fungi cause leaf spots on different hosts. Spots may vary from small discrete dots and raised areas to irregular yellow or brownish patches that cover much of the leaf surface. Leaves may fall off the tree if the problem is severe, but these pathogens rarely cause long-term damage to trees. Similar spots can be caused by bacterial pathogens, insects and mites, or abiotic factors on some plants.

Solutions

In most cases, infections can be tolerated. Remove fallen leaves and debris promptly. Many of the pathogens are favored by moisture, so avoid overhead sprinklers and irrigate early in the day so that the foliage dries more quickly. Generally, fungicide treatment is not warranted.
GLADIOLUS

Scab—*Pseudomonas gladioli*

Scab is a disease of gladiolus caused by bacteria that penetrates the corm and then moves up the stem base. Scab causes corms to develop brown to black, irregular or round, sunken spots with shiny brittle, varnishlike bacterial exudates on the surface. Leaf bases have red or brown specks.

Solutions
Scab is favored by poorly drained, wet, warm soils. Provide good soil drainage. Don’t overirrigate or overfertilize. Control chewing insects in soil that injure corms. Remove and destroy infected plants.

NASTURTIUM

Clubroot—*Plasmodiophora brassicae*

Clubroot is a problem on plants such as cabbage, broccoli, alyssum, and nasturtium, as well as many weeds in the mustard family. During initial stages of clubroot, aboveground symptoms may be absent. Foliar symptoms include stunting, yellowing, and wilting. Extensive galling, swelling, and distortion of the roots and hypocotyl are the main symptoms of the disease. Clubroot is common in soils where *Brassica* spp. plants have previously grown.

Identification
Clubroot may often be confused with nematode damage. Aboveground symptoms of both disorders are similar—wilting or stunting of leaves. Digging up the plants and observing the roots is the only way to distinguish the two disorders. Roots with clubroot are heavily clubbed and may appear spindle shaped. Multiple infections of the same root cause extreme swelling and distortion. Nematodes cause distinctive galls or swellings to form on the roots, but they are not clubbed or spindle shaped. In some cases, small white or brown structures (bodies or eggs of some nematode species) may be seen.

Life cycle
The fungus that causes clubroot persists in soil for many years. Infection is favored by acid soils with adequate moisture, but infections can occur above pH 7.0. In the presence of host plant roots, spores germinate and release swimming spores, called zoospores. These zoospores infect and colonize root hairs. Later, a second type of zoospore appears that can infect the main roots. Infection and colonization by this second zoospore causes the galling and clubbing of roots. Additional spores are formed inside the galled roots and are released into the soil when roots
decay. The fungus is dispersed by the movement of infected plants, especially transplants, and the movement of soil.

**Solutions**

Clubroot is most common in acid soils. Add lime annually to affected soils below pH 7.2. Provide good drainage. Minimize the spread of the pathogen by using pathogen-free transplants. Avoid planting plants where other infested plants in the mustard family have grown, such as broccoli and cabbage. Solarization will also give control.

![Clubroot on broccoli infected at early seedling stage.](image1)

![Plants infected with clubroot are stunted.](image2)

![Infected plants show significant root clubbing.](image3)
SWEET PEA

Ascochyta blight — Ascochyta spp.

Ascochyta blight is a problem on peas and sweet pea. Symptoms of plants infected with Ascochyta blight, or fungal leaf spot, include irregularly shaped brown or purple blotches on leaves or pods. Black lesions can be found on the stems, which may eventually rot and break. Leaves may shrivel and die. Petals have blackish rot and may extend into the flower stalk.

