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Cotton Aphids

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In Texas, three species of aphids, or plant lice, feed on cotton plants as secondary pests: the cotton aphid, the cowpea aphid, and the green peach aphid (Fig. 1). Secondary pests, such as aphids, become a serious problem when broad-spectrum insecticides targeted at primary pests disrupt natural control. The resulting larger aphid populations damage cotton by sucking sap from plants, stunting plant growth and yield, and fouling leaves and bolls with honeydew—all of which translates into economic loss for cotton producers.

Description

Green peach aphids, *Myzus persicae,* are light green or pink and can occur on cotton seedlings early in the growing season. The cotton aphid, *Aphis gossypii,* and the cowpea aphid, *Aphis craccivora,* are the only species that establish sustainable, reproductive colonies during most of the growing season. Common on seedling plants, the cowpea aphid is shiny black with white patches on its legs. The nymphs of the cowpea aphid are ash-gray.

Cotton aphids are the primary aphid species of concern in cotton. Their color varies from light yellow to dark green or almost black. However, unlike cowpea aphids, cotton aphids are not shiny and can occur anytime during the growing season.

Although size and color can differ based on environmental conditions, adult aphids tend to be about 1/16 inch long, soft-bodied, and pear-shaped. Aphids have piercing-sucking mouthparts and those that infest cotton have two protrusions (cornicles) at the back of the

Figure 1A. Cotton aphids. *Source: Xandra Morris, Texas A&M AgriLife Extension Service*

Figure 1B. Cowpea aphids feeding on weedy kochia. *Source: Andrew Jensen, BugGuide.net*

Figure 1C. Green peach aphid adult. *Source: Jim Baker, North Carolina State University, Bugwood.org*

abdomen. Aphid adults can be winged (alate) or wingless (apterous). Winged types usually develop in response to overcrowding or poor host quality. The immatures or nymphs look similar to the adults but smaller.

Life cycle

Aphids reproduce prolifically. Those found in cotton reproduce asexually, giving birth to live young without mating. (No male aphids have been reported in Texas cotton.) Nymphs are born with developing embryos already present—essentially, aphids are born pregnant and give birth to genetic clones of themselves. One female may produce as many as 80 young females that mature within 8 to 10 days. It is possible for aphids to have as many as 50 generations a year. Under optimum conditions, these generations can occur as often as every 5 to 7 days.

In the growing season, aphids usually appear on the undersides of leaves (Fig. 2), on stems, in terminals (Fig. 3), and on blooms and fruit.

Figure 2. Cotton aphid colony on the underside of a cotton leaf. *Source: Xandra Morris, Texas A&M AgriLife Extension Service*

Figure 3. Aphid colony on a plant terminal. *Source: Suhas Vyavhare, Texas A&M AgriLife Extension Service*

Damage

Aphids suck phloem sap and its sugars from the plant, robbing it of energy otherwise used for growth or fruit production. Heavy and prolonged infestations can cause leaves to curl downward (Fig. 4), older leaves to turn yellow and shed, squares and small bolls to drop off, and smaller bolls to develop, resulting in incomplete fiber development.

A small number of aphids in a cotton field can be a good thing. Aphids are the favored prey of many insect predators, and attracting these predators into a field could help manage other pests such as bollworms and budworms.

Because the food source aphids feed on is rich in sugars yet poor in amino acids, they must ingest more sugary sap than needed to

Figure 4. Leaf curling caused by an aphid infestation. *Source: Xandra Morris, Texas A&M AgriLife Extension Service*

Figure 5. Honeydew on cotton leaves. *Source: David Kerns, Texas A&M AgriLife Extension Service*

filter enough amino acids for optimal nutrition. To rid themselves of excess sugar, they excrete copious amounts of sugars, forming a sticky-sugary substance called honeydew. With heavy aphid populations, honeydew collects on the leaves, giving them a shiny, sticky appearance (Fig. 5). A black, sooty mold grows on the honeydew, covering the leaf and inhibiting photosynthesis.

