



# Diseases and Disorders of Potatoes

## in the home garden

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### Introduction

Potatoes are a commonly grown vegetable in many home gardens. The potato originated from the Andes region and is well adapted for growth at higher elevations and potentially harsh climates. It is relatively easy to grow in Wyoming and many of the disease issues that plague potato production in other areas of the country are not a significant problem in Wyoming due to the dry climate. For this reason, Wyoming's small potato industry is focused on seed production, as it's easier to produce seed for the certified market.

However, even in Wyoming, the potato plant and the tuber, are subject to several diseases and environmental disorders. Problems associated with producing potatoes are broken down to environmental disorders (physiological) and some infectious (biotic) diseases that Wyoming gardeners may encounter.

### Environmental disorders affecting potato plants (physiological)

#### Physiological leaf roll

Leaf roll is associated with hot dry weather, rapid growth, certain varieties and other potential unrelated causes. Leaf margins roll inward in an almost tube-like fashion starting with the lower leaves. The affected leaves will be firm and leathery to the touch. The leaves typically do not unroll even if conditions improve. This condition does not seem to affect yield. This can be confused with potato leafroll virus symptoms or psyllid (an insect) infestation. The potato leafroll virus causes the rolled leaves to become brittle with some tissue browning and the plant will "rattle" when shook. If psyllids are suspected, look for the presence of small nymphs (several millimeters in diameter), flattened and pale yellow to green on the underside of the potato leaf.

#### Tip burn

Tip burn is related to excess moisture loss during periods of hot weather, followed by cooler conditions. This can be



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seen at the end of the leaf when the margins turn yellow and then brown.

### Herbicide injury

Potatoes are very sensitive to many of the broadleaf herbicides commonly used by homeowners that include the auxin-type herbicides like 2,4-D. Exposure can be from direct contact from foliar spray and indirectly from herbicide-treated grass clippings when applied around potatoes. Symptoms of auxin herbicide exposure include deformation of leaves and stems. If foliage symptoms are severe, this can result in tuber distortion and cracking.

### Nutrient imbalances

Diagnosis of nutrient balances can only be reliably determined with tissue analysis. Nitrogen deficiency results in plants that turn pale green and chlorotic- pale, yellow or yellow white, with lower leaves most severely affected. On the other end of the spectrum, excess nitrogen can result in delayed tuberization, increased tuber knobiness and excessive top growth. Phosphorus deficient plants are stunted and darker green than normal. Leaflets may develop abnormally, appearing distorted or cupped with some dark discoloration on bottom leaves. Potassium deficiency leaves can be dark green and crinkled. Leaves can become bronzed and under severe deficiency, leaf margins will become necrotic (zones of dead tissue which usually turns brown or black) which spreads leading to leaf death.

## Environmental disorders affecting potato tubers (physiological)

### Enlarged lenticels

Lenticels are the small and usually inconspicuous pores for gas exchange on the tuber surface. Under conditions of excessive soil moisture or very dry compacted soil, tissue beneath these lenticels swell then burst resulting in raised corky tissue replacing the damaged tissue. This is mostly a cosmetic issue but can predispose the tuber to decay-causing organisms. To manage, avoid overwatering especially toward the end of the growing season.

### Sunscald and tuber greening

Both disorders are associated with exposing developing tubers to excessive sun. Tubers can develop a blistered

and metallic appearance under frequent or prolonged exposure to intense sunlight and temperature. In contrast, even low light exposure on tubers can stimulate chlorophyll production causing a condition called tuber greening. The alkaloid compounds associated with tuber greening can be mildly toxic to humans. To manage, maintain soil coverage over developing tubers. At harvest avoid long-term exposure of tubers to light.

### Hollow heart

Hollow heart is a risk when growing conditions fluctuate rapidly during tuber development. This disorder is not apparent until the potato is cut open, revealing a hollow area in the center or stem-end center of the potato. Brown discoloration may or may not be present. Environmental conditions like inconsistent watering, large fertilizer applications, highly variable soil temperatures or prolonged cloudy weather followed by sunny conditions can increase the likelihood that hollow heart will develop. Hollow heart can be difficult to prevent but consistent watering and fertility can reduce occurrences.

### Tuber surface injuries

Tuber surfaces can suffer damage due to improper handling of tubers during harvest. Injuries can be skin abrasions, thumbnail cracks or larger cracking that can happen with rough handling of tubers. To alleviate this problem, harvest tubers that have had time for proper skin development (skin-set) and careful handling of tubers at harvest.

## Infectious diseases of potato

### Sprout and seed tuber diseases

Seed tubers are susceptible to fungal and bacterial diseases, which can affect the seed's ability to produce a viable plant. Use certified disease-free seed and select seed tubers that are free of surface defects and have firm (not rotted) tuber flesh.

