UtahStateUniversity
COOPERATIVE EXTENSION

Orchard IPM Series HG/Orchard/13

Apple Aphids

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Oregon State University

Green apple aphids (note the black cornicles, "tail-pipes," on the abdomen).

Do You Know?

- A common, secondary pest of apples, but infestations resulting in economic losses usually do not occur.
- Most aphids overwinter as eggs on tree limbs.
- An excellent window of opportunity for controlling most tree fruit aphids is at delayed dormant (half-inch-green). A treatment of dormant oil plus an organophosphate insecticide at this time may provide season-long control.
- Established trees can generally tolerate moderate to heavy infestations without loss of production or vigor; control of aphids on young trees is more critical.

Michigan State University

Rosy apple aphids.

There are several species of aphids that infest apple trees in the western United States. Green apple aphid, rosy apple aphid, and woolly apple aphid are the three most common species on apples in the West that may damage young trees if left unchecked. The green and rosy apple aphids feed primarily on leaves and prefer the succulent growth of tender shoots. Their feeding causes leaves of the terminal shoots to roll and curl, protecting the aphids inside from natural enemies, weather, and pesticides. Neither species typically harms established trees, but high populations can stunt young trees. The woolly apple aphid differs from green apple and rosy apple aphids, in that the woolly apple aphid feeds in both the tree canopy and below ground on the roots. Canopy feeding is primarily on the succulent growth associated with stems, pruning wounds, root suckers, and leaf axils. Damage from woolly apple aphids is caused primarily by those aphids forming galls on the roots. In addition, all three aphids produce a clear, sticky, sweet substance called honeydew. Economic damage may occur when aphids build up to levels where honeydew drips onto the fruit. The honeydew provides a site for the growth of sooty mold, which can discolor fruit and cause surface russeting.

Colony of wooly apple aphids.

Aphids are secondary pests and although their colonies may be unsightly, their populations frequently do not build to damaging levels. Aphid densities often increase because of a reduction in their natural enemies due to toxic

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insecticide applications for aphids and/or other pests. Aphids have many natural enemies such as lady beetles, lacewings, syrphid flies, predaceous midge larvae, and predatory bugs, which can often keep aphid populations under control if they are not disturbed by broad-spectrum insecticide treatments.

Green Apple Aphid

Aphis pomi

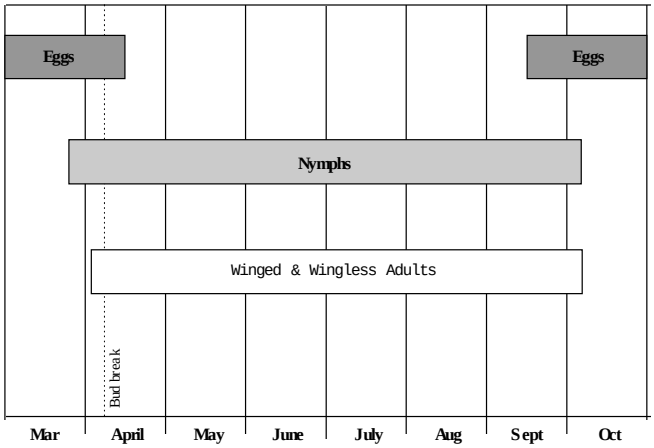
The green apple aphid is the most common aphid pest of apples in Utah. The green-colored young, called nymphs, begin to hatch from overwintered eggs as early as silvertip, but populations generally do not begin to build until late May to early June when shoot leaves are rapidly expanding. During the spring and summer, females produce live young without mating. In addition, they can complete a life cycle in as short as one week during the warm summer months. The short generation time and ability of these aphids to reproduce asexually allows them to rapidly increase their populations and feeding injury to apple trees.