Solutions

The fungus that causes Ascochyta blight survives in infected plant debris in the soil or on seed. Rain or overhead irrigation leads to rapid spread. Plant on raised beds so that the soil has good drainage. Limit the use of overhead sprinklers. Keep flowers and foliage dry and humidity low. Pull up and destroy infected plants as soon as you notice them to prevent spread in the field. Use pathogen-free seed and plants and rotate out of peas.
VARIOUS FLOWERS

Armillaria root rot (Oak root fungus) — Armillaria mellea

Armillaria root rot, also known as oak root fungus disease or shoestring disease, affects mostly woody plants but also affects certain herbaceous perennials, such as begonia, carnation, daffodil, dahlia, geranium, and peony. Armillaria infects and kills cambial tissue, causing major roots and the trunk near the ground to die.

Identification

The first aboveground symptoms are often undersized, discolored, and prematurely dropping leaves. Branches die, often beginning near the tops of plants; on herbaceous hosts, stems become discolored and cankered. Eventually the entire plant can be killed. Armillaria forms characteristic white mycelial plaques that have a mushroomlike odor when fresh. Mycelia grow between the bark and wood on woody hosts and can grow through soft plant tissue and appear on the surface, especially with herbaceous hosts. Clusters of mushrooms may form at the base of infected woody plants. Black or dark reddish brown rootlike structures (rhizomorphs) are frequently attached to the surface of roots or the root crown.

Dematophora root rot also causes white growths that may be confused with Armillaria, but Dematophora tends to occur in smaller patches and grows throughout the wood rather than just under the bark.

Life cycle

Armillaria thrives under moist conditions, for example when irrigated turf is planted around the roots of California native oaks. Plants become infected through root contact with infected plants or rhizomorphs attached to infected roots. Armillaria root rot can develop slowly, and symptoms may not appear until the fungus is well established. The fungus can survive for many years in dead or living tree roots.

Solutions

Preventing infection of new plants and planting resistant species are the only effective controls for Armillaria. Prepare the site well. Remove old roots and debris from the soil before planting. Use pathogen-free plants and air-dry soil well before planting. Provide plants with appropriate cultural care, especially proper irrigation, and adequate drainage.
Above ground symptoms of oak root fungus

Mushrooms at base of infected tree

Mycelial fans between bark and wood
VARIOUS FLOWERS

Bacterial soft rots, leaf spots, blights, wilts—Erwinia, Pseudomonas, Xanthomonas spp.

Bacterial soft rots affect many plants including begonia, carnation, daffodil, geranium, impatiens, and zinnia. Soft rot bacteria cause infected tissue to turn brown, become mushy, and develop an unpleasant odor. Stem tissue turns brown and deteriorates near the soil. Plants grow slowly and seedlings collapse. Bacterial spots often start out as tiny water-soaked areas on leaves, stems, or blossoms. Spots or blotches turn dark gray or blackish as they enlarge and sometimes have yellow borders. Initial spots are circular but may become angular and coalesce and cause plant tissue death or necrosis. Cankers may form on stems. Under wet conditions, infected tissue may exude brownish masses of bacteria. Dead tissue may tear out, leaving holes and a ragged appearance.

Pathogens causing spots, blights, and soft rots can also cause vascular wilt if the infecting bacteria become systemic. Aboveground plant parts yellow, droop, wilt, and die.

Solutions

Use disease-free cuttings, corms, and other stock. Avoid planting too deeply. Provide good drainage. Do not overwater and avoid overhead irrigation. Keep foliage dry and provide good air circulation. Don’t crowd plantings. Bacteria commonly infect through wounds, so avoid injuring plants. Use good sanitation. Regularly inspect plants for disease and remove infected plants immediately. Some cultivars are more susceptible to infections than others. Seek information on resistant cultivars and consider planting them.

Wilted lilac leaves and blossoms caused by Pseudomonas bacterial blight
Botrytis blight—*Botrytis cinerea*

Botrytis blight is a fungus that causes flowers to become spotted or discolored. Buds may rot. Leaves and shoots discolor, wilt, decay, and drop. Gray brown spore masses are diagnostic. Twigs may die back. Flower buds may fail to open. The fungus that causes Botrytis blight is favored by high humidity.

