

Pest Management of Hemp in Enclosed Production

Cannabis Aphid

(*Phorodon cannabis*)

Damage and Diagnosis. Cannabis aphid is a pale-colored insect that occurs on leaves and stems. Pale yellow forms predominate; less commonly they may be light green. Pale pink and light brown may occur indoors following shift to short day lighting and are regularly present outdoors late in the season.

Cannabis aphid may produce both wingless and winged forms; some dark spotting occurs on winged forms. Wingless forms lack this patterning but may have pale striping running along the top of the body.

Cannabis aphid feeds on fluids of the plant phloem, which it extracts through its "piercing-sucking" mouthparts. Very little, if any, injury occurs to cells from this feeding, so there are no symptoms on leaves of white flecking or surface scarring such as is produced by spider mites or thrips.

Damage is caused by the loss of plant fluids. When high numbers of aphids are present and sustained this can cause reductions in plant vigor that can result in slowed growth, wilting, and leaf yellowing. However, in outdoor production numerous natural enemies are normally present (e.g., lady beetles, syrphid flies, green lacewings) that suppress aphid populations before significant damage is done.

As cannabis aphids feed, they also continuously excrete a sticky fluid, known as **honeydew**. This is produced in the form of tiny droplets which drop onto leaf surfaces below where it can be noticed as small shiny spots. This excreted honeydew can be an excellent diagnostic sign for detecting cannabis aphid infestations.

As cannabis aphids grow they must periodically shed their external "skin" (exoskeleton) and as they produce a new and larger exoskeleton for the next, larger life stage. These "**cast skins**"



Typical light form of a cannabis aphid. This is a wingless form, with young.



Mixed life stages with a range of coloration typical of what is seen on outdoor grown plants in late summer.



Winged forms with newly produced young.

will collect around colonies of aphids and often drop onto leaves below an aphid colony. Along with honeydew, the cast skins can be an excellent diagnostic sign for detecting cannabis aphid infestations.



Left. Hemp leaf with "cast skins" of cannabis aphid, discarded after molting.

Right. Cannabis plant with cast skins and shiny, sticky surface produced by aphid excreted honeydew.

Biology Notes. The only host plants on which cannabis aphid can develop species of *Cannabis*.

Biology of cannabis aphid is very little studied. Presumably it is fairly typical of most other aphids. Live birth is the norm, and the aphids may become mature adults within a week or two after birth. (Development is always strongly related to temperature.) Adult females may give birth to perhaps 1-5 young per day for their remaining life, which likely will normally be short, perhaps a 3-4 week maximum. Outdoors, where natural enemies are present, aphid survival will average a much shorter period.

Under normal conditions cannabis aphid normally reproduces asexually (with males and fertilization). Only females are present and they give live birth to genetically identical daughter aphids. As aphids feed and develop, they will periodically molt, discarding their old exoskeleton (cast skin) while growing into a new, larger one.

Two forms of this aphid may be produced, wingless or winged. Normally wingless forms are produced, particularly if the host plants are in good condition and the aphids are not overcrowded. However, some percentage of the population instead produces wings, and these are the forms that can disperse over long distances and will most readily colonize new plants. Large numbers of winged cannabis aphids have been observed on outdoor grown hemp crops in September and it is possible that shortening day lengths are a trigger to produce a shift to increased percentage of winged forms.

Winged stages of aphids are relatively weak fliers and will largely be carried by wind speeds more than about 3 mph. By controlling air flows aphid movement in a greenhouse can largely be controlled - with aphids collecting in areas when winds flow and aphids being inhibited from entering areas where headwinds are too strong.

In outdoor production there is a significant change in the life history late in the season, triggered by declining day length. In September and October, some of the aphids will be males, all of which develop wings. Also at this time there are sexual form females produced, with which the males then mate. After mating these forms (known as **oviparae**) will then lay eggs on stems and flower buds. These eggs remain dormant through winter and are likely the only stage that survives outdoors in Colorado between growing seasons. The eggs remain on the old plant debris and hatch the following spring. If the eggs are immediately adjacent to where young volunteer *Cannabis* plants are growing then they will start infestations in the new growing season.

