National Soil Dynamics Laboratory

Fall 2025

Highlights

USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

First Genetic Evidence Confirms Cotton Jassid in the United States

The cotton jassid, also known as the two-spot leafhopper, is a tiny leafhopper native to Asia. Adults often show two dark spots on their forewings, a distinctive feature used to help with field identification. In Asia and Africa, it is considered a serious pest of several crops, including cotton, okra, and eggplant. This insect feeds on plant sap, and heavy infestations can lead to significant yield losses. Damage often appears as "hopperburn", characterized by yellowing, curling, and bronzing of leaves that weakens plants. Due to its destructive potential, the spread of this pest has raised growing concern among farmers and agricultural specialists. Greenhouse tests showed heavy infestations can cause entire cotton seedlings to wilt and stop growing (Fig. 1).

In 2023, the cotton jassid was morphologically identified in Puerto Rico – the first report in the Western Hemisphere. Since then, reports based on field observations have emerged from several southeastern U.S. states, including Florida, Georgia, Alabama, and South Carolina, though none had been verified by genetic analysis.

In August 2025, we observed a suspected cotton jassid infestation in a cotton field in Macon County, Alabama, where plants displayed hopperburn symptoms such as leaf discoloration and curling (Fig. 2A). Nymphs (immature stages) and adults were collected from the infested field, with adults showing the two dark spots on their forewings (Fig. 2B-C).

To confirm their identity, we analyzed the specimens using DNA barcoding. The U.S. sequence shared over 99% identity with reference sequences from cotton jassids collected in Asia, and all clustered together with strong support in phylogenetic analysis, confirming that the specimens from Macon County were indeed cotton jassids. Likely due to their recent invasion, low population density, and the fact that cotton had already fruited, no noticeable yield losses were observed at the time of collection.

This finding represents the first genetic confirmation of the presence of the cotton jassid in the United States and highlights the urgent need for close monitoring and early detection efforts in U.S. cotton-growing regions. Timely action will be critical to slowing the spread of this invasive pest and protecting crop yields in future seasons.

Fig. 1. Heavy infestation of cotton jassids in the greenhouse caused leaf wilting and stunted plant growth.

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Dynamically Speaking

H. Allen Torbert
Research Leader

As we approach the end of 2025, I believe that the National Soil Dynamics Laboratory had another successful year of agriculture research. We look forward to fulfilling our primary mission in 2026 which is to solve problems for farmers in the southeast USA. I would like to note some changes in our staff. This summer Dr. Ted Kornecki retired after a very successful career as a Research Agricultural Engineer. Dr. Kornecki's research was greatly respected and internationally recognized for equipment development for conservation systems (including 8 patents). Much of his research was focused on developing no-till tools for small, limited resources farms. Details regarding some of his designs can be seen on the NSDL website. We wish him the best in his retirement. I hope you enjoy reading about some of the research efforts we have included in this issue of NSDL Highlights.

