Cotton Aphid: *Aphis gossypii*

Cotton aphids are considered secondary pests of cotton, because they rarely reach damaging levels unless the predators and parasites that attack them are destroyed by insecticide treatments applied to control other pests. When aphid populations are "released" from this natural biological control they increase rapidly and can quickly build to high populations.

Biology: Although cotton aphids overwinter as eggs in more northerly regions, this rarely occurs in the Mid-South. Here, cotton aphids continue to reproduce and grow throughout the winter, although at much slower rates, on available on winter weeds. Eggs are only produced as a result of mating, and male cotton aphids are uncommon in the Mid-South. Unmated female cotton aphids reproduce parthenogenetically (without mating), giving birth to live female nymphs. These nymphs become mature within five to seven days and begin producing young of their own. A female aphid will produce as many as 80 offspring during her life, and aphids can complete a generation in as little as four to five days, so the extremely rapid reproductive potential of this pest is obvious.

Fortunately, cotton aphid populations are normally kept in check by a number of predators, such as lacewings and lady beetles, and parasitoids. Of the parasitoids, the most important is a tiny wasp known as *Lysiphlebis testacipes*, which lays its eggs inside live aphids. The immature wasp larva develops inside the aphid, killing it, and eventually emerging as an adult wasp. Interestingly these wasps also reproduce parthogenetically, which helps them keep pace with aphid population development.

When cotton aphid outbreaks do occur in the Mid-South, they are eventually controlled by another beneficial organism, the naturally occurring fungal disease, *Neozygites fresenii.* Once this disease begins to occur in cotton aphid populations it spreads quickly, resulting in dramatic crashes in aphid populations. Once aphid populations crash due to an epizootic of this disease, they usually remain suppressed for the remainder of the season. Occasionally aphid populations will begin to resurge during late season, but, usually, they are quickly suppressed by another disease outbreak.

Damage: Aphids have piercing-sucking type mouthparts, which they use to suck sap from the host plant. Because plant sap has a very high carbohydrate content, but is relatively low in protein, aphids must consume large amounts of sap in order to meet their protein needs, much more than they need to meet their carbohydrate requirements. At times, aphids may consume an amount of sap equal to their own body weight in only an hour. Aphids have a specialized digestive system that allows them to excrete large amounts of sap and excess sugars without digesting them. The fluid that is excreted in this manner is know as "honey dew", and it has a very high sugar content.

Aphids damage to cotton in several ways, but they do not feed directly on squares and bolls. Thus the damage that they cause in considered "indirect damage". The most important damage is the removal of sap from the plant, which takes resources from the plant that it would otherwise use for growth and development. When aphid populations are high enough, this loss of sap can significantly affect plant growth and development, resulting in stunted plants.

In addition, when aphids feed on the underside of a leaf with their piercing-sucking type mouthparts, they cause a certain amount of mechanical damage to developing cells and clogging and disruption of the vascular system. When this damage occurs on leaves that are still growing, leaves are often distorted and tend to curl downward at the margins. This downward curling occurs because aphids feed primarily on the undersides of leaves. Because cells on the underside of the leaf are injured by aphid feeding, while those on the upper leaf surface are not, the upper leaf surface grows faster than the lower surface, causing the expanding leaf to curl downward.

The honeydew that aphids produce accumulates on the leaf surfaces, initially forming a shiny, sticky coating. Because of its high sugar content, this honeydew supports the development of sooty mold fungi. Sooty mold fungi do not invade the plant and do not cause plant disease. However, the accumulation of large amounts of sooty mold, which forms a dark coating over the leaf, can reduce light penetration and interfere with photosynthesis. Overall however, sooty mold may be more beneficial than harmful, because it eliminates honeydew. When honeydew is deposited on open lint it results in "sticky cotton", which can result in price discounts because it causes difficulties in milling. Fortunately, sticky cotton is seldom a problem in the Mid-South.

Yield Effects: As with most insects that cause indirect damage, it takes relatively high populations of aphids to adversely affect yield. Additionally, the impact of aphids on cotton yield can vary greatly under different environmental conditions. Plants that are growing under severe stress conditions, such as drought, are generally more susceptible to aphid-induced yield loss than are plants growing under optimal conditions. For these and other reasons, there is considerable range in the amount of yield loss that cotton aphids have been shown to cause in cotton.

Many studies have reported no yield loss from aphid populations that exceeded 100 aphids per leaf. However, some reports have indicated that yield reduction resulted from aphid populations as low as 35 aphids per leaf. Other studies have demonstrated yield reductions as high as 125 lbs. of lint per acre due to aphid populations that exceeded 200 aphids per leaf. One Mississippi study documented a yield reduction of 220 lbs of lint for an infestation that exceeded 800 aphids per leaf and persisted for more than three weeks.

Control: Although outbreaks of cotton aphids are always controlled by epizootics of the *Neozygites* fungal disease, this may not always occur soon enough to prevent yield loss. Foliar applied insecticides are recommended when aphid populations reach damaging levels (50 to 100 aphids per leaf) and there is no evidence that the fungal disease is present in the field.

Cotton aphids are difficult to control for a number of reasons. Their overall biology is favorable to the development of insecticide resistance, and cotton aphids have developed resistance to many cotton insecticides. Because they are distributed throughout the plant canopy and feed primarily on the undersides of leaves, only systemic insecticides will provide the type of "coverage" necessary to control cotton aphids. In addition, their high reproductive potential allows them to rebound quickly following insecticide treatments, especially if the treatment is also active against the predators and parasitiods of aphids. Unless a treatment provides a high level of initial control, the rebounding populations may reach higher numbers than they would

have in the absence of treatment. In addition, because the *Neozygites* fungal disease develops in a density dependent fashion, insecticide treatments may delay the development of disease epizootics. Treatments recommended for control of cotton aphids are listed in Table 4. In past years, these treatments have proven effective in suppressing cotton aphid populations until the fungal disease becomes established. This usually occurs during early to mid-July.

Table 4: Insecticides Recommended for Control of Cotton Aphids

Insecticide	Trade Name	Lbs ai/acre
Dicrotophos	Bidrin	0.3 to 0.5
Imidacloprid	Trimax	0.047
Thiamethoxam	Centric	0.05
Acetamiprid	Intruder	0.05

Source: Cotton Insect Control Guide, 2003, Publication 343, Mississippi State University Extension Service

Cotton Aphids: Cotton aphids are small, slow moving, highly prolific insects that feed primarily on the underside of cotton leaves. Both winged and wingless forms of adult aphids can be seen in this photo, along with nymphs and the white shed skins that are cast as aphids grow. The two black tail-pipe like structures protruding from the back of the abdomen of cotton aphids (see photo below) are known as cornicles, and are a useful character in aphid identification.