# INTERACTION OF COTTON NITROGEN FERTILITY PRACTICES AND COTTON APHID POPULATION DYNAMICS IN CALIFORNIA COTTON

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**Introduction:**

During the last 10 years, the cotton aphid (*Aphis gossypii*) has developed from a non-pest to one of the most significant insect pests of California cotton. For instance, in 1997, cotton aphid outbreaks were severe and an estimated 3.5% yield loss occurred despite ~$40/acre control costs which were incurred. Cotton aphid infestations during the mid-season (July to mid-August) reduce cotton lint yields since the aphids act as a significant sink, competing with the bolls, for energy. The late-season infestations (mid-Aug. to Sept.) are problematic because the aphids deposit honeydew on the exposed cotton lint, which reduces the lint value. Reasons for this change in pest status of cotton aphid are unclear; however, one of the most noticeable changes in cotton production over the last 10 years is the use of a plant growth regulator instead of irrigation and nitrogen deficits to limit early-season cotton vegetative growth. This has allowed cotton production practices in the SJV to evolve to higher nitrogen fertilization and irrigation inputs.

Host plant conditions including high nitrogen and adequate moisture are generally optimal for aphid population growth and development. Small plot research by Cisneros and Godfrey in 1997 and 1998 at the Shafter Research and Extension Center verified that there were more cotton aphids on cotton in a 200 lbs. N/A compared with 50 lbs. N/A treatment. The idea of balancing the amount of nitrogen needed for optimal cotton yield with the level required to mitigate cotton aphid population build-up is the goal of this project. Utilizing cultural control measures such as nitrogen management could play an important role in cotton aphid management. Biological control, predators and parasites, of mid- and late-season aphid outbreaks is only moderately effective. Relying on insecticides for aphid control adds undesirable production costs and also promotes the development of insecticide resistance in this aphid pest. Therefore, additional non-chemical control measures would fill an important void.

**Project Description:**

Two studies were conducted in 1999 at the Shafter Research and Extension Center to further examine the interaction of nitrogen level and aphid populations in cotton. Aphid levels were monitored in plots containing treatments of 0, 50, 100, 150, and 200 lbs. N/A; superimposed across these treatments was the application of either Capture® or Provado® (or untreated). Both high nitrogen and application of Capture have been shown to increase aphid population levels; however, the interaction between these factors has not been evaluated. Treatments were applied in mid-August as the aphid populations began to develop. At the end of August, populations appeared to be increasing, but at that time the season was moving out of the "mid-season" period

for cotton (which was the target for this study) and into the late-season. Cotton aphids can also be a pest during the "late-season" for cotton, but the nitrogen regimes that were set-up have likely largely equilibrated at that time. Data are still being collected and summaries have not yet been prepared.

For the second study, a detailed examination of the mode through which nitrogen influences cotton aphid populations was conducted. Cotton aphids from a laboratory colony were used and infested into cotton plots within mesh bags. Five aphid adults were confined on to a 4th main stem node leaf and allow them to deposit aphid nymphs for 1 day before removing adults. Data were collected such that we can examine the effects of the nitrogen regime on percentage aphid survival, length of survival, length of reproduction period, number of offspring produced, etc. This will allow us to determine and separate the exact effects of nitrogen on cotton aphid biology.

These studies were conducted in small plots (4 rows x 20 feet) with differing nitrogen rates (ammonium sulfate) of 0, 50, 100, 150, 200, and 250 lbs. N/A, 200 lbs. N/A split into 4 applications of 50 lbs. each, 200 lbs. N/A + 100 lbs./A of potassium, and 200 lbs. N/A (urea form). Data are still being summarized, but preliminarily aphid survival and reproduction was significantly less in the 0 and 50 lbs. treatments compared with the higher rates.