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Sunflower diseases

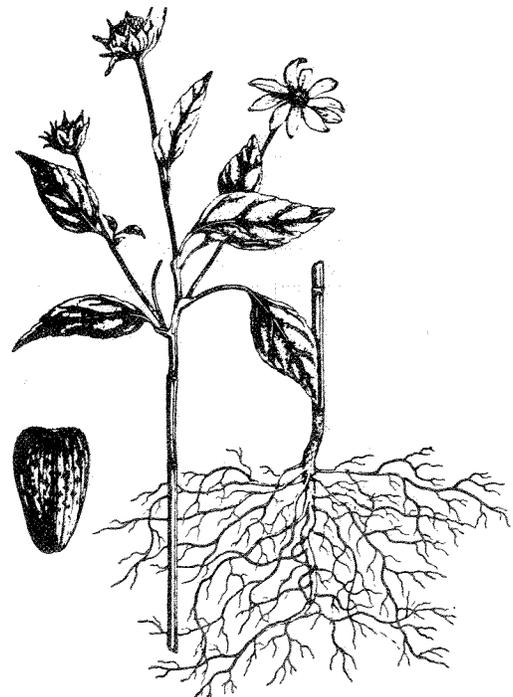
¹Howard F. Schwartz

Quick Facts

Disease problems in Colorado can occur from alternaria leaf and stem spot, phoma black stem, rhizopus head rot, sclerotinia (in irrigated production), seedling blights and verticillium wilt.

Other problems can establish over time and include charcoal rot, rust, bacterial and virus diseases.

Sunflower disease management strategies rely on crop rotation, debris and volunteer sunflower sanitation, wild sunflower and other weed control, planting clean seed, seed treatment, appropriate planting dates, minimal moisture and fertility stress or excess, recommended plant stands, chemical sprays and varietal selection.



Oilseed and confectionery sunflowers (*Helianthus annuus*) are grown in many parts of eastern Colorado and western Kansas. The crop's productivity primarily depends on adequate environmental conditions and minimal stress from insects and birds. Diseases have not been a serious problem yet due to the relatively recent introduction of sunflowers into isolated regions, and its production under dryland (rainfed) conditions. However, diseases may become more serious as sunflower acreage expands and the crop is repeatedly grown on individual farms.

Fungal Diseases

Various fungal pathogens can cause trace to serious (25 percent or more) crop losses by infecting roots, stems, foliage, heads and seeds of sunflowers during favorable environmental conditions. *Alternaria* leaf and stem spot, powdery mildew, rhizopus head rot, sclerotinia head rot and wilt (under irrigation), seedling blight, and verticillium wilt have been detected in Colorado. Other diseases are included in this section because of their potential threat to the crop. Clean seed, crop rotation (with cereals) for at

least three to five years, sanitation or previously-infested debris and volunteer or wild sunflowers, and selection of varieties with proven performance and disease resistance are highly recommended practices to manage all diseases (see Table 1).

Alternaria leaf and stem spot (*Alternaria zinniae*) seldom appears until after flowering. It produces circular, dark-colored, target-like leaf spots. Brown, superficial flecks, streaks or areas also may form on the stem, petiole or back of the head. Severe infection can cause premature defoliation and lodging. The pathogen can be seed-borne, and is favored by high humidity and warm temperature. Foliar sprays with products such as maneb, zineb, captafol and chlorothalonil control the pathogen, but are not labeled yet in Colorado.

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Charcoal rot (*Macrophomina phaseoli*) appears after flowering as a wilt, decay and lodging of the stem. Stems are gray and shredded at the base with only the vascular bundles or fibers remaining. Small black sclerotia (size of pepper grains) may cover infected tissue. Plants may ripen prematurely and have poorly filled heads. The pathogen has a wide host range (corn, sorghum, soybeans) and can be seed-borne. It is favored by high soil temperature, high fertility, moisture stress and high salt concentration. Late planting (or moderate to late maturing varieties) may reduce high temperature and moisture stress during flowering.

Downy mildew (*Plasmopara halstedii*) can cause seedling blight and damping off, or light green to yellow, angular spots that spread from leaf midribs. As infected plants continue to grow, leaves become wrinkled and distorted, basal root or stem galls may form, and the entire plant may be stunted. A downy, whitish fungal growth may develop on the lower surface of leaves during wet weather. Systemically infected plants may produce normal sized heads that remain upright and contain mostly empty seeds. The fungus can survive in soil, debris and seed. Infection is favored by wet weather in the spring, and seedlings become increasingly resistant with age. Late planting may assure rapid germination after the soil temperature warms up. Metalaxyl seed treatment is effective, but not labeled yet in Colorado.

Phoma black stem (*Phoma oleracea* var. *helianthi-tuberosi*) usually appears after flowering as brown to black lesions on the stem near the base of leaf petioles. Dark, irregularly-shaped spots may occur as leaf petioles, leaves, flower bracts and the back of flower heads. Leaves may be killed if infected early. Small, black, pimple-like fungus structures (pycnidia) may be observed in infected tissue with a hand lens. Infected plants may lodge, and produce small heads with little seed. The fungus can survive in infected residue, is favored by wet weather, and spores can be spread by splashing water and feeding insects.

Powdery mildew (*Erysiphe cichoracearum*) is seldom serious since it usually does not occur until after full bloom on lower leaves. It appears as white powdery areas (fungal mycelium and spores) on the upper surface of leaves, and eventually all above-ground plant parts. Infected tissue later turns gray or yellow, and may dry out. The fungus can survive in infected residue, and spores are wind-blown.