Late in the growing season and once open bolls are in the field, honeydew can accumulate on the lint of the open bolls. Even under low infestation levels, cotton aphids can excrete enough honeydew to contaminate the lint, causing "sticky cotton" that causes significant loss of fiber quality and costly problems at the textile mill. Mills are reluctant to buy and may reject contaminated lint; any confirmed "sticky cotton" brings a serious price reduction.

Management and decision making

Cultural management. Aphid populations tend to be larger in clean-till or conventional-till production systems compared to crops planted into small grains or sorghum residue.

The planting date can greatly influence the risk of developing abundant aphids. In general, higher aphid numbers tend to develop in late-planted cotton than in early plantings.

A uniform stand can also play a role. Aphids are likely to be more prevalent in "skippy" stands or cotton planted in a skip-row pattern.

Avoid excessive nitrogen. Nitrogen compounds are the staple of aphid nutrition; too much nitrogen makes the cotton a more nutritionally suitable host, and the aphids thrive in greater numbers.

Biological control. Predators, parasitoids, and aphid-killing fungi are often the most effective tools for managing an aphid population. These beneficial organisms can effectively prevent aphids from reaching the action threshold, or can quickly reduce the aphid population to sub-threshold levels. When possible, avoid killing these natural enemies when treating for other pests such as cotton fleahoppers, bollworms, or lygus bugs.

Lady beetles are usually the most notable aphid predator in cotton (Fig. 6). Research conducted by the University of Arkansas demonstrates that once a lady beetle population reaches 0.3 adults or 0.2 larvae per 1 row-foot, the aphid populations usually decline within a few days.

Figure 6. Adult lady beetle. *Source: Pat Porter, Texas A&M AgriLife Extension Service*

The parasitoid *Lysephilebus testaceipes,* a small wasp about 1/16 inch long, lays a single egg in an aphid. The egg hatches and, as it grows, the wasp larva feeds on the internal structures of the aphid. Each swollen, parasitized aphid (mummy) produces a single parasitoid—the new wasp that eventually emerges from the dead husk of their aphid host.

Another natural control agent is *Neozygites fresenii,* a fungus that infects and kills aphids. It is most prevalent under humid conditions, but can grow in drier areas under dense, shady plant canopies. This fungus can quickly reduce an aphid population to very low numbers.

Because the parasitoid and the fungus need relatively high aphid populations to develop an epizootic (disease outbreak in an animal or insect population) widespread enough to control an aphid population, these agents often arrive when the aphid population is near or has exceeded the action threshold. However, if the aphid population contains 20 percent mummies or fungal-infected aphids, the population will decline sharply within a week.

Scouting. Although honeydew accumulation on the leaves is an easy way to detect an aphid infestation, it is not always a reliable tool. Rain and overhead irrigation can wash honeydew from the leaves so that the presence of sticky plants might not accurately indicate the density and overall health of the aphid population.

While scouting cotton fields, randomly check several upper, middle, and lower leaves across the field. Because the aphids reproduce so rapidly, once you detect cotton aphids, scout fields twice a week.

To determine the infestation level,

- Sample a total of 60 leaves divided between the top, middle, and lower portion of the plants across the field.
- Count the number of live aphids (do not count cast skins), mummies, and fungus-killed aphids on each leaf.
- Calculate the average number of live aphids per leaf, and the percentage killed by either the wasps or fungi.
- If aphid numbers are approaching threshold, also estimate the number of lady beetles.
- Once the aphid numbers are near threshold, scout again in 48 hours to determine whether the aphid population is declining.

Chemical control and action thresholds.

Early season. Aphids in preblooming cotton, from emergence to first bloom, rarely develop to economically damaging levels, and many insecticidal seed treatments can affect aphids for up to 30 days after planting. Until bloom stage, consider light aphid populations as an important food source for natural enemies such as lady beetles and parasitoids, allowing those populations to build. Avoid insecticide treatments for aphids in preblooming cotton unless you have very high aphid populations. The insecticides you use for early season pests (thrips and cotton fleahoppers) can influence both aphid and natural enemy populations. Select an insecticide that controls the pest you are targeting but has the least detrimental impact on natural enemies.

