UNIVERSITY OF WYOMING
EXTENSION
B-1287
January 2016

Aphids in Alfalfa

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Shipher Wu (photograph) and Gee-way Lin (aphid provision), National Taiwan University - PLoS Biology, February 2010

Aphids are a pest commonly found in alfalfa. Because of their feeding behavior and rate of reproduction, aphids can become a serious problem.

Aphids feed on plant sap using piercing sucking mouthparts. Aphids are effective feeders because they secrete saliva into their feeding site, which blocks plant chemicals that would normally protect the plant from being eaten by insects.

Aphids reproduce asexually, allowing them to produce multiple generations per year. Aphids give birth to 6-7 live young per day, and 50-100 over their lifetime. This can lead to heavy infestation in a short time. When a plant gets overcrowded, aphids produce winged morphs that disperse through wind and air currents to nearby plants. In the fall, aphids begin to produce males and females that mate to lay overwintering eggs that will hatch in spring.

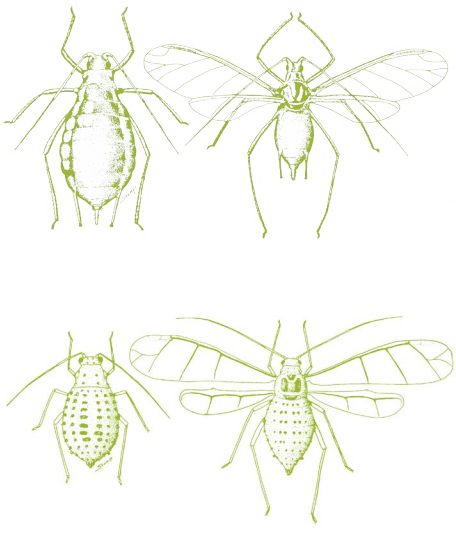
Aphids can...

Reduce Yield
Aphid infestations can stunt alfalfa growth and reduce the percentage of digestible dry matter. Aphids can also cause defoliation, leaf yellowing, and leaf curling in mature alfalfa. Damaged leaves are more susceptible to dropping from wind and touch. Heavy infestations of aphids can also cause significant damage, including seedling mortality.

Reduce Quality
Aphids produce honeydew, a sticky substance left on plants. In heavy infestations, honeydew can build up on swathers and baling equipment during harvest, requiring extra cleaning and maintenance. Honeydew is also an ideal substrate for sooty mold, which can reduce hay quality and marketability.

Vector Disease
The wounds aphids create through feeding are ideal places for infection by plant pathogens. For example, alfalfa mosaic virus can be transmitted by all four species of alfalfa-feeding aphids (see next page). Laboratory studies showed yield losses from alfalfa mosaic virus ranging from 45 to 68%.

Delay Seed Maturation
When alfalfa is grown for seed, aphid infestations may compromise seed maturation by delaying flowering or stripping florets.



Pea Aphid and Spotted Alfalfa Aphid.
Illustration by William Stump

Common Aphids in Alfalfa

Pea Aphids (*Acyrthosiphon pisum*)
- Up to1/4 inch long.
- Yellow-green color (although some pink morphs) with a dark antennal band around each antennae segment.
- Prefer cool, dry conditions and are problems in the spring during the first cutting and seed establishment, though may be present throughout the summer.
- Gather on terminal shoots, stems and leaves.

Blue Alfalfa Aphids (*Acyrthosiphon kondoi*) (not pictured)
- Less than 1/4 inch long.
- Resemble pea aphids but can be slightly darker with uniformly dark antennae.
- Prefer cool, dry conditions and are more active in the spring and early summer before the first cutting, or during seed establishment.
- Gather on new shoots and leaves but will move down the plant as populations become more crowded.
- Toxins secreted in saliva can cause serious damage to plants and are the reason the economic thresholds for these aphids are lower.

Spotted Alfalfa Aphids (*Therioaphis maculata*)
- Less than 1/8 inch long.
- Pale yellow color with, six rows of raised dark spots along its back.
- Prefer hot, dry conditions and will reproduce throughout the summer, becoming a problem in later cuttings and late summer seedlings.
- Feed on undersides of leaves, moving up or down the plant depending on humidity.
- Can cause further damage by injecting a toxin into the plant while feeding, which can lead to yellowing of leaf veins and leaf drop.

Cowpea Aphids (*Aphis craccivora*)
- Up to 1/4 inch long.
- Dark and shiny
- Active in early spring and late summer, dropping off when temperatures exceed 75°F.
- Feeds on young leaves, blooms, and stems.
- Only black aphids found on alfalfa.

Management

The most effective options for dealing with aphids in alfalfa include biological pest control, insecticides, and using resistant varieties of alfalfa.

Biological Pest Control

Aphids are just one piece of a complex community of insects in alfalfa. Insect interactions can have either positive or negative effects on the alfalfa crop. Effective natural enemies include predators and parasitoids that kill aphids and positively affect the crop.

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Predators
Aphid predators include lady beetles, brown lace wings, mites, damsel bugs, and syrphid fly larvae. These insects feed directly on aphids. For example, adult lady beetles can eat up to 50 aphids per day, and lady beetle larvae will eat their weight in aphids each day. A density of as few as 25 aphids per sweep can attract predators.

