

Study Of Sunflower Plant-Seed Germination And Seedling Disease Due To Storage Fungi And Cause And It's Diagnosis

Dr. Raman Kumar*
Asst. Professor *,Department of Botany*
R.P.M Degree College Tuniyahee Madhepur*
B.N.M University*,Laloo Nagar,Madhepur*

ABSTRACT

*Damping-off is a disease that leads to the decay of germinating seeds and young seedlings, which represents for farmers one of the most important yield constraints both in nurseries and fields. As for other biotic stresses, conventional fungicides are widely used to manage this disease, with two major consequences. On the one hand, fungicide overuse threatens the human health and causes ecological concerns. On the other hand, this practice has led to the emergence of pesticide-resistant microorganisms in the environment. Sunflower (*Helianthus annuus* L.) has become a popular cut flower in the United States and globally. Easy to grow, bright and cheerful large flowers, with ray flowers from white to yellow to orange to magenta, it is often a centerpiece in mixed bouquets. Sunflower and the rest of the *Helianthus* genus are native to North America, and, as such, there is a native population of disease organisms and insect pests that can be a production challenge. Fortunately, ornamental sunflower and oilseed sunflower are the same species, and thus genetic advances made with oilseed germplasm can be readily transferred to ornamentals, if the need arises. The major diseases posing threats to ornamental sunflower are the same as those threatening oilseed sunflower hybrids, namely downy mildew, rust, *Phomopsis* stem canker, *Sclerotinia* wilt, *Verticillium* wilt, and charcoal rot. However, greenhouse production presents a different environment, and thus, there can be diseases affecting cut sunflowers that are seldom seen under field production. General management strategies for diseases of florists' crops may be found in the introductory chapters on integrated disease management.*

Keywords: *Damping-off, Fungicides, Sunflowers*

INTRODUCTION

Requirements Sunflowers are generally very easy to grow and thrive in areas with long hot summers which promote flowering. They grow best at temperatures between 21 and 25.5°C (70–78°F). Sunflowers can be very large and require plenty of space although there are some varieties which have been specially bred to be compact for growing in smaller spaces or for growing in containers. Sunflowers will grow in a variety of soils as long as they are not waterlogged and can be grown successfully at a pH ranging from 6.0 to 7.5. A pH above 6.0 is not recommended. They should be grown in an area that receives full sunlight and it is preferable to provide them with some shelter from wind which can damage the stems e.g. along a fence or wall. Sunflowers

originate from the dry prairie regions of North America and are drought resistant once established. Their easy to grow nature makes them ideal plants for growing with children. **Planting** Sunflowers are most easily grown by direct seeding outdoors. In areas with a long growing season, they should be planted in late Spring after all danger of frost and when the soil has warmed through. However, in areas with short growing seasons, the seeds can be planted a week or two before the last frost date as the plants are tolerant to cold. Prepare the soil for planting by digging to loosen the soil and break up any large clumps. Plant seeds 2.5–5.0 cm (1–2 in) deep and space them 10–15 cm (3–4 in) apart. If planting in rows, allow 0.75 m (~30 in) between each one. An application of a balanced fertilizer at planting promotes the development of a strong root system. The seeds should sprout in 7–10 days. When the seedlings are about 15 cm (6 in) tall with two pairs of true leaves, thin the plants to a final within row spacing of 60 cm (2 ft). Sow more seeds every 2–3 weeks for a continuous bloom over the summer. **General care** Although sunflowers are drought resistant, frequent, deep watering promotes the development of a strong root system. The plants do not require fertilizing, indeed, addition of nitrogen promotes vegetative growth and will delay flowering. The stems of the plants can easily reach in excess of 1.8 m (6 ft) in height and will benefit from some support. Bamboo stakes work well. **Harvesting** Sunflowers are ready to harvest when the back of the flowers begin to turn yellow and the flower head droops. Cut the stem about 5 cm (2 in) below the head and hang up to dry in a warm, well ventilated place for several weeks. When the heads are thoroughly dried, remove the seeds with a brush or by hand. Allow the seeds to dry out for a further few days before storing.

COMMON PESTS AND DISEASES

DISEASES

CATEGORY : FUNGAL

Alternaria leaf blight *Alternaria helianthi*



Alternaria lesions on sunflower leaves

Symptoms

Dark brown lesions on leaves surrounded by a yellow halo; lesions coalesce and become irregularly shaped and cause leaves to become blighted; plant becomes defoliated and dies

Cause**Fungus****Comments**

Disease emergence favors hot weather and frequent rainfall; fungus may survive in crop debris or on suitable weed hosts; disease can be transmitted through infested seed

Management

Prune out infected leaves; use adequate plant spacing to reduce humidity around plants and promote good air circulation; disease can be controlled by application of appropriate foliar fungicide

Downy mildew *Plasmopara halstedii*

Symptoms of downy mildew on sunflower foliage



Downy mildew on sunflower leaf

Symptoms

Death of seedlings leading to reduced stand in field; if seedlings survive they may be chlorotic with thickened leaves; white cottony growth is present on leaf undersides; systemic infection causes stunted plant growth and reduced seed production

Cause

Fungus

Comments

Disease emergence favors high humidity; fungus can survive in soil for up to 10 years

Management

Plant sunflower varieties that are resistant to downy mildew; treat seeds with an appropriate fungicide prior to planting; foliar fungicides are ineffective at controlling systemic infections and are not recommended

