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Pests & Diseases

www.cannagardening.com

Spider mite

What are spider mites?
Spider mites are not insects and are in fact more closely related to spiders. They belong to a class called *Arachnida*.

What can you see?
Spider mites usually spin a silk webbing. When spider mites infest plant leaves, they damage the plant tissue leaving yellowing and dead spots that coalesce until eventually the entire leaf is affected. The leaf will turn yellow, wilt and finally be shed. There are some varieties of mites that do not spin webs and live in the plants bud terminals, where the damage cannot be seen until the tip expands.

What can you do?
Spider mites have several natural enemies that can be used to control the population.

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Whitefly

What are Whiteflies?
Whiteflies are hemipterous insects belonging to the Aleyrodidae family. They can cause considerable damage and loss of production.

What can you see?
Discolored patches on the parts of the leaf where the insects have been feeding.

What can you do?
One of the main objectives when controlling whitefly is to prevent the crop being infected by a virus that the insects can be carrying.

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Thrips

What are Thrips?
When we use the term thrips, we are referring to a wide group of insects of the order *Thysanoptera*.

What can you see?
Because certain toxic substances are present in the saliva of thrips, you may see some deformations in the shoots or flowers of the affected plants.

What can you do?
Spray plants with ecological insecticides like potassium soap or plant extracts with pyrethrum.

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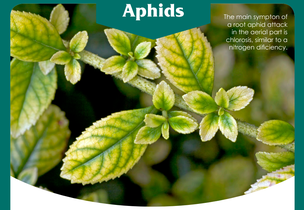
Aphids



The main symptom of a root aphid attack in the aerial part is chlorosis, similar to a nitrogen deficiency.

What are aphids?
When we refer to aphids, or plant lice, we usually mean a super family of insects which includes over 4,000 species of plant-specific parasites.

What can you see?
Aphids can cause decreased growth rates, mottled leaves, yellowing, stunted growth, curled leaves, browning, wilting, low yields and death in plants.

What can you do?
There are several cultivation techniques that we can use to prevent or minimize an attack of aphids.

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Mildew

What is mildew?
The term mildew refers to a group of phytopathogenic fungi that causes diseases in plants.

What can you see?
In general, mildew is found on the upper side of the leaf, but there are exceptions. One type of mildew only grows on the underside of the leaf. The leaf looks as if it has been dusted with powder.

What can you do?
Keep humidity low and keep your growing area clean.

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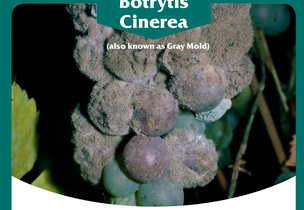
Botrytis Cinerea

(also known as Gray Mold)



What is Botrytis?
Botrytis cinerea is a necrotrophic fungus, which means that it kills its host to obtain all the nutrients it needs.

What can you see?
The tissue on which it develops becomes dark and sometimes soft, due to the death of the host cells. In time, a layer of furry gray mold will form on these dark spots.

What can you do?
You must never allow the infected plant or parts of the plant to come into contact with other plants.

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Fungus Gnats

What are fungus gnats?
Fungus gnats (families *Mycetophilidae* and *Sciaridae*) are a common pest affecting indoor plants, especially where humidity and moisture levels are high.

What can you see?
They are usually first noticed when the harmless adults are seen flying around house plants or gathered at a nearby window.

What can you do?
Make sure that air is circulating over the top of your soil and water your plants properly.

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Curled, yellow, brown or spotted leaves, stunted growth, silk webbing between leaves or even the death of a beloved plant: it is a grower's worst nightmare. Beautiful green and healthy plants full of flowers can suddenly become really unhealthy. Finding out what went wrong is not always easy, but the CANNA Pests and Diseases Guide can help shed some light on the matter.

Spider mites, whiteflies, thrips, aphids, mildew, fungus gnats and Botrytis cenerea are very common pests and diseases that can affect many plants, and they are probably some of the most stubborn too. Each one can cause considerable damage to your plant and it is not always easy to get rid of them.

This CANNA Pests and Diseases Guide provides some background information about these common pests and diseases (including the biological cycle), and tells you all you need to know about symptoms, prevention and control.