### Whole plant and root diseases

**Early blight** is a foliar fungal pathogen that causes symptoms of prominent brown to black lesions, which sometimes resemble target-like spots on the leaf. This disease initiates later in the season and on older leaves. Lesions will move up the plant if the disease worsens.

Good control measures include removal of fallen, diseased leaves, avoid wetting leaves during watering, no dense plantings and not planting potatoes in the same space next year. Use of protective fungicides at disease initiation can be effective.

**Fusarium** and **Verticillium** are soil-borne fungal pathogens that attack the plant vascular system (carries water and minerals up from roots to leaves). The lower leaves will yellow and drop causing the plant to wilt and eventually lead to early plant death. A diagnostic test inspects an angular-cut stem. Diseased plants will have a dark discoloration of the vascular system instead of a nice, healthy, green color. Once these fungi enter the vascular system, little can be done. Remove affected plants and avoid planting back to potatoes in that space for at least three years.

**Rhizoctonia stem canker** is a disease caused by the soil-borne fungal pathogen *Rhizoctonia solani*. Disease symptoms can be found on all underground parts of the potato during the growing season. Most prominent are reddish brown to black lesions on shoots and roots. Lesions are often sunken and can enlarge to girdle the affected plant part. Rhizoctonia can be seed-borne (refer to black scurf tuber disease below) so plant disease-free seed tubers. Because Rhizoctonia can survive in plant debris and soil, crop rotation may have limited impact. Rhizoctonia development can be sensitive to temperature so planting too early in cool wet soils can increase disease severity.

Several **viruses** can infect potatoes in Wyoming including, but not limited to, curly top virus, potato virus Y (PVY), tomato mosaic virus and leafroll virus. Symptoms of virus infections include leaf mosaic (alternating areas of light- or dark-green or yellow areas), yellowing, necrosis, malformation (leaf rolling, puckering and twisting), stiff stems and leaves and stunting. Insects like leafhoppers and aphids spread these viruses and can survive in the absence of potato on common weeds and some agronomic and horticultural crops (like tomatoes). The most effective management strategy is with resistant varieties. Little can be done once a plant is infected, so it is best to remove the plant to prevent further spread.

Conclusive diagnosis requires a lab analysis, which costs more than the plant is worth.

### Tuber diseases

**Common scab** is caused by a soil-borne bacterium and can be problematic in Wyoming's high pH soils. Symptoms are characterized by brown tuber skin lesions at harvest that are roughened, raised or sunken, usually 5-10 cm in diameter but can combine to cover large areas of the tuber. Yields and taste are not affected but tuber quality, storability and marketability are negatively impacted. This disease can be difficult to manage once established. Avoid planting scabby seed tubers, plant less susceptible varieties like Russet Norkotah, Norland or Superior and maintain high soil moisture for 4-6 weeks starting at tuber initiation. A 3-4 year rotation out of potato can reduce inoculum. Avoid rotations with beets, radishes, carrots and parsnips as these can serve as hosts. Refrain from using barnyard manure soil amendments as this has been found to harbor the bacterium.

**Black scurf**, also caused by *Rhizoctonia solani*, is characterized by little brown-black, hard masses evident on the tuber surface at seasons end. These fungal resting bodies (sclerotia) are superficial and don't wash off but don't damage the tuber, even in storage. To manage, start with disease-free seed tubers and avoid leaving the tubers in the ground for prolonged periods after skin-set.

### General disease management tips

Preventing diseases and disorders is the best management step a home gardener can take. Since the seed tubers can carry many diseases, using certified seed is the best initial step in managing disease. Saving last year's tubers or your neighbors, can initiate problems if disease was present in the previous crop.

Prior to planting, warm seed pieces at room temperature for about a week or until the eyes start to sprout. When cutting whole seed, sterilize the knife or tool between tubers with alcohol or a 10 percent bleach solution. Allow these cut tubers to heal (suberize) for several days prior to planting. Plant tubers in moist soil that is at least 50° F at a depth of 3-4 inches. As the plant develops, "hill" soil

at the base to maintain proper soil coverage of developing tubers. Plants should be spaced at 12 inches within the row with 2-3 ft. row spacing. Avoid planting potatoes near tomatoes since they share many of the same diseases. Remove plants from the garden completely as they become diseased and remove all plant debris after harvest.

The best time to harvest tubers is after skin-set to avoid tuber injury and post-harvest disease. This involves waiting two weeks after vine death before digging potatoes. Vine death can be natural or by removing the vines, for proper skin-set to occur. Periods longer than two weeks can increase chances of black scurf forming. Carefully harvest tubers to avoid injury and store at 60-70° F to heal wounds for two weeks then store tubers long term at 35-40° F. Monitor tubers for both wet rot and dry rot decay, which when detected should be removed from the others to prevent disease spread.



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