Phoma blight *Phoma macdonaldii*



Symptoms of Phoma blight of sunflower



Symptoms of Phoma blight of sunflower

Symptoms

Symptoms of the disease develop after flowering; large black lesions appear on stem and coalesce to form large blackened areas; dark colored irregularly shaped lesions appear on leaves and flowers; early infections can cause flowers to die; infected plants die prematurely and produce little seed; disease often affects plants in a circular pattern in the field

Cause

Fungus

Comments

Fungus survives in seeds or sunflower debris in the field; disease emergence favors periods of wet weather during flowering

Management

Rotate crop to a non-host (e.g. small grains) a period of 4 years; plant hybrids which are more tolerant of the disease; control stem weevil populations in sunflower fields

Powdery mildew *Erysiphe cichoracearum***Symptoms**

Powdery white patches which appear initially on lower leaves but which may spread to all above-ground parts of plants; white patches turn gray in color and black fungal fruiting bodies are visible; severely infected leaves may turn yellow and dry up

Cause

Fungus

Comments

Conditions which favor the development of the disease match those that are favorable for the host plant; disease emergence is favored by periods of high humidity where leaves remain dry

Management

Allow adequate spacing between plants to promote good air circulation around foliage; plant sunflowers in an area that receives full sun for most of the day; remove and destroy all sunflower crop debris after harvest; applications of appropriate foliar fungicides can help control the disease but care should be taken as some labels do not allow seeds from treated plants to be used as food or feed

Septoria leaf spot *Septoria helianthi***Symptoms**

Water-soaked circular or angular spots on leaves with a greasy, greenish appearance on lower leaves; lesions are usually gray with a darker margin; some lesions may have a narrow yellow border; tiny black fungal fruiting bodies may be present in the lesions

Cause

Fungus

Comments

Little is known about the survival and spread of the pathogen which causes the disease; spores are believed to be spread by splashing water; disease will develop rapidly during periods of moderate to warm weather with high rainfall

Management

Plant high quality seed which is free of diseases; rotate crop away from sunflower for a period of 3 years, especially if overhead irrigation is used; fungicides are rarely required for the treatment of Septoria leaf spot

Verticillium wilt *Verticillium dahliae*

Verticillium wilt symptoms on sunflower



Sunflowers infected with Verticillium wilt



Sunflowers infected with Verticillium wilt

Symptoms

Lower leaves developing mottled appearance; leaf tissue between veins turns yellow and then brown; infected leaves wilt, dry out and eventually die; stems of plants may become blackened close to the soil line; a cross section of the stem reveals blackened vascular system

Cause

Fungus

Comments

Fungus is soil-borne and enters plants through the roots, invading the vascular system; pathogen can be spread to unfested fields through contaminated irrigation water or movement of infested soils

Management

Plant high quality, disease-free seed; avoid planting sunflowers in fields known to have been infested with *Verticillium* previously; plant resistant sunflower hybrids in areas where disease is known to be problematic

CONCLUSION

*Losses in the field occur at the time of harvesting due to untimely harvest, poor agricultural operations, careless handling, birds, rodents, bad weather conditions like heavy rainfall, hailstorm, etc. During harvesting, proper care should be taken to avoid quantitative and qualitative losses. Following care should be taken during harvesting: Sunflower should be harvested when the plant attains physiological maturity i.e. when the back of the head turns from green to lemon yellow colour and the bottom leaves starts drying and withering. At physiological maturity, the seed attains maximum weight and oil concentration and harvesting at this stage, results in highest seed and oil yield. 10 percent of heads should turn brown and florets attached to the tip of the seeds drop off naturally. Delay in harvesting causes reduction in seed yield due to lodging of plants and more damage due to birds, rodents and termite attack. Harvesting should be done by adopting proper method. Chemical defoliation or, dessication using DIQUAT, magnesium chlorate or, dipyrldyl phosphate should be used to accelerate drying of standing crops. Mechanical thresher should be used to separate seed from flower which is labour saving and economical. Avoid harvesting during adverse weather conditions i.e. rains and overcast weather. Downy mildew is caused by a soil-borne, wind-borne and seed-borne fungi *Plasmopara halstedii*, which can survive in soil for up to 10 years. Under cool, water-saturated soil conditions, the spores germinate upon contact with sunflower roots, entering the seedlings' roots and spread throughout the entire plant. Systemic infection occurs only when the roots are less than 2 inches long when they contact the fungi. Sunflower plants surviving the initial infection will produce white spores on the underside of chlorotic areas on leaves. The white spores are air-borne, and upon landing on sunflower leaves may cause secondary infections; which are most common when sunflower leaves remain wet for prolonged periods of time. Susceptibility to secondary infection is a longer period versus systemic infections via root infection. As infected plants rot and are tilled into the soil, the fungus forms the resting stage which will germinate during favorable conditions in subsequent years and sunflower crops. Harvest timely to reduce losses. Adopt proper method of harvesting. Adopt modern mechanical methods to avoid the losses in threshing and winnowing. Use improved techniques of processing. Adopt the grading to get better price. Use good packaging materials for storage and transportation. Use proper techniques in storage. Moisture content of the seed should be less than 9.5 percent for storage. Adopt proper pest control measures during storage. Adopt timely and proper handling while loading and unloading. Avoid use of hooks during handling.*

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