Hosts

apple
pear

Life History

Green Apple Aphid Life History



Egg—Overwintering Stage

- **Size and color:** 1/50 inch long, shiny, black, and oval shaped
- **Where:** found on smooth twigs and water sprouts
- **When:** eggs are laid in the late summer and fall
- Difficult to distinguish from the eggs of the rosy apple aphid

Nymph—Damaging Stage

- **Size, color, and shape:** about 1/16 inch long, yellow-green to dark green, oval shaped with black cornicles (tail-pipes)
- Passes through five instars
- **Where:** generally found on young shoots and watersprouts, primarily on the underside of leaves
- **When:** from about budbreak through early October

Adult—Damaging Stage

Wingless

- **Size, color, and shape:** about 1/8 inch long, bright green with black cornicles (tail-pipes) and legs, oval shaped
- **Where:** generally found on succulent shoots and watersprouts, primarily on the underside of leaves
- **When:** from about budbreak through early October
- Those that hatch from overwintering eggs are all females and begin producing winged and wingless forms to start colonies

Winged

- This is the dispersal form and allows aphids to spread to other sites
- **Size, color, and shape:** about 1/8 inch long, black head and thorax with a yellow-green abdomen, clear wings; body is narrower than wingless forms
- **When:** during the same time as wingless forms, but may be more common early in the season
- **Where:** generally found on succulent shoots and watersprouts, primarily on the underside of leaves

Through most of the season only female aphids are produced. These aphids give birth to live young and do not lay eggs. During late summer, male and female sexual forms are produced. These sexual forms mate and produce the overwintering eggs.

Host Injury

- Generally, the visual appearance of apple aphids in trees is much worse than the injury caused by their feeding.
- Apple aphids prefer feeding on succulent tissue where they suck sap from the phloem
- This feeding results in leaf curling and sometimes shoot curling
- Feeding by aphids does not harm established trees, but can stunt young trees
- Occasionally aphids feed on the fruit of Golden Delicious and Granny Smith later in the season, but injury disappears by harvest
- Honeydew produced by the aphids may drip onto fruit which causes discoloration and provides a site for the growth of blackish-gray sooty mold

Rosy Apple Aphid

Dysaphis plantaginea

This aphid is easily distinguishable from the green apple aphid by its rose-colored body. Rosy apple aphids generally increase their populations during the spring, which is earlier in the season than green apple aphids. Their feeding causes leaves to curl and deforms shoots. When feeding occurs in fruiting clusters, the toxic saliva, which is injected into the tree during feeding, stunts and distorts fruit growth. These aphids migrate from apple trees to weed hosts in late June to early July, therefore, controls for this species are not necessary in orchards during summer.

Hosts

Winter and spring

apple

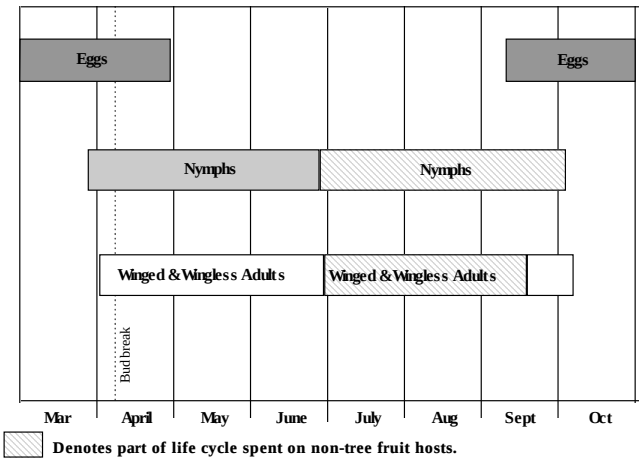
Summer

plantain

dock

Life History

Rosy Apple Aphid Life History



During early summer winged adults migrate to herbaceous weed hosts and by late June or early July most rosy apple aphids have left the apple trees. In fall, winged adults fly back to apple trees to mate and produce overwintering eggs.

Egg—Overwintering Stage

- **Size and color:** 1/50 inch long, shiny, black, and oval shaped
- **Where:** found on smooth twigs and water sprouts
- **When:** eggs are laid in the late summer and fall
- Difficult to distinguish from the eggs of the green apple aphid

Nymph—Damaging Stage

- **Size, color, and shape:** about 1/16 inch long, rosy brown or purple with a dusty-white covering
- Has long rosy colored cornicles (tail-pipes)
- Passes through five instars
- **Where:** generally found on succulent shoots, watersprouts, and developing fruit clusters, primarily on the underside of leaves
- **When:** from about budbreak through late June

Adult—Damaging Stage

Wingless

- **Size, color, and shape:** about 1/8 inch long, rosy to purple with a dusty-white covering, oval shaped
- **Where:** generally found on succulent shoots and watersprouts, primarily on the underside of leaves
- **When:** early bloom through late June
- Those that hatch from overwintering eggs are all females and give birth to live young
- Several generations are produced in spring and early summer
- Each succeeding generation has a higher percentage of winged forms

Winged

- This is the dispersal form and allows aphids to migrate to summer weed hosts and back to apple orchards in the late summer to early fall
- **Size, color, and shape:** about 1/8 inch long, brownish-green to black and more elongate than wingless forms
- **When:** most common from early June through early July
- **Where:** generally found on succulent shoots and watersprouts, primarily on the underside of leaves

In early fall winged adults migrate from weed hosts back to apple. These adults give birth to egg-laying females. Males also develop at this time. They mate with the females which lay overwintering eggs.

