

Alfalfa Aphid Complex

(Blue Alfalfa Aphid, Pea Aphid, and the Spotted Alfalfa Aphid)

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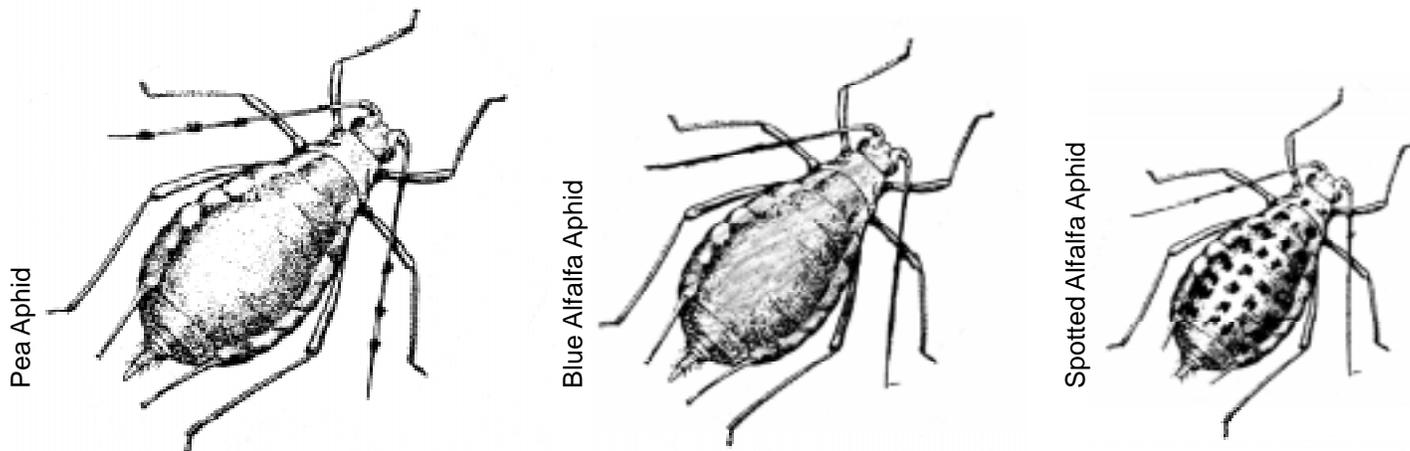
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Description and Biology of the Pest Complex

The pea aphid (*Acyrtosiphon pisum*) and blue alfalfa aphid (*Acyrtosiphon kondoi*) are very similar in appearance. They are typically 1/6 inch long and green in color. The antennae are used to distinguish between these two aphids. The pea aphid has narrow, dark bands at the tip of each antennal segment, whereas the blue alfalfa aphid has light green segments that gradually darken to the tip. Additionally, the pea aphid is characteristically yellowish green in color with a light brown thorax, shiny in appearance, and can be found over most of the plant. The blue alfalfa aphid is bluish green with a blackish brown thorax (if winged), waxy in appearance, and is typically found on young, tender shoots and terminal leaves of the alfalfa plant. Adult blue alfalfa and pea aphids may be wingless or may have transparent wings. Winged adults are far more common among blue alfalfa aphid populations. In contrast, the spotted alfalfa aphid (*Therioaphis maculata*) is a small pale yellow or grayish aphid with four to six rows of spined, black spots on its back. They are usually found feeding on the underside of leaves or on lower portions of the plant. Mature spotted alfalfa aphid females may be wingless or have wings with smoky areas along the veins.

Aphids are capable of asexual reproduction. Each female can produce live offspring at a rate of up to 12 per a day, but typically average five to six individuals per a day, depending on temperature. Aphids produce many generations per year. These aphids are exclusively asexual in southern Arizona. The pea aphid is capable of producing 12 to 15 generations per year, and the spotted alfalfa aphid can produce as many as 35 generations per year. The immature aphids, which closely resemble the adults, molt four times before reaching maturity. The developmental time from newborn nymph to adult is approximately six days at 75° F, depending on the species.