Still hungry for more information? CANNA Research is happy to share its expertise and provides growers with a full range of growing information through its magazine, CANNAtalk.
The magazine is available at www.cannagardening.com, where you can also submit your own question and receive a personal answer from CANNA Research.

Pests & Diseases

Spider mite

About the pest in brief

Spider mites affect many crops worldwide. There are well over 1200 species of spider mite, of which more than a hundred can be considered as a pest, and about ten of those as a major pest. The most well-known and problematic spider mite is *Tetranychus urticae* (common names include red spider mite and two-spotted spider mite). Their ability to reproduce extremely rapidly enables them to cause enormous damage in a short period of time. Spider mites have needle-like sucking mouthparts. They feed by penetrating the plant tissue with their mouthparts. Large populations can even cover entire plants with their web. These webs are used to move around. Because spider mites are so small they can easily move through ventilators.

Biological cycle of spider mites

Each female two-spotted spider mite lays 10-20 eggs per day, and 80-120 altogether during its life cycle of up to four weeks. These are mostly attached to the silk webbing. The six-legged larvae hatch after 3-15 days. Newly hatched larvae are almost colorless and have bright red eyes. They moult three times within 4-5 days, becoming a protonymph, then a deutonymph and finally the adult form. Both adults and nymphs have eight legs.

Symptoms of the pest

The first visible symptoms will be small yellowish or whitish specks, mainly around the midrib and larger veins of the leaves. If these spots grow bigger and merge, the empty cells give some areas of the leaf a whitish or silvery-transparent appearance.

How to prevent the pest?

To minimize the risk and rapid spread of spider mite infestations, try to keep the temperature lower (<77°F) and humidity higher (>60%), since this will slow the rate of reproduction. Higher humidity is also needed for the predators of the spider mite. Keep your growing areas clean and remove all leaf litter. Adequate irrigation is important, because water-stressed plants are more likely to suffer damage.

Solutions for controlling the pest

When you see spider mites (recognizable from silk webbing on top of the leaves), remove the affected leaves. Spray the plant thoroughly with a mixture of alcohol and soap. Repeat this treatment several times a week. You can also use natural enemies: predatory mites, ladybirds, predatory bugs and lacewings.

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Whitefly

About the pest in brief

The two species of whitefly that affect many crops are *Bemisia tabaci* or tobacco whitefly and *Trialeurodes vaporariorum* or glasshouse whitefly. The main morphological difference that enables these insects to be distinguished from one another is the position of the wings. In *B. tabaci*, they are joined to the body and in *T. vaporariorum* they are parallel to the surface of the leaf. Furthermore, the adult and pupa of *T. vaporariorum* usually has a greater quantity of waxy powder than *B. tabaci.*

Biological cycle of Whitefly

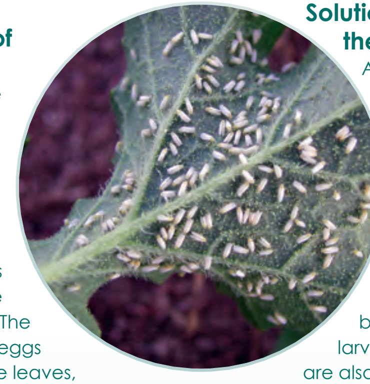
The full life cycle of the whitefly lasts between 15 and 40 days, depending on environmental conditions, particularly the temperature, since eggs will develop into adults more quickly when the temperature is higher. The whitefly usually lays its eggs on the underside of the leaves, which the eggs stick to.

Symptoms of the pest

The direct damage is caused to the plant when the whitefly feeds. The sucking of the sap causes discolored patches on the parts of the leaf where they have been feeding. Furthermore, as they suck out the sap, they release toxic substances into the phloem, which then spreads throughout the plant. This leads to metabolic imbalances in the plant and general weakening, chlorosis and changes to the flowers and fruit. In terms of indirect damage, the molasses excreted by the nymphs enables fungi, such as sooty mold (*Capnodium sp.*), to form on the leaves. This mold acts as a screen and reduces the photosynthetic capacity of the plant.
However, the most serious damage that the whitefly can cause to crops is the transmission of viruses.