Cannabis aphid can also produce sexual forms and eggs indoors if lighting shifts to short day lengths. It is not known how long - or even if - eggs can survive indoors at sustained warm temperatures and what would trigger their hatching.

It is suspected that the normal form of this aphid, which reproduces asexually and does not produce eggs are those that are pale yellow. Colored forms – pale pink, brown or green – are possibly sexual forms, including the egg producing oviparae.

Management of Cannabis Aphid

Monitoring. Careful plant inspections can be very useful in detection of cannabis aphid. The presence of honeydew droplets on leaves, often with some cast skins, can identify plants that are possibly infested. A subsequent inspection of the plants can then often located living stages, if present.

Yellow sticky traps can be used to capture winged aphids, which can be useful to detect changes in abundance of the aphids and determine when winged forms may be dispersing through the crop. However, it will require some experience and a bit of magnification to identify winged aphids from some other kinds of similarly sized insects that can occur in the crop, notably fungus gnats and the tiny wasps that are parasites of aphids.



A cannabis aphid that has recently molted. To the upper left is the previous exoskeleton, the "cast skin" discarded at molting.

Biological Controls. On outdoor grown hemp there is a fairly robust complement of natural enemies attacking cannabis aphid in Colorado and these have been observed to effectively control the cannabis aphids present in the late-season outbreaks. Most important among the natural enemies were convergent lady beetle (*Hippodamia convergens*) and multicolored Asian lady beetle (*Harmonia axyridis*), but at least four other lady beetle species were common in Colorado hemp fields. Three species of green lacewing were present, with *Chrysopa oculata* and *Chrysoperla plorabunda* the most common. At least four species of hover fly (Diptera: Syrphidae) and *Aphidoletes aphidimyza* were also observed feeding on cannabis aphids in hemp fields. Parasitism by braconids (Hymenoptera: Braconidae) and infection with entomopathogenic fungi

has been observed but only infrequently. Numerous other generalist predators of insects (e.g., *Orius insidiosus*, *Nabis alternatus*, *Geocoris punctipes*) are present in Colorado hemp and likely predaceous on cannabis aphid.

Outdoors, these natural enemies of cannabis aphids can be expected to naturally colonize aphid infested plants, providing control so that high populations of aphids on plants are sustained for only short periods. However, when plants are grown indoors these natural enemies are usually absent and must be introduced.

Some of the more effective insects that can be purchased and introduced into greenhouses for control of aphids include green lacewings (normally sold as eggs), aphid predator midge, and convergent lady beetle. (**Note:** Convergent lady beetles are field collected and upon introduction into a greenhouse often start in a semi-dormant condition. It may take a few weeks before they will lay eggs that then result in the presence of lady beetle larvae, which are the stage that feeds most heavily on aphids and can best provide aphid control.)

There are also a few types of parasitic wasps that attack aphids. These lay their eggs in a developing aphid and the young wasps consume the host aphid internally. Aphids parasitized by these wasps become bloated, discolor to a light brown color and die stuck to the plant; these are known as **aphid mummies** and the adult wasps ultimately cut their way out through the back. Among the parasitic wasps used to control aphids that are commercially available are *Aphidius colemani*, *Aphidius ervi*, and *Aphidius matricariae*. Parasitic wasps have been observed to attack cannabis aphid but the species has not been determined.



Cannabis aphid (right) "mummy", an aphid that has been attacked by a parasitic wasp that is developing within the insect.

Sources of biological controls organisms can be found at the Hemp Insect Website in the [Miscellaneous Section](#).

Insecticides. A few of the [insecticides allowed for use on cannabis in Colorado](#) do have potential for control of aphids. These include sprays of products that contain the active ingredients pyrethrins, insecticidal soaps (potassium salts of fatty acids), and azadirachtin.