Host Injury

- Feeding by rosy apple aphids causes leaves to curl and deforms shoots.
- When feeding occurs in fruiting clusters, toxic saliva stunts and distorts fruit growth.
- Root growth and photosynthesis may also be reduced.
- Damage is most severe on young trees.
- Rosy apple aphids produce a lot of honeydew which may drip onto fruit. Honeydew on fruit may cause russeting and provide a site for the growth of blackish-gray sooty mold.

Timing Control—Green Apple Aphid and Rosy Apple Aphid

Delayed-Dormant

One of the most opportune times to control both aphid species is at delayed-dormant (half-inch-green). A superior or supreme type horticultural oil plus an organophosphate insecticide will kill most of the eggs and hatching nymphs. This treatment generally provides optimum control of rosy apple aphids and additional treatments may not be needed. Clues that may indicate aphid control is necessary are high aphid populations the previous season and the presence of overwintered eggs on young apple limbs and twigs. Black aphid eggs can be observed during tree pruning and other spring activities.

Green apple aphids are more likely to become a problem later in the season than rosy apple aphids. If green apple aphids begin to build up to worrisome levels, monitoring should be conducted to determine if treatment is necessary. Many factors can influence the amount of potential damage, such as tree structure, tree age, time of year, and apple variety.

Summer Treatment Thresholds—Green Apple Aphid

There are two basic methods which are commonly used for determining the need for treatment against green apple aphids in established trees during summer and early fall.

- 1) Randomly choose 10 shoots from each of 10 different trees and treat when 75% of the terminals are infested.
- 2) Randomly choose 10 shoots from each of 10 different trees and treat when an average of 3 leaves per shoot are infested.

Time of year and prevalence of natural enemies should also be considered when making a control decision. If it is mid- to late summer and natural enemy populations are building, then aphid controls are probably not economically justified.

Management—Green Apple Aphid and Rosy Apple Aphid

Delayed-dormant sprays are the first step in controlling green and rosy apple aphids (see “Timing Control” above). If during or following the flush of spring growth, aphid populations are building or remain high, then additional controls may be necessary. However, established trees can tolerate fairly high aphid populations without loss of production or vigor (see “Summer Treatment Thresholds” above). Rosy apple aphids move from apple to their summer weed hosts by late spring to early summer, so controls for this aphid are unnecessary if populations in apple are already on a decline. Treatment thresholds for green apple aphid described above should be used to determine if this aphid is approaching levels of economic concern. However, in a young apple orchard, spring and/or summer aphid controls may be necessary to prevent stunting of tree growth.

Aphids prefer feeding on succulent shoots and their populations are more likely to build up to high levels when there is a lot of succulent tissue present in the orchard. Pruning and fertilization practices that minimize growth of water-sprouts and lush shoot growth should be used to help manage aphids. Apple varieties that are vigorous growers and produce a lot of lush growth may be more prone to large populations of aphids. In most years, succulent shoots are beginning to harden off at the time when aphid populations are beginning to increase. This will slow down the rate at which the aphid populations increase and may be sufficient to prevent damaging population levels from developing.

Biological Control

Aphids have many natural enemies including lady beetles (adults and larvae), lacewing larvae, syrphid fly larvae, predaceous midge larvae, and predatory bugs such as pirate bugs, damsel bugs, and campylomma. These predators generally appear after the aphid colonies begin to appear. Several species of parasitic wasps have also been found attacking apple aphids in the western United States, but they do not complete development in apple aphids. However, they can kill sufficient numbers of apple aphids to provide control. These parasites need other aphid species to survive. Their primary hosts are green peach aphid and aphids found on hawthorn.