**Solutions**

Remove and dispose of fallen leaves and debris around plants. Prune out dying tissue. Avoid overhead watering. Thin the plant canopy to improve air circulation. Provide proper cultural care.
Crown gall—
*Agrobacterium tumefaciens*

Crown gall hosts include chrysanthemum, dahlia, geranium, marigold, peony, and snapdragon. The crown gall bacterium causes distorted growths or galls, principally on the basal stem and root crown at the soil line or just below the soil surface. Galls sometimes also form on roots, limbs, and trunks of many species of woody plants. Under moist conditions, galls may appear on upper stems or even leaves of some plants. Infected plants may become distorted, grow slowly, and become stressed and susceptible to drought or other problems. Foliage may be chlorotic and leaves may be small.

**Solutions**

Sanitation is the most important management strategy for crown gall. Clean tools, containers, and work surfaces frequently and treat them with a commercial disinfectant. Use only high-quality plants. Avoid injuring
plants, especially around the soil level and when plants are wet. Dig out and destroy infected plants. In hot areas, solarizing the soil before planting can reduce crown gall bacteria in the soil. Infection may be prevented by dipping cuttings in *Agrobacterium tumefaciens* K-84, a biological control agent that produces an antibiotic that reduces or eliminates infection.

**Downy mildew—*Plasmopara (=*Peronospora) spp.***

Downy mildew causes problems on various plants including alyssum, carnation, pansy, poppy, snapdragon, sunflower, and sweet pea. Downy mildew causes soft and fluffy gray, purplish, or light brown sporulation on the underside of leaves and sometimes on stems or buds. Pale yellow areas or irregular purplish red to dark brown necrotic lesions are sometimes visible on the upper surface of infected leaves.

**Solutions**

Provide good air circulation and maintain low humidity. Avoid wetting foliage; use drip instead of overhead irrigation where feasible. Dig out infected plants as soon as possible to reduce the spread of disease. Several fungicides can prevent infection of healthy tissue, and fungicide use may be necessary to prevent damage to susceptible plants if conditions are good for disease development.
Yellow blotches on upper surface of leaf

Grayish patches of powdery growth on the underside of a leaf

Fasciation

Fasciation affects many plants, including alyssum, aster, carnation, chrysanthemum, geranium, impatiens, Marguerite daisy, nasturtium, petunia, and primrose. Fasciation is an abnormal flattening of stems, often appearing as if several adjoining stems have fused. Fasciated plants have short, swollen clumps of distorted shoots. Leaves growing from distorted stems are abnormally abundant and undersized. Distortion often develops
at the plant base, and crowns may appear galled. Sometimes only new terminal growth is affected. The cause of most fasciations is not understood. Some may be genetic and others may be caused by bacterial or viral infections. Fasciation bacteria survive on infected plants and debris. They spread in water and through wounds.

**Solutions**

Control bacterial fasciation primarily through good sanitation and use of pathogen-free plants. Avoid injuring the base of plants, especially when plants are wet. Keep the base of plants dry. To control fasciation to all potential causes, do not propagate or graft symptomatic plants. Remove and dispose of infected plants, or prune and dispose of distorted tissue and do not propagate from those plants.

**Fusarium wilt—**

*Fusarium oxysporum*

Fusarium wilt affects relatively few woody ornamental species but can kill certain hosts, including albizia, date, palm, hebe, and pyracantha. Most forms of *Fusarium oxysporum* attack only herbaceous plants including aster, camation, chrysanthemum, dahlia, and freesia. Fusarium wilt causes foliage to yellow, curve, wilt, then turn brown and die. Fusarium wilt symptoms often appear first on one side of a plant. Older leaves usually die first in infected plants, commonly followed by death of the entire plant. Plants infected when they...
are young often die. Cutting into infected wood may reveal that vascular tissue has turned brown, often all the way from the shoot to the soil line. Cross-sections of basal stems may reveal brown rings. Masses of spore-bearing stalks are sometimes visible on dead tissue and may look like small pink cushions.