Although both the blue alfalfa and pea aphids do best at mild temperatures, the pea aphid is somewhat more tolerant of higher temperatures than the blue alfalfa aphid. Typically, blue alfalfa aphid populations build up earlier in the year, but taper off before the pea aphid population. The blue alfalfa aphid may be present in area fields as early as December, whereas pea aphid populations begin to increase in January and February. As temperatures begin to warm in spring, both aphid populations peak, usually in March. When temperatures become hotter in April and May, blue alfalfa and pea aphid populations are drastically reduced. However, pea aphid populations can remain high until early summer. In contrast, the optimum temperature for reproduction and development of the spotted alfalfa aphid ranges from 90 to 100° F, 20 to 30° F higher than the optimum temperature for development of the blue alfalfa and pea aphids. Under favorable conditions, spotted alfalfa aphid populations begin to build upon susceptible alfalfa varieties from November through February with peak populations in April, July, and October.



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Damage

Aphids feed in groups, often on the growing tips of plants. They have piercing-sucking mouthparts that extract the plant sap (phloem). Excess plant sap is excreted as a sticky material called honeydew. Severe aphid infestations can retard growth, reduce hay yield, and may even kill alfalfa plants. Damage can also reduce the alfalfa's feed value. Furthermore, a black fungus called sooty mold that grows readily on the honeydew excreted by aphids reduces palatability of the alfalfa hay. The pea aphid is the least serious pest of this complex, because it does not inject toxin into alfalfa plants as it feeds. Pea aphid damage is usually limited to cupping and curling of the leaves and severe burning of the foliage when populations are large. Blue alfalfa and spotted alfalfa aphid inflict more serious damage because they inject toxins into the plant as they feed. Toxins injected by the blue alfalfa aphid can stunt growth and cause yellowing of the entire plant. Infested plants have smaller leaves and shorter internodes than normal. The spotted alfalfa aphid injects a toxin while feeding on the alfalfa plant that causes vein clearing, yellowing, and severe stunting of plant growth. Susceptible plants can be killed when populations are heavy. Alfalfa that is stressed by lack of water or by cutting is not able to withstand as large an aphid population as healthy unstressed alfalfa.

Resistant Varieties and Biological Control

The most effective means of controlling pea and spotted alfalfa aphids is planting resistant varieties. CUF 101 is highly resistant (> 50% resistant plants) to spotted, pea, and blue alfalfa aphids. UC Cibola is highly resistant to spotted alfalfa aphid, resistant (31-50% resistant plants) to pea aphid, and has a low resistance (6-14% resistant plants) to blue alfalfa aphid.

Larvae of common lady beetles (primarily the convergent lady beetle, *Hippodamia convergens*) can attack and consume large numbers of aphids in alfalfa. The predominant aphid predator in area alfalfa is the convergent lady beetle. Parasitic wasps that are somewhat host specific also prey on alfalfa aphids. The predominate parasitic wasp species of the pea aphid is *Aphidius smithi*, while the major parasite of the blue alfalfa aphid is *A. ervi*, and the major parasite of the spotted alfalfa aphid is *Trioxys complanatus*. Golden brown aphid mummies attached to the leaves and stems of alfalfa plants indicates parasitic wasps are present and active. Lacewing larvae (*Chrysopa* spp.) and other generalist predators including Syrphid or hover fly larvae, bigeyed bugs (*Geocoris* spp.), damsel bugs (*Nabis* spp.), and minute pirate bugs (*Orius* spp.) also feed on aphids. Aphids also may be controlled by a naturally occurring fungal disease favored by high relative humidity and cool conditions.

Monitoring

When the blue alfalfa aphid and the pea aphid are present in the same field, it is important to determine the relative proportion of each species, because the blue alfalfa aphid can cause more serious damage than the pea aphid. This separation can be done easily by using a sweep net sample. The blue alfalfa aphid will cling to the sides of the sweep net more so than the pea aphid. Therefore, after one or two 180° sweeps are made, abruptly hit the net handle with the palm of the hand, or shake the net so that most of the pea aphids will fall to the bottom. The adult aphids remaining on the sides of the sweep net will be 90 to 95% blue alfalfa aphids, while those at the bottom of the net will primarily be pea aphids.