The natural enemy complex often changes as the season progresses because some predators are more common early and some are more common later in the season. Also some are more tolerant of insecticides than others. Biological control can be disrupted by insecticides applied against other pests. When possible use softer pesticides, because these materials are less likely to disrupt predator populations. Predator complexes are generally more diverse in sites where fewer insecticides are applied.

Scouting for the presence of predators should be included when assessing aphid densities in orchards. If natural enemies are present in the aphid colonies, re-sample in a week or so to see if the predators are providing control. Incidences of complete summer aphid control by natural enemies are not uncommon in Utah. Remember that established apple trees can tolerate fairly large aphid populations, so give the natural enemies a chance to reduce aphid numbers and spray only as a last resort.

Insecticides

Insecticides can be very effective against aphids, however, repeated use of the same products has resulted in aphid resistance. Good coverage is important. Aphid feeding causes leaves to curl and within these curled leaves the aphids are partially protected from insecticides. The available materials which are effective are limited and some are very toxic to natural enemies. Having a limited variety of materials increases the possibility that the aphids will develop resistance to them. For these reasons insecticide

use should be limited.

Recommended Chemicals

- Provado (imidacloprid)
- Thiodan (endosulfan)
- Dimethoate
- Diazinon
- Lorsban (chlorpyrifos)
- Insecticidal Soap
- Horticultural oils
- Pyramite (pyridaben) – after petal fall, suppressive
- Neemix and other neem oil products registered on apple – suppressive

Note: Check preharvest interval and registered crops before using any oth these chemicals.

Woolly Apple Aphid

Eriosoma lanigerum

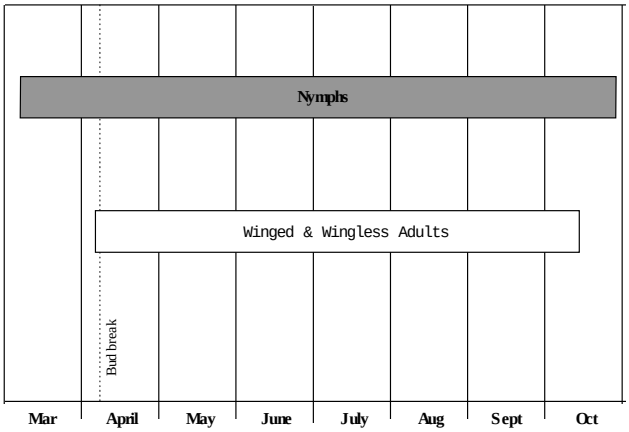
The woolly apple aphid is native to North America. This aphid can be found in all apple growing areas in the United States and Canada. Several generations occur each year. The nymphs are produced asexually by mother aphids. Aphids are first observed in June. Adults and immatures are reddish-purple in color with a waxy covering. From a distance, a colony of woolly apple aphids appears as mass of cotton on the tree. This cottony mass is a result of long, white, filamentous, waxy secretions from the back of the adult aphids. This waxy mass protects the woolly aphid from insecticides, weather, and natural enemies. Without chemical or natural controls, woolly apple aphids can increase to high numbers in apple orchards.

Host

apple

Life History

Woolly Apple Aphid Life History



The egg stage of the woolly apple aphid is not known to occur in the western United States. The aphid overwinters in the nymphal stages either on the tree root or above ground in bark crevices or under bark scales.

Overwintering Stage

Woolly apple aphids (WAA) overwinter as nymphs and adults on galls formed on apple tree roots. During mild winters, some WAA may survive the winter in protected locations on above ground branches and stems.

Nymph—Overwintering and Damaging Stage

- **Size, color, and shape:** size about 1/20 inch long, reddish to purple in color and covered with a white cottony wax
- They pass through 4 instars
- **Where:** 1st instar nymphs are considered the dispersal stage as they are the most active.
- This stage can migrate to tree limbs or roots to form colonies. When the nymph finds a suitable spot to feed, it settles down and begins a new colony.
- **When:** Aphids which overwintered on the roots begin dispersing to tree limbs in June. Dispersal to the roots can take place anytime during the summer or fall.
- In large colonies, the nymphs are found beneath the adult females.

Adults—Overwintering and Damaging Stage

- **Size, color, and shape:** adults are approximately 1/16 inch in length and reddish-purple and covered with a white cottony wax
- Adults observed on apple trees are females, males are rare
- Females produce live young without mating
- Egg production is rare, and is associated with their alternative host, the American elm
- Several generations of WAA are produced during the summer
- Winged adults are formed during mid to late summer. These winged adults disperse to new host trees.

