Damping-Off (Transplant Production)

SEVERITY: moderate

OTHER HOSTS: all vegetable crops

GENERAL INFO: Damping-off is caused by several soilborne fungi including Pythium, Rhizoctonia, Fusarium, and Phytophthora species. The fungi infect and kill the roots of germinating and established seedlings. They can survive in plant debris in greenhouses, reused seed trays, benches, and outdoor soils. Outbreaks of damping-off can occur when seedlings are kept overly wet. In wet conditions, damping-off pathogens produce spores that migrate to seed trays through openings in the tray bottom. Once symptoms are visible on seedlings in a tray, neighboring seedlings are likely infected as well.

SYMPTOMS:
- Seedlings shrivel and collapse at the stem.
- Failed germination.

MANAGEMENT: Sterilize pots and trays by soaking in a 10–15% bleach solution or quaternary ammonium chloride salt products. Disinfect greenhouse benches and other supplies. If infections do occur, seedlings should be disposed of along with the potting mix as they may harbor the soilborne fungi.

Gray Mold

SEVERITY: low to moderate

OTHER HOSTS: strawberries, and other greenhouse crops

GENERAL INFO: Gray mold is caused by the fungus Botrytis cinerea. The fungus overwinters on crop debris. Under the right conditions (cool and humid), it will cause infection of all plant parts and produce thousands of spores that initiate new infections. It is most prevalent in high tunnels, cool greenhouses, and tightly packed fields. Plants are most susceptible if they are damaged or have senescing tissue.

SYMPTOMS:
- Soft, wet rot on foliage.
- Collapsed plant.

MANAGEMENT: Remove infected plants immediately from the area. Avoid injury to the plant tissue. Limit overhead irrigation so plant leaves do not remain wet. Use fans inside greenhouses to reduce humidity. Consider fungicides labeled for gray mold on leafy greens.
Beet Curly Top Virus

SEVERITY: low to moderate

OTHER HOSTS: beet, cucurbit, pepper, potato, spinach, Swiss chard, Kochia, lambsquarters, mustards, and pigweed

GENERAL INFO: Beet curly top virus is vectored by the beet leafhopper (Circulifer tenellus). The disease is a concern during spring and summer. Beet leafhoppers acquire the virus when feeding on infected weeds or other plants and transmit it when feeding on healthy plants. The virus overwinters in living host plants. The severity of symptoms can vary from plant to plant, and outbreaks vary from year to year.

SYMPTOMS:
• Stunted growth.
• Yellow/wrinkled foliage.

MANAGEMENT: There are no chemical control options for beet curly top virus, and insecticide applications directed at beet leafhoppers are ineffective. Exclude leafhoppers with floating row covers. Remove infected plants immediately upon detection.

Leaf Spots

SEVERITY: low to moderate

GENERAL INFO: Leaf spots on spinach and chard are caused by the seed-borne pathogens Stemphylium botryosum f. sp. spinacia and Cladosporium variabile. Spores can also spread by wind and rain during cool temperatures (<65°F). Leaf spots on spinach, beet, and chard may also be caused by Ceratospore beticola which overwinters on infected residue, weeds, and seed. It is primarily spread during high humidity when temperatures are greater than 75°F.

SYMPTOMS:
• Tan/olive colored spots with water-soaked borders (Stemphylium).
• Tan/olive colored spots with distinct borders. Spots eventually merge with visible fungal growth (Cladosporium).
• Distinct spots with dark purple to tan colored borders. Spots eventually merge with visible fungal growth (Cercospora).

MANAGEMENT: Till or remove infected crop residue at the end of the season. Source certified disease-free seed. Rotate to non-host crops (outside of the Chenopodium family) for 2-3 seasons. Use drip irrigation to prevent humidity and moisture on foliage.

Drop

SEVERITY: low

OTHER HOSTS: legumes, cabbage, celery, melon, squash, tomato, cucumber, and sunflower

GENERAL INFO: Drop is caused by the fungal pathogen Sclerotinia sclerotiorum. Infected foliage forms a watery, soft rot and causes leaf drop. The pathogen overwinters as survival structures (sclerotia) in the soil for up to 3 years. It spreads by wind-driven spores in cool, moist conditions, and wet soil.

SYMPTOMS:
• Mass of bright white mycelium near the base of the plant.
• Wet rot near plant base causing the plant to “drop.”
• Formation of black sclerotia at the base of the plant.

MANAGEMENT: Deep-plow to keep the sclerotia away from the soil surface. Rotate crops with non-hosts. Use drip irrigation. Consider a fungicide such as boscalid, iprodione, or various organic options.
**Leafminers**

**SEVERITY:** high  
**OTHER HOSTS:** various vegetables, ornamentals, and weeds  
**GENERAL INFO:** Adult flies range in color from black to gray; some bear yellow markings. Eggs are oblong and white in color. Larvae (maggots) are a cream-yellow color. Leafminer species have several generations per season and overwinter as pupae. They emerge in early to mid spring and larvae feed and tunnel between the upper and lower leaf surfaces creating “mines” or blisters.  
**SYMPTOMS:**  
- Mines are initially opaque, eventually turning brown with age.  
**MANAGEMENT:** Use a row cover over leafy greens to physically exclude adult flies from laying eggs. Rotate crops with non-leafy greens. Cultivate soil after harvest to disrupt the overwintering pupae stage. Remove any infested leaves. Pesticides are not recommended as the larvae are protected between the leaf layers.