Rhizopus head rot (*Rhizopus* species) causes head tissue to turn brown, soft and mushy. During wet weather, coarse thread-like strands of the fungus may be evident on infected tissue. Infected seeds have lower germination and upon drying, heads appear to shred. Infection after flowering is favored by warm, wet weather and head damage from birds, hail or insects such as

the sunflower moth. Chemicals, such as dichloran and copper, applied to heads at the end of flowering can reduce infection, but are not labeled yet in Colorado.

Rust (*Puccinia helianthi*) initially appears as small, yellow to orange spots (pycnial and aecial spore stages); and later develops into numerous, dark brown (uredial stage) to black (telial stage) powdery pustules on leaves. Lower leaves are affected first, and severe infection may cause them to dry out. Pustules also may develop on stems, petioles, bracts and the back of heads. The fungus can produce a new cycle of uredia every seven to 10 days during periods of high humidity and cool to moderate temperature. Fungicides such as sulfur, maneb and zineb can control the pathogen, but are not labeled yet in Colorado.

Sclerotinia head rot and wilt (*Sclerotinia sclerotiorum*) may appear as a watersoaked, gray to brown, canker on the lower stem or upper root system. Infected areas become shredded and break at the soil line or cause plant wilting. White fungal mycelium and large, black sclerotia form in and on infected tissue. Windblown spores also may infect upper stem areas and heads, and cause a partial to complete rot with shredded remnants of vascular bundles and fibers. Infection is favored by irrigation or frequent rainfall after flowering, high plant density, high fertility, and other susceptible hosts (dry beans, soybeans, safflower, vegetable crops). Fungicides such as benomyl and thiophanate methyl can reduce disease outbreaks when applied at budding and early flowering, but are not labeled yet in Colorado.

Seedling blight and seed rot (*Fusarium*, *Rhizoctonia*, *Pythium* and *Rhizopus* species) can occur from seed or soil-borne organisms which kill seedlings before or after emergence. Roots and stems rot, plants wilt and die, and stands are reduced. Clean seed and treatments with fungicides such as thiram are recommended in Colorado.

Verticillium leaf mottle and wilt (*Verticillium dahliae*) is most obvious at flowering when infected plants occur singly or in groups. Symptoms appear first on lower leaves and gradually progress upwards. Tissue between leaf veins becomes yellow then brown, giving the leaf a mottled appearance. Black areas may occur on the tap root or stem, particularly near the soil line. A cross section of vascular tissue is brown to black, and severely infected plants are stunted, ripen prematurely or die. The fungus may be seed-borne or survive in the soil up to 12 years. Infection is favored by mechanical damage (root pruning) during tillage operations.

Many other fungi are reported to be pathogens of sunflowers in other regions of North America or the world (see references).

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Other Diseases

Other types of organisms (bacteria, mycoplasma-like, viruses and nematodes) also can be pathogens of sunflowers. They are not known to exist in Colorado yet, but producers and operators should be aware of them.

Bacterial diseases consist of: crown gall (*Agrobacterium tumefaciens*), which produces a gall or tumor on the stem or root near the soil line; bacterial soft rot (*Erwinia carotovora* var. *carotovora*), which produces a soft rot of stems, petioles or heads; bacterial wilt (*Pseudomonas solanacearum*), which causes a blackening at the base of stems and a wilt; and angular leaf spot (*Pseudomonas syringae* pv. *helianthi*), which produces small, pale green, water-soaked, angular lesions on leaves, petioles or stems.

Mycoplasma, like organisms, are transmitted by aster or six-spotted leafhoppers (*Macrosteles fascifrons*), and cause flowers to remain green instead of yellow. Small leaves that are larger than normal flowers replace the floral parts in the head. Affected portions eventually turn brown, and this discoloration extends downward as a narrow stripe along the stem. Infected plants may be stunted or lodge, and set seed only on the normal portion of their head.

Various viruses can be transmitted mechanically or by insects, and produce yellow to green mosaics on leaves. Plants may be stunted and form malformed heads with shriveled seed.

Nematodes are not reported to be a problem on sunflowers, but it is a host for *Meloido-gyne javanica*, *Longidorous brevicaudatus* and *Anguina balsamophila*.

Non-Parasitic Diseases

Environmental or physical agents also can damage sunflowers during various stages of plant development and produce symptoms that can be confused with those caused by plant pathogens.

Boron deficiency can appear at any stage of plant development as dark spots on leaf margins. A severe deficiency may cause death of the terminal bud, small and thickly cupped leaves, and plant stunting. Stems may be weak and brittle, and flower heads malformed. Symptoms are more common with moisture stress. To date, boron deficiency symptoms have not been confirmed in Colorado.

Early season cold injury may occur as a light yellow to brown discoloration on upper leaves. Symptoms start from the leaf tip and advance along the margin to the base, and plants generally recover after the weather warms up. Late season frost damage causes wilting, darkening and death of affected tissue.

Herbicide injury can occur from last season's carryover of damaging chemicals (atrazine) or current season drift (2, 4-D and Dicamba). Atrazine damage causes brown to dead margins of leaves followed by plant death if chemical concentrations are high. A 2, 4-D type herbicide would cause leaves to be fan-shaped, thickened or puckered, and have prominent or frilly veins. Flower heads also could be undersized or not set seed. No sunflowers should be planted within one to two years after application of Glean.

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