How to prevent the pest?

One of the main objectives when controlling whitefly is to avoid the crop being infected by any virus that the insects may be carrying. It is therefore important that, any weeds or remains of other plants, near the crop are removed because these can act as a habitat for whitefly. Furthermore, if a whitefly feeds off a weed that has a virus and then reaches your crop, the virus can easily spread. The use of protective barriers such as nets and covers are also a good option for preventing infestations.



Solutions for controlling the pest

A range of entomophagus insects, parasites, and some entomopathogenic fungi can be used to control whitefly. Most predators feed on the eggs and nymphs of the whitefly. This category includes the *Delphastus catalinae* beetle. The chrysopidae larva and some bedbugs are also good natural controllers of this pest. The small wasps of the *Aphelinae* family are parasites of the whitefly larvae. The wasps lay their eggs on the larvae and they develop by feeding on their host.

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Thrips

About the pest in brief

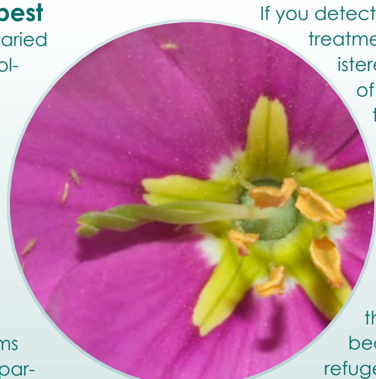
Thrips are recognizable by their small size and long flat shape. The adult thrips has four feathery wings. They can vary in color from gray to yellow or brown. Thrips are carriers of viruses, mainly of the genus *Tospovirus*. These viruses cause significant crop loss and are incurable.

Biological cycle of thrips

The first stage of the thrips' life cycle is the egg, which will hatch much more quickly when temperatures are higher. The females lay eggs in plant tissues. The larvae that emerge from the eggs feed on the surrounding tissues. One of the characteristics of these insects is that they make the transition from pupa to adult in the soil or in the lower leaves. The larvae live in the leaves, but as soon as they reach the right stage of development, they fall to the ground or lower leaves where they live during the pre-pupal and pupal stages until a reproductive adult appears with fully developed wings. The whole life cycle lasts only a few weeks.

Symptoms of the pest

The adult thrips eats a varied diet based mainly on pollen, but the larvae feed on plant tissues and it is the larvae that are responsible for the majority of plant damage. The larvae suck the liquid from plant cells, mainly from the leaves, but also the petals, shoots and fruits. Early symptoms include an almost transparent or clear discoloration of the leaf with black dots (which are caused by fecal secretions). They have rasping, sucking mouthparts that look like combs and make a soup from the tissue which is then sucked up. Usually the top layer of the tissue is undisturbed and a window of clear tissue is seen in the middle of the area of discoloration.



Because certain toxic substances are present in the saliva of thrips, some deformations may occur in the shoots or flowers of affected plants. In cases of very severe infestation, the leaves may dry up entirely. At the same time, some thrips like *Frankliniella occidentalis* secrete a few drops of a substance when they are threatened by predators. These excretions contain decyl acetate and dodecyl acetate – pheromones that serve as a warning signal for other nearby thrips.

How to prevent the pest?

Because of the thrips' ability to transmit viruses, it is important to monitor our crops for thrips and detect them as early as possible. The classic method for doing this is by using adhesive traps. These traps are blue in color, because thrips are strongly attracted to blue. The traps should be examined every few days using a magnifying glass to see if any thrips (usually winged adults) have gotten stuck to them.

Solutions for controlling the pest

If you detect thrips, appropriate treatments need to be administered to minimize the risk of an infestation. These treatments include ecological insecticides such as potassium soap or plant extracts with pyrethrum, in places where these are allowed by law. Plants must be sprayed thoroughly all over because the thrips will take refuge under the veins of the leaves, making it difficult for the insecticide to come into contact with all the insects.

It is also possible to use entomophagous fungi to combat thrips. *Beauveria bassiana* is one fungi that is typically used to combat thrips. It is also important to make sure that you clean up and remove any plant or soil residues from the floor or worktops.