Host Injury

WAA feeding on roots causes gall formation. The galls increase in size over several seasons of feeding. The galls inhibit root function and under severe infestations can stunt or weaken the tree. Severe root infestations can kill young trees. Heavy infestation on aerial portions of the tree can cause leaf yellowing. Infestations can lead to honeydew deposits on fruit causing the growth of sooty mold, and subsequent downgrading of fruit. WAA can serve as vector for perennial apple canker. Perennial apple canker (*Gloeosporium perennans*) spores, enter the tree via feeding wounds. Cankers form along the length of stems. A large canker looks like a bulls eye, and may grow large enough to girdle and kill the branch. WAA colonies can also serve as a nuisance to pickers, as the crushed aphid bodies stain skin and clothing.

Management

Monitoring

Treatment thresholds have not been developed. In general, growers should start monitoring orchards in June for colonies. If colonies are present and if broad-spectrum insecticides are used on a regular basis, an insecticide treatment should be applied in early to mid-July.

Biological Control

In organic orchards, and those management programs which minimize the use of broad-spectrum insecticides, WAA populations are controlled by a number of natural enemies. The most important natural enemies are general predators such as green lacewing larvae, lady beetle adults and larvae, and syrphid fly larvae. Flowering plants in or on the borders of orchards provide nectar and pollen, which helps maintain and attract natural enemies. In some apple growing areas, a small parasitic wasp, *Aphelinus mali* (Eulophidae) attacks WAA. In those orchards which have low to moderate populations of WAA, *A. mali* can provide good control. The use of organophosphates, carbamates, and pyrethroids exclude parasitic wasps from the orchard.

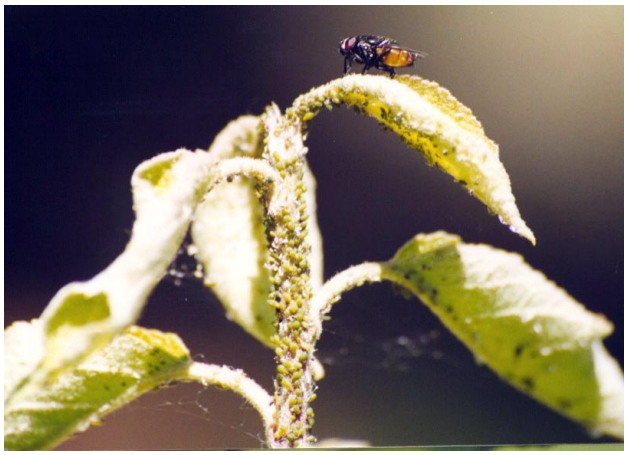
Cultural Controls

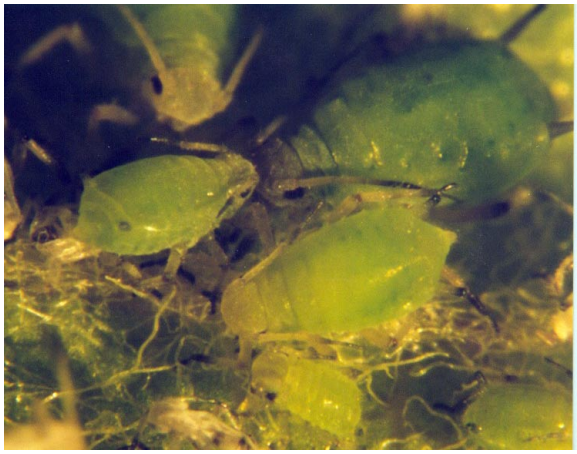
If replanting or starting a new orchard, plant resistant rootstock. The Malling Merton (MM) rootstock series, MM.106 and MM.111, have been bred to be resistant to WAA.

Chemical Control

WAA are easily controlled with broad-spectrum insecticides. In order to significantly increase insecticide efficacy, it is recommended a horticultural oil be added to the tank mix. Without horticultural oil the insecticide has difficulty penetrating the waxy covering of the colony.

Recommended Chemicals
Diazinon 50WP (diazinon)+*
Thiodan 50WP (endosulfan)+ *
Lorsban 50WP (chlorpyrifos)+ *
* horticultural oil





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