---

**Slugs/Snails**

**SEVERITY:** high  
**OTHER HOSTS:** most vegetables and ornamental landscape plants  
**GENERAL INFO:** Slugs and snails have similar characteristics except snails have an external, spiral shell. Both glide with a long, flat, muscular organ called a foot. Mucus or slime secreted by the foot aids in locomotion and dries to form a shiny white silvery trail, indicating that the pests are present. Both snails and slugs are hermaphrodites, meaning they have both male and female organs. All are capable of self-fertilization.  
**SYMPTOMS:**  
- Irregular holes that have smooth edges on foliage.  
**MANAGEMENT:** Limit damp, protected areas in landscapes. Consider using drip irrigation to limit excess moisture. Set up copper-based barriers around leafy greens to deter slugs and snails. Strategically-placed trap and bait stations with iron phosphate or metaldehyde products are highly effective.

---

**Flea Beetles**

**SEVERITY:** moderate  
**OTHER HOSTS:** cole crops, solanaceous crops, cucurbits, and weeds  
**GENERAL INFO:** Adults have metallic bodies that range in color from black, bronze, blue, brown, or gray, with stripes in some species. Larvae are small, white, and worm-like with a brown head. Most flea beetles overwinter as adults in protected places. Adults become active mid to late spring when host plants become available. When disturbed, adults will use their large hind legs to jump.  
**SYMPTOMS:**  
- Chewed holes or “pits” in leaves and cotyledons.  
**MANAGEMENT:** Keep leafy green production areas weed-free. Consider planting a trap crop (mustard) on field edges. Use a row cover during seedling establishment to exclude flea beetles. Eliminate old crop debris and other surface trash. Flea beetles are highly mobile, so insecticides are ineffective.
Aphids

SEVERITY: moderate

OTHER HOSTS: most vegetable crops, fruit, ornamentals, and weeds

GENERAL INFO: Aphids are small, soft-bodied, pear-shaped insects with two tailpipe-like appendages. Common species that attack leafy greens include cabbage aphid, green peach aphid, potato aphid, melon aphid, black bean aphid, mustard (turnip) aphid, currant-lettuce aphid, and poplar-lettuce gall aphid. They overwinter as eggs on woody hosts and after hatching, feed for several weeks on the succulent new growth before migrating to vegetables. Some aphids may overwinter as adults in greenhouses or high tunnels and become a concern throughout the growing season.

SYMPTOMS:
- Stunted, yellow, and distorted plant structures.
- Presence of sticky honeydew (secreted by aphids).
- The presence of white “casted” aphid skins.

MANAGEMENT: Scout for aphid signs and symptoms frequently. Remove nearby weeds that can serve as an alternate host. Encourage natural aphid predators in your garden by planting attractive flowers and other plants. Organic insecticides such as neem oil, pyrethrins, or insecticidal soap must contact the aphids to work.

Armyworms

SEVERITY: low to moderate

OTHER HOSTS: most vegetable crops, ornamentals, and weeds

GENERAL INFO: There are several species of armyworms present in Utah. Adult moths are mottled gray and brown with light-colored markings. Larvae vary in color from tan, green, to almost black. They are typically a concern from mid-July through September and have one to three generations per growing season. Eggs are laid on leaves, larvae disperse and feed on foliage and fruit, and mature larvae pupate in the soil.

SYMPTOMS:
- Irregular holes in foliage or fruit.
- Skeletonized or shredded foliage.
- Complete defoliation.

MANAGEMENT: Keep garden areas weed-free. Consider tilling soil in the fall to disrupt the overwintering pupal stage. Organic insecticides with active ingredients Bacillus thuringiensis or spinosad are effective on young larvae.

REFERENCES & FURTHER READING


Precautionary Statement: Utah State University Extension and its employees are not responsible for the use, misuse, or damage caused by application or misapplication of products or information mentioned in this document. All pesticides are labeled with ingredients, instructions, and risks. The pesticide applicator is legally responsible for proper use. USU makes no endorsement of the products listed herein.

In its programs and activities, including in admissions and employment, Utah State University does not discriminate or tolerate discrimination, including harassment, based on race, color, religion, sex, national origin, age, genetic information, sexual orientation, gender identity or expression, disability, status as a protected veteran, or any other status protected by University policy, Title IX, or any other federal, state, or local law. The following individuals have been designated to handle inquiries regarding the application of Title IX and its implementing regulations and/or USU’s non-discrimination policies: Executive Director of the Office of Equity, Alison Adams-Perlac, alison.adams-perlac@usu.edu, Title IX Coordinator, Hilary Renshaw, hilary.renshaw@usu.edu, Old Main Rm. 161, 435-797-1266. For further information regarding non-discrimination, please visit equity.usu.edu or contact: U.S. Department of Education, Office of Assistant Secretary for Civil Rights, 800-421-3481, ocr@ed.gov or U.S. Department of Education, Denver Regional Office, 303-844-5695 ocr.denver@ed.gov. Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.