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… Jassid continued

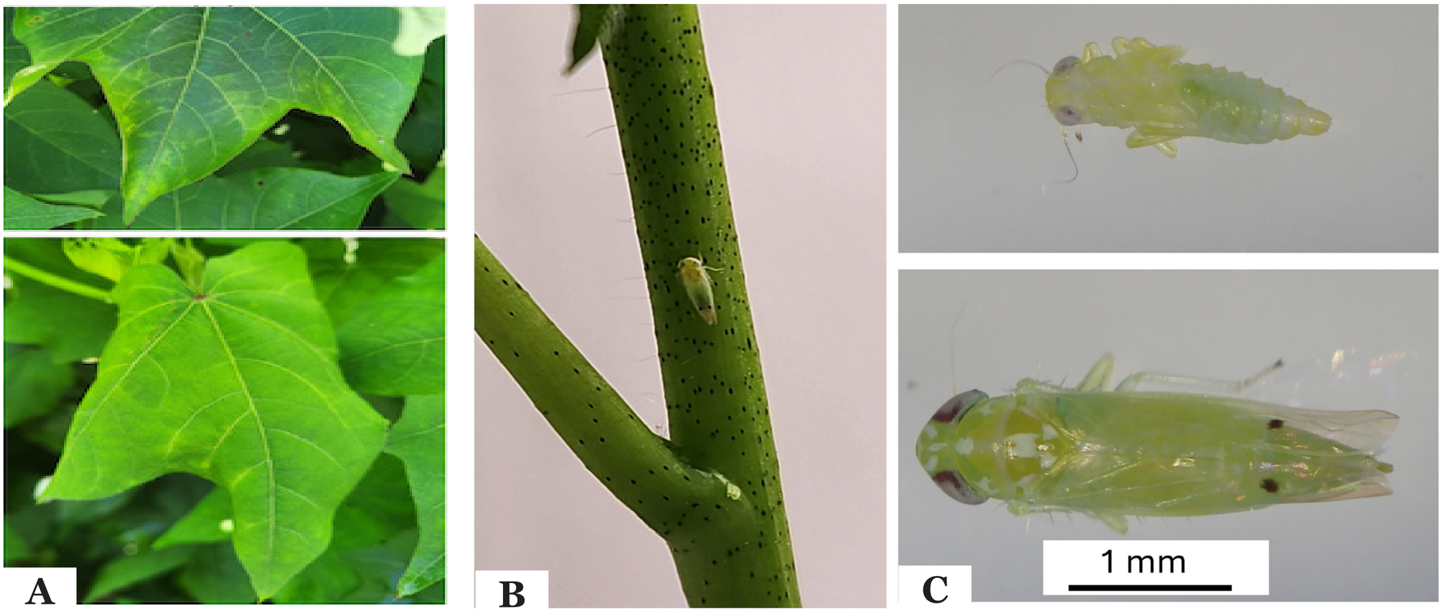

Fig. 2. (A) Cotton leaves showing hopperburn symptoms with marginal discoloration (top) and leaf curling (bottom). (B) Adult cotton jassid on a cotton seedling. (C) Magnified views of a cotton jassid nymph (top) and adult (bottom).

Recent Selected Publications

All our publications are available on our website: http://www.ars.usda.gov/sea/nsdl

Adesemoye, A.O., Antony-Babu, S., Nagy, E.M., Kafle, B., Gregory, T.A., Xiong, C., Fadamiro, H.Y. 2025. Bacteria-based artificial diets modulate larval development, survival and gut microbiota of two insect pests. Biological Control. 205:105769. https://doi.org/10.1016/j.biocontrol.2025.105769.

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Tillage and Atmospheric CO_2 Effects on Rainfall Runoff

Soil erosion is the most important global problem plaguing agriculture production worldwide. Minimal tillage and cover cropping can increase residue accumulation, which will help improve infiltration and reduce runoff. This will also help minimize erosion by protecting soil while improving water conservation. The well documented rise in global atmospheric CO2 may be beneficial since elevated CO2 has also been shown to increase crop residue production. However, there remains a lack of information regarding how conservation tillage practices and its interaction with atmospheric CO2 will impact infiltration, sediment and nutrient loss, and runoff in agricultural systems exposed to an extreme rainfall event.

Following a 10-year study, a rainfall simulation (Fig. 3) examined the impacts of atmospheric CO2 level (ambient and twice ambient) and tillage system (conventional tillage and no-till) on a Decatur silt loam (clayey, kaolinitic, thermic Rhodic Paleudults). Conventional tillage was a sorghum and soybean rotation using spring tillage and winter fallow, while the no-till system used this same rotation with three rotated cover crops (crimson clover, sunn hemp, and wheat).

Fig. 3. Photograph of the rainfall simulation system.

Elevated atmospheric CO2 led to more residue production in both tillage systems; this effect was greater under no-till conditions. More residue improved water infiltration only in the no-till system (Fig. 4). Regardless of CO2 level, sediment loss was lower under no-till, and elevated CO2 reduced sediment loss in the conventional tillage system. No-till reduced sediment loss in addition to C, N, and P lost in sediment. No-till also reduced runoff water volume and N and P losses in this runoff. Results indicated that both no-till management and high CO2 increased surface residues that improved water infiltration, reduced sediment and runoff losses as well as nutrients lost in sediment and runoff water. These results suggest that farmers who practice conservation agriculture are likely to lose less soil to rain-induced erosion and retain healthier soils. Given the effects of elevated CO2 in this study, farmers could experience benefits in terms of increased infiltration, reduced runoff, and loss of nutrients as the CO2 concentration in the atmosphere continues to rise, even in conventional tillage systems.

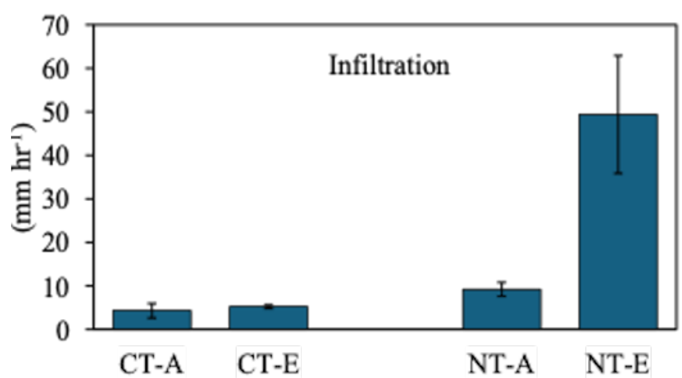

Fig. 4. Rainfall simulation infiltration following a 10-year study examining effects of tillage system and atmospheric CO2 concentration on crop growth. Data represents means (n=3) ± standard error. Treatments were conventional tillage (CT) and no-tillage (NT) under elevated CO2 (E) and ambient CO2 (A).