Generally, the sweep net does not provide adequate sampling for aphid population levels in alfalfa since it will not dislodge first or second instar nymphs feeding in small unopened new leaves. The most accurate method for sampling aphids is to count them directly. Check alfalfa plants in each of four field quadrants on at least a weekly basis, especially when aphids are expected to be abundant. In each quadrant carefully cut five individual alfalfa stems off at ground level with a sharp knife. Shake the stems or rap them sharply onto a clean white surface such as a white net, paper, or plastic bucket. This will dislodge most of the aphids that can easily be counted. While counting aphids, note the presence or absence of lady beetle larvae and parasitized aphid mummies. Further inspect each stem by prying open small new leaves and search the spaces between them for first and second instar nymphs that were not dislodged previously. Record the total number of aphids counted for each stem, and calculate the average number of aphids per stem.

When to Treat

There are a number of factors that should be considered when determining an action/economic threshold for alfalfa aphids:

- 1) Value of the commodity — when alfalfa hay prices are higher, economic thresholds are lower.
- 2) Plant height and age of the stand — the shorter the plant, the less aphid pressure it can withstand.
- 3) Beneficial insects — high numbers of lady beetle larvae, lacewing larvae, and parasitic wasps may provide adequate biological control. The presence of lady beetle larvae or adults at a ratio of approximately one lady beetle to 10 aphids can provide adequate natural control.
- 4) Weather and irrigation scheduling — irrigation and high relative humidity in the crop encourages the natural development of a fungus disease that can completely control aphids. Rain and overhead sprinklers can also reduce aphid numbers in alfalfa.

- 5) Cutting schedule — most aphicides have restrictions pertaining to harvest interval and number of applications per cutting.
- 6) Pest complex present — many times Egyptian alfalfa weevil (*Hypera postica*) populations are coincident with aphids and further the need for insecticidal control.
- 7) Species of aphid present — the three aphid species have different thresholds depending on their potential severity. The spotted alfalfa aphid has the lowest treatment threshold, followed by the blue alfalfa aphid, and the pea aphid, respectively. If both blue alfalfa and pea aphids are present, use blue alfalfa aphid treatment thresholds. The following treatment thresholds have been suggested for southern California:

Aphid	Alfalfa Height	Aphids/Stem
Blue Alfalfa Aphid	< 10 inches	10 to 12
	> 10 - 12 inches	50 to 60
Pea Aphid	< 10 inches	40 to 50
	10 - 20 inches	70 to 80
	> 20 inches	100
Spotted Alfalfa Aphid*	seedling (spring)	10 to 20
	established (spring)	40
	established (summer)	20
	established (fall)	50 to 70

* Treat seedling fields with less than five true leaves when one adult spotted alfalfa aphid per seedling and established fields when five to six spotted alfalfa aphids per trifoliate leaf are found.

Currently Registered Aphicides For Arizona Grown Alfalfa Hay

Insecticide	Preharvest Interval	Other Restrictions/Remarks
Carbofuran (Furadan)	½ pint = 7 days 1 pint = 14 days 2 pints = 28 days	One application per season. Move bees for seven days.
Chlorpyrifos (Lorsban)	½ pint = 7 days 1 pint = 14 days 2 pints = 21 days	One application per cutting. Four applications per season
Cyfluthrin (Baythroid 2)	7 days	One application per cutting. 11.2 fluid oz/acre/season limit.
Cyhalothrin (Warrior)	7 days	Move bees two to three days 0.96 fluid pt/acre/season limit
Dimethoate (Digon, Dimate)	10 days	One application per season. Do not apply during bloom.
Malathion (Cythion)	0 days (EC) 7 days (Cythion)	Do not apply when bees are working fields.
Methomyl (Lannate)	7 days	Ten applications per crop (3.6 lbs. a.i./acre/crop).
Methyl Parathion (Pencap-M)	15 days	Do not apply during bloom. Hazardous to bees.
Permethrin (Ambush, Pounce)	<0.1 lb. a.i. = 0 days >0.1 lb. a.i. = 14 days	0.2 lb. a.i./acre/ cutting limit. Toxic to bees and fish (see label).

References

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