Parasitoids
These are predominately species of tiny wasps that kill their host in the process of parasitism. Parasitoids can be highly effective at reducing aphid populations. For example, in Australia, introduction of parasitoids saved farmers an estimated $2 million dollars per year by reducing the use of pesticides.

Community Interactions
Aphid populations can also indirectly affect populations of other alfalfa pests such as alfalfa weevil. Aphid honeydew is a sugary food source for parasitoids of alfalfa weevil. Therefore, higher aphid populations may be indirectly reducing alfalfa weevil populations by supporting their parasitoids. Aphid honeydew may also attract predators such as lady beetles. When choosing a management strategy, it is therefore important to consider not only how it will affect aphids, but also the rest of the alfalfa community.

Chemical Control

Insecticides

Another common method of aphid management is insecticide application; however, in the High Plains, aphids are not always found in large enough numbers to be considered an economic pest warranting use of chemical control. If insecticide applications are used, there can be both short- and long-term tradeoffs to consider. For example, during insecticide applications, aphids residing on the undersides of leaves may remain unaffected. Without predation or parasitism from their natural enemies, aphids are able to repopulate quickly. This can result in what are referred to as aphid flare-ups. In field studies in northern Colorado, fields previously treated with pesticides actually had higher aphid densities than those left untreated. Flare-ups have also been observed after insecticide treatment for alfalfa weevil. In addition, the quick reproductive cycle of aphids may also contribute to the development of insecticide resistance.

Scouting for Aphids

Sampling a field can help determine whether aphids are a problem and if action is necessary. Start by selecting five to six locations across a field. At each location, collect six alfalfa stems from randomly selected plants. Shake the stems into a pan or bucket and count the number of aphids. Take care when removing stems from plants, because aphids can easily drop off plants when disturbed. Use Table 1 to determine whether treatment is necessary based on the numbers you collect.

High Plains IPM Guide

This guide provides a table of insecticides approved for pea, blue and spotted alfalfa aphid during bloom or pre-bloom. It includes application rate, pre-harvest interval, remarks about pollinators, and is kept up to date.

This table can be found on the High Plains IPM website at: *wiki.bugwood.org/HPIPM:Pea_Aphid_Blue_Alfalfa_Aphid_Spotted_Alfalfa_Aphid*

Table 1. Treatment Thresholds for Aphids on Alfalfa

Plant Height	Pea Aphid	Blue Alfalfa Aphid	Spotted Alfalfa Aphid	Cowpea Aphid
Seedling	5 per stem	1 per stem	1-3 per stem	1-3 per stem
< 10 inches	40-50 per stem	10-12 per stem	10 per stem	40 per stem
> 10 inches	70-80 per stem	30-40 per stem	30 per stem	75 per stem
> 20 inches	100 + per stem	40-50 per stem	100 per stem	100 per stem

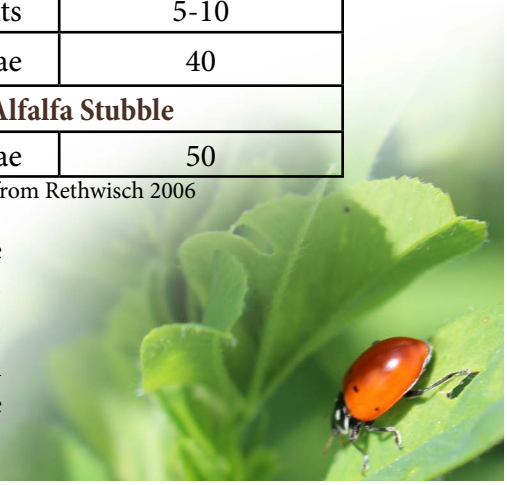
Adapted from: High Plains IPM Guide (http://wiki.bugwood.org/HPIPM:Pea_Aphid_Blue_Alfalfa_Aphid_Spotted_Alfalfa_Aphid) and Insect pest management in the western US (http://alfalfa.ucdavis.edu/+symposium/proceedings/2006/06-113.Pdf)

Besides counting aphids, keeping count of natural enemies such as lady beetles is also important for determining when to treat for aphids. Having a large enough ratio of lady beetles to aphids in your alfalfa fields may mean that no action is needed, as shown in Table 2.

Table 2. Treatment Thresholds considering Lady Beetles

Lady Beetles per sweep	Aphids per stem
On Standing Alfalfa	
1 or more adults	5-10
3 or more larvae	40
On Alfalfa Stubble	
1 or more larvae	50

Adapted from Rethwisch 2006



Resistant Varieties

Choosing an alfalfa variety that has resistance to aphids may reduce damage. Alfalfa cultivars have been bred with resistance to spotted alfalfa aphid, pea aphid, and blue alfalfa aphid. The National Alfalfa and Forage Alliance publishes an annual list of alfalfa varieties with information about their level of resistance to aphid pests. This list can be found online at *www.alfalfa.org*. It is also available in *Hay and Forage Grower* (NAFA).

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Funding from the Wyoming Agriculture Experiment Station Competitive Grants Program supported production of this document.

Issued in furtherance of extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, director, University of Wyoming Extension, University of Wyoming, Laramie, Wyoming 82071.