**Solutions**

Fusarium wilt results from infection through roots by hyphae that germinate from long-lasting survival structures in the soil. Plant with species from different genera rather than with plants previously infected there by *Fusarium*. Choose resistant cultivars if available. For herbaceous species, plant on raised beds. Provide proper sanitation and cultural care to reduce plant susceptibility to infection and damage. Avoid overwatering and provide good drainage. Avoid applying excessive fertilizer. Chronic branch dieback may develop in surviving trees; prune out any dead wood. Regularly inspect for possible hazards; affected trees may need to be removed. Soil solarization before planting may be effective.

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**Solutions**

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**Root, stem, and crown rots—*Fusarium, Pythium, Phytophthora, and Rhizoctonia* spp.**

*Fusarium, Pythium, Phytophthora,* and *Rhizoctonia* species are common fungi that infect roots and crowns of plants. Virtually all flowers are susceptible to attack by one or more of these pathogens. Dull-colored foliage or wilting followed by yellowing of plants are often the first aboveground symptoms of root and crown disease. Plants may be stunted and can eventually die. Infected roots and stems often are dark, soft, decayed, break off easily, or have brownish tips. Seedlings don’t emerge. Seeds rot in soil.

**Solutions**

Good cultural practices and sanitation are critical control measures for all root and crown rots. Avoid excess moisture in the root zone and minimize other plant stresses. Use only pathogen-free plants or bulbs. Plant in well-drained soil or use raised beds. Don’t plant too deep. Avoid overwatering. Dig out and destroy infected plants.

For more information, see the Phytophthora Root and Crown Rot or Damping-off Diseases in the Garden Pest Notes.
Fungal root decay on lisianthus roots

Root rot causing foliage dieback on gerbera daisies
**Verticillium wilt—**
*Verticillium dahliae* and *V. albo-atrum*

Verticillium wilt affects many herbaceous plants, including dahlia, gerbera, marigold, peony, snapdragon, and vinca. Leaves infected with *Verticillium* wilt and turn yellow, first at the margins and between veins; foliage then turns tan or brown and dies, progressing upwards from the base to the tip of the plant or branch. Browning of older leaves while younger leaves remain green is also characteristic. Woody plants are often affected first on one side of the plant or only in scattered portions of the canopy. Water-conducting tissue in branches and stems may darken in some hosts. Infection usually occurs during cool conditions but damage may not become apparent until warm weather when plants are more stressed.

**Solutions**

Sanitation and resistant plants are the primary strategies for managing Verticillium wilt. Plant only pathogen-free plants. Avoid planting susceptible cultivars. Plant in disease-free soil. Solarization can reduce *Verticillium* fungi in the upper few inches of soil. Keep plants vigorous by providing proper cultural care.
Viruses

Most flowers are susceptible to infection by one or more plant viruses. Viruses can slow plant growth and change the appearance of foliage, flowers, and fruits. Virus-infected leaves can become spotted, streaked, mottled, distorted, or stunted. Veins may lose their color or develop outgrowths. Flowers can be dwarfed, deformed, streaked, or faded, or they can remain green or develop into leaflike structures. Viruses usually infect through a wound. Many are transmitted by invertebrates, such as aphids and thrips, that feed on plant juices. Mites, nematodes and fungi can also transmit viruses. Viruses can spread in vegetative plant parts, such as cuttings from infected stock plants and in bulbs, corms, and rhizomes.

Identification

Solutions

Viruses rarely kill woody plants, but can dramatically alter plant appearance, reducing the value. Herbaceous ornamentals and certain vegetables are generally more susceptible to serious injury or death from viruses, especially when plants are young. Most plants infected with a virus cannot be cured. Dig out and destroy virus-infected plants. Prevent spreading viruses by using good sanitation and cultural practices. Control nearby weeds that serve as reservoirs for viruses and insects. Use only virus-free plant material and consider growing virus-resistant cultivars if available.