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Aphids

About the pest in brief

Aphids are no longer than about 4 mm, have a bulbous abdomen and can be many different colors. They are among the most destructive pests to affect cultivated plants in temperate regions. Winged aphids are especially dangerous for your crops, since they destroy plants much faster than regular aphids.

Biological cycle of aphids

Aphids can be winged or wingless. Usually, the first generation to hatch after winter is wingless. However, after several generations there can be a lack of space on the host plant. This triggers the birth of a generation of winged aphids, which can migrate to other hosts. All the aphids born from the winter eggs are females. Several more generations of female aphids are born during spring and summer. Females can live for 25 days, during which they can each produce up to 80 new aphids. Spring and summer reproduction occurs asexually – without males.

Symptoms of the pest

The aphids feed on phloem sap, which weakens the plant and causes a metabolic imbalance, twisting of the leaves and, in extreme cases, causing leaf loss. Leaf loss affects the quantity and quality of the final harvest. Aphids also introduce toxins into the plant, systemically altering its development.

Furthermore, the honeydew secreted by the aphids is an ideal culture medium for a range of various fungi, which form a barrier on the leaf, stopping it from taking in all the light that hits it.

However, the most harmful effect of aphids is the transmission of viruses. Aphids can transmit dozens of viruses from a diseased plant to healthy one iin just a few seconds, especially the winged generations. The biggest problem with viruses is that there is no remedy for them, so the infection of a plant that is not tolerant or resistant to the virus leads inevitably to a decline in the final production.

How to prevent the pest?

There are several cultivation techniques that we can use to prevent or minimize an infestation of aphids. These include:

- Eliminating weeds that can serve as a reservoir of eggs and adults
- Using insect nets (sometimes insecticide-impregnated) to cover crops
- Avoiding the excessive use of nitrogenous fertilizer
- Removing crop residues
- Establishing plant species that can serve as a reservoir for predators (banker plants)

Solutions for controlling the pest

The natural enemies of aphids include ladybird beetles (or ladybugs) and lacewings. Green lacewing larvae (*Chrysoperla sp.*) are voracious predators of aphids.

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Mildew

About downy mildew

Mildew is also known as 'downy mildew' and as the disease spreads, the leaves curl up, necrotize and eventually fall off. The parts of the mycelium that contain the spores of the fungus emerge through the stomata of the plant. In good light it can readily be identified by the gray or purple felt like covering on the back of the leaves.

About powdery mildew

Powdery mildew is also known as Oidium. Before any symptoms become visible the leaf starts to develop blister-like patches, which is followed by the characteristic white powder where the blister was. The leaf looks as if it has been dusted with powder. In general, mildew is found on the upper side of the leaf, but there are exceptions. One type of mildew only grows on the underside of the leaf, so it's no surprise that this often gets overlooked. However, as the disease advances, the leaves can end up being completely covered in this white layer and it can even colonize the fruits, with subsequent losses in crop size and quality.

How to prevent the disease?

The best treatment against these types of fungi is prevention; once they have set in and developed, they are very difficult to eradicate, sometimes even with chemical fungicides. Try to prevent spores coming in from elsewhere and contaminating your plants by keeping your growing area clean. You can do this by using only clean equipment and washing your hands thoroughly before entering.

Solutions for controlling the pest

Check older leaves regularly for light yellow discoloration and fungal growth.

- You can remove suspicious leaves and keep these in a re-sealable freezer bag along with some moist paper in a warm place. After two days you can check the leaves for mildew, maybe using a magnifying glass.
- Remove any contaminated leaves, but also make sure that you don't spread the disease yourself. Make sure that you wash your hands regularly, preferably with an alcohol solution.
- Remove infected materials totally from the growing area and dispose promptly and off property.
- Don't forget that you will need to repeat the spraying several times.

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Botrytis Cinerea

(also known as Gray Mold)

About the disease in brief

Botrytis attacks weak plants or dying flowers. In fact, in nature it helps the recycling process of plants by breaking them down and making the nutrients available in the soil. So the fungus actually plays a vital role in the natural growth cycle. But when it strikes your crops, it's a pest!