Also allowed on cannabis is the fungus *Beauveria bassiana*, which produces disease in susceptible insects - including aphids - and can kill them. Relatively high humidity is important in the effectiveness of these products. Presently allowable pesticides that contain *Beauveria bassiana* (Botanigard Maxx, Xpectro OD) are combination mixtures with pyrethrins.

The insecticides that are allowed to be used in production of *Cannabis* crops in Colorado are regularly updated by the [Colorado Department of Agriculture](#). (Note: In the absence of federal

regulation of pesticides on this crop, the permitted use of any pesticide on any *Cannabis* crop is determined on a state-by-state basis. A few states (e.g., Colorado, Washington, California) have lists of pesticides that are allowed within the state; most states do not have such lists and therefore no registered pesticides of any kind are permitted.

Eradication of Cannabis Aphid on Indoor Production. *Cannabis* species plants are the only known hosts for cannabis aphid. Aphids also require living hosts on which they can feed, and can only survive for short periods in the absence of a plant on which they can feed. Both winged and wingless forms will starve to death within a few days in the absence of food. *Therefore removal of all live cannabis plant material from a growing area for a period of a week can be expected to result in causing all remaining aphids to die out within a week or so.*

Normally cannabis aphids do not produce eggs, instead continuously giving live birth. If eggs are produced this would be triggered by periods of shortened day length. Outdoors in Colorado egg producing cannabis aphids have been found to occur in late September/early October when there is a period of a bit less than 12 hours of daylight in a 24 hour period. (On October 1 in Denver there is 11:45 hours of daylight, 9:15 hours of dark, and 3 hours of twilight.) It is likely that cannabis aphids developing indoors may shift to egg-producing forms if light cycles are shortened sufficiently (e.g., less than 12 hours of daylight).

If this does occur then eggs would be laid on the plants and these eggs would remain dormant, unhatched, for a considerable time. It is not known how long eggs of cannabis aphid can survive and what triggers eggs to hatch. For other aphids of similar habit the eggs can last for months with egg hatching usually triggered by passage of a cold/chill period followed by increasing day length. It is unknown how long cannabis aphids survive - or if they are even able to hatch - in an indoor site where temperatures remain high (e.g., no chill period).

If eggs are produced and they later hatch, there could be a remote chance that these could be a source of aphids that could infest later crops. Therefore, it may be important to remove all plant debris before moving new, uninfested plants into the facility. Furthermore, surfaces should be washed to remove any eggs that may have fallen from the plants. (Aphids that hatch from eggs are very tiny and will likely only be able to move a short distance - perhaps a couple of feet.) With these steps, any risk of infestation from cannabis aphid eggs should be eliminated.

Once indoor facilities have been cleared of cannabis aphid the only likely means of re-infestation is through the introduction of *Cannabis* plant material containing live aphids. Strict sanitation practices that ensure all introduced plant material is completely free of aphids should be done before any new plant material is introduced. To further ensure that cannabis aphid is not present, new plant material should be maintained separately for a quarantine period of several weeks and thoroughly inspected during this period for any evidence that the insect is present (e.g., honeydew droplets on leaves, cast skins on leaves, live aphids on plants or winged stages in sticky traps).

Note on virus transmission: At this point in time the viruses present on North American hemp are extremely poorly studied. Until this situation is improved, online information on the

identification of Cannabis viruses and how they are transmitted should be considered with caution.

Some specific kinds of aphids can transmit some specific viruses to some specific plants. However, many, if not all, of the viruses present on the crop in the United States are not transmitted by aphids. The most commonly reported hemp viruses seem to be those that are "mechanically transmitted"; hemp mosaic, a virus in the tobacco mosaic group, is an example. These viruses that are mechanically transmitted are spread through wounds, such as are produced when plants are cut or by roughly handled. However, viruses that are mechanically transmitted cannot be transmitted from plant to plant by aphids or other insects.

With better understanding of the viruses affecting cannabis, in the future it may prove that there are some viruses of hemp in North America that may be transmitted from plant to plant by this insect. However, if the virus in question is one that was present in the crop prior to the time when cannabis aphid was present, then it can be assumed that the virus is not one that can be transmitted from plant to plant by aphids.