Mid season. Use the action threshold and natural enemy considerations to determine the need for an insecticide application. Adhering to the threshold lets parasitoids and predaceous insects, such as lady beetles, control the aphid populations and you might not need to use insecticides.

Table 1. Aphid Action Threshold

Cotton stage	Action threshold
Prior to first cracked boll	40–70 aphids per leaf*
After first cracked boll	10 aphids per leaf**

*Higher the yield potential (>1000 lbs lint/acre), lower the threshold
**Where rainfall is not likely to wash honeydew from the lint

When maturing grain sorghum or corn fields are nearby, natural enemies often move into cotton where aphid populations are increasing. If the number of mummies or fungus-killed aphids is 20 percent of the total aphid population (live and dead aphids), or if the lady beetle population reaches 0.3 adults or 0.2 larvae per 1 row-foot, then an insecticide application may be unnecessary.

Consider alternatives to pyrethroids for managing pests such as bollworms and lygus bugs when aphids are present. Pyrethroids can flare aphid populations. Avoid using excessively low rates of aphicides and concentrate on providing good treatment coverage.

Cotton aphid infestations develop on the undersides of leaves throughout the plant canopy. Thorough top-to-bottom coverage through increased spray volume and nozzle selection is important. Use drops on ground application equipment, a minimum of 10 gallons total spray volume per acre for ground equipment, and 5 gallons per acre by air. Some aphicides perform better when you apply them with crop oil concentrate, but others may perform worse. Carefully follow the product label suggestions.

Cotton aphids are known for developing resistance to insecticides. Repeated use of the same insecticide chemistry can reduce aphid response to similar insecticides used later in the season. Avoid exposing an aphid population to multiple applications of the same class of insecticide, regardless of the initial target pest. For example, if you treat for cotton fleahoppers with an organophoshate insecticide and aphids are present in the field, and 2 weeks later you need to treat for aphids, avoid using an organophosphate; choose an alternative chemistry.

Late season. Avoid sticky cotton once bolls open. Low infestation levels of cotton aphids can excrete sufficient honeydew to contaminate the lint of open bolls and create significant and costly problems at the textile mill. Mills are reluctant to buy and may even reject contaminated lint.

Factors that increase late-season aphid populations include late irrigations or rainfall events, plant regrowth, insecticide applications (especially pyrethroids), and cotton treated with boll openers containing the active ingredient, Ethephon. Timely rainfall of at least 1/4 inch or more can reduce honeydew deposits. Configure center pivot irrigation systems for above-canopy application or, in a LEPA system, for drops that give upward

Table 2. Suggested Insecticides and Rates for Managing Aphids in Cotton

Insecticide (trade name)	Amount of formulated product (fl oz or oz per acre)	Lb of active ingredient per acre	Acres treated per gal or lb of formulated product	Mode of action group (*IRAC)
Flupyradifurone (Sivanto 200SL)	7.0–10.5	0.0913–0.137	18.29–12.19	4D
Flonicamid (Carbine 50WG)	1.4–2.8	0.044–0.089	11.43–5.71	29
Acetamiprid[1] (Intruder Max 70WP/Strafer Max)	0.6–1.1	0.025–0.05	26.67–14.55	4A
Dicrotophos[1], [@](Bidrin 8EC)	4.0–8.0	0.25–0.5	32–16	1B

[1]Rates will vary depending on product formulation.
[@]Suppression only
*IRAC = Insecticide Resistance Action Committee (1B = Organophosphates, 4A = Neonicotinoids, 4D = Butenolides, 29 = Flonicamid)

penetration of water into the plant canopy. Whether rainfall or irrigation reduce honeydew contamination below troublesome levels depends upon the initial contamination level, and multiple water applications may be necessary. If aphids remain on plants during or after rain or irrigation, the lint remains susceptible to further contamination.

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