Biological cycle of Botrytis

The early development of gray mold usually starts in infected plant debris from previous crops, which have been left in the field. The mycelium present in the debris begins to develop when temperatures increase, for example in early spring. In bright light, the mycelium begins to produce structures called conidiophores. At the end of these conidiophores, spores called conidia are formed which are then transported through the air and can come into contact with the leaves or stems of crops.

Symptoms of the disease

The fungal infection in flowers is not visible initially. Necrosis – tissue that looks brown and wet near the infection site – is one of the first symptoms that indicate a possible Botrytis attack. A lighter colored spot on the flowers with a dark brown ring around it can also indicate a mold infection.

How to prevent the disease?

It is very important to get rid of any parts of the plant that are infected with Botrytis. The infected parts should be removed immediately.

You must never allow the infected plant or parts of the plant to come into contact with other plants, because even the briefest contact will send clouds of gray spores into the air. These spores will land on healthy plants and may infect them. Good ventilation is essential in order to maintain slightly lower humidity around the leaves and flowers. For outdoor crops, it is advisable to cover the plants with a plastic shelter like a poly-tunnel when rain is expected. This prevents the plants from getting wet.

It is also important to be vigilant for pests such as caterpillars which can cause damage to the cuticle, which *B. cinerea* can exploit to enter the plant more easily. It's easier for the fungus to infect plants that have been damaged by chewing pests. Other insects like thrips can carry and spread Botrytis spores.

Solutions for controlling the disease

Several micro-organisms have proven successful in controlling *B. cinerea* in a wide variety of crops. *Clonostachys rosea* (= *Gliocladium roseum*) is a fungus that is used to combat and prevent Botrytis attacks because of its ability to suppress the production of spores. Some nematode species have also been used to control gray mold effectively.
Many plant extract preparations are marketed primarily as being able to prevent the attack and development of *B. cinerea*. Good results have been achieved with extracts of thyme, citrus seed, oregano, mint, garlic and pepper, to name a few.

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Fungus Gnats

About the pest in brief

The adult fungus gnat is a small black fly, about 3-4 mm in length. They are commonly seen swarming in greenhouses because they are attracted by the humidity, high temperatures and decomposing organic matter. Crop substrates offer ideal conditions for their larvae, which are white and legless, resembling small worms. They feed on organic matter and the tender parts of plants below the ground, such as roots, as well as the stems.

Biological cycle of fungus gnats

Adults live about one week and lay up to 300 eggs in rich, moist soils. Within 4-6 days tiny larvae emerge and begin feeding on plant roots during their two-week lives. The pupal stage lasts 3-4 days before young adults leave the soil and begin the next generation. The entire life cycle from egg to adult may be completed in as little as 3-4 weeks depending on the temperature. Because of their proclivity and relative short gestation period, potted plants can host each stage - egg, larvae, pupae, adult - with multiple generations at once. Because of this, remedies usually require repeated applications until there are no surviving eggs.

Symptoms of the pest

Plant symptoms that indicate fungal gnats are sudden wilting, loss of vigor, poor growth, and yellowing of the leaves. With severe infestations, a considerable portion of the plants may be lost.

How to prevent the pest?

- Inspect plants thoroughly prior to purchase for signs of insect pests. Turn up soil carefully near the base of the plant and look for the glossy, clear larvae. Reject any plant sending up flying gnats.
- Fungus gnats do best in damp soils; be careful not to over water, especially during winter months when plants require less water. When potting, avoid organic material that holds water, such as algae, which may encourage egg laying.

Solutions for controlling the pest

- If pests are present, allow the soil to dry to a depth of one to two inches between waterings. This not only kills the larvae and inhibits the development of eggs, it also makes the soil less attractive to egg-laying females.
- Use yellow sticky traps placed horizontally at the soil surface to capture large numbers of egg laying adults. The gnats are attracted to yellow and can easily be removed from the trap before they can lay more eggs.
- Top-dress houseplants with beneficial nematodes to destroy the larval stage. Nematodes are microscopic round-worms that penetrate fungus gnat larvae, as well as harmful lawn and garden grubs, fleas, and other soil-borne pests (they do not harm earthworms), and then release a bacterium that consumes the pest from the inside out. The long-lasting nematodes are safe for use around pets, plants, and your family.

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