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Upcoming Events 2026		
Dates	***Meeting***	***Location***
Jan 7 - 9	Beltwide Cotton Conference	San Antonio, TX
Jan. 15	Georgia Peanut Farm Show	Tifton, GA
Jan. 20 - 21	Alabama Row Crops Short Course	Prattville, AL
Jan. 29	Alabama-Florida Peanut Trade Show	Dothan, AL
Feb. 5 - 6	29th Annual National Conservation Systems Cotton & Rice Conference	Jonesboro, AR
Feb. 25 - 26	Southern Cover Crops Conference	Gainesville, FL

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The Future of Biologicals for Crop Production is Here

Previously, stakeholders commonly referred to biological/microbial-based products as promising future technologies in agriculture. Now, the future is here as evidenced by the market available products and ongoing huge investments in the microbial product portfolio of most big ag companies. Biological products, particularly microbials, use beneficial microbes alone or combined with plant nutrient sources for better nutrient uptake and more recently, biological control function may be integrated with plant nutrient efficiency function in some products. These tools need continuous development to accelerate global agriculture's transition toward efficient fertilizer and pesticide usage that will result in increased sustainability for agricultural production.

In the fore front of microbial technology is a bacteria group termed plant growth-promoting rhizobacteria (PGPR). Through cross-team collaborations, we are conducting greenhouse and field studies to investigate utility and efficacy improvement of biologicals in forage production with different grasses. We used recommended rates of chemical fertilizer and poultry litter (PL) as benchmarks while combining a consortium of PGPR with different reduced rates of fertilizer or PL that push the boundaries of the usability of the technology.

Over the past couple of years, a PGPR consortium consisting of four Bacillus/Lysinibacillus PGPR strains are continuously being evaluated in greenhouse and field studies. Repeated factorial greenhouse studies have tested the effects of the PGPR consortium on germination and seedling vigor of four forage grass species at two temperature regimes (Fig. 5). The forage grasses examined included annual ryegrass, tall fescue, bermudagrass, and Bahia grass while the temperatures were 21°C and 32 °C. We found that PGPR significantly increased seedling length and vigor index after a temporary initial delay in germination. The temporary delay was possibly because of the effect of PGPR colonization on seed metabolic processes during imbibition. Notably, the impact of PGPR was greater on cool-season grasses (ryegrass and tall fescue) where at the lower temperature (21°C), between 25-36% improvement in length and 23-26% improvement in vigor index were recorded.

In another greenhouse study, we supplemented reduced rates of PL with PGPR consortium in a randomized complete block design and investigated if we could achieve more efficient uptake of nutrients from PL as well as good growth without compromising yield in annual ryegrass and tall fescue. We found a significant enhancement of plant height, tiller number, shoot and root biomass, and root traits with reduced PL plus PGPR. These results suggest that PGPR can enhance seedling growth and mitigate stress in cool-season forage grass. Further studies are ongoing in the lab, greenhouse, and fields for better understanding of the mechanisms and how PGPR efficacy may be improved for consistency. There is no need to choose between productivity/profit and agricultural sustainability when we can have both, if microbial strategies were properly implemented.

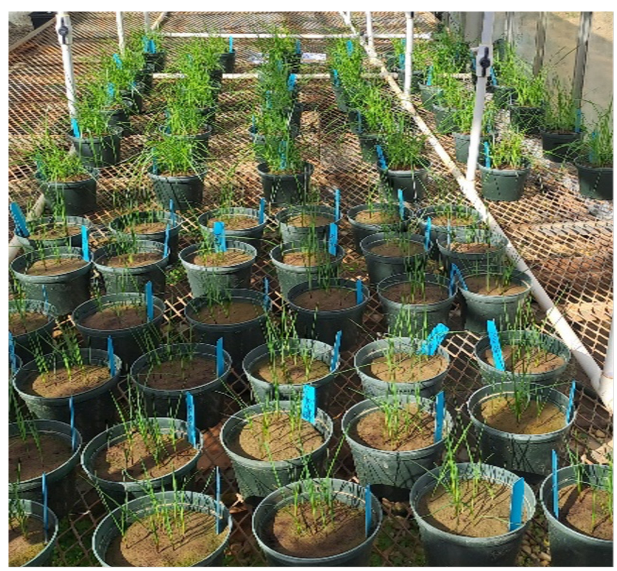

Fig. 5. Study at the USDA-ARS greenhouse facility, Auburn, AL.

Happenings

Dr. Kip Balkcom was invited to present at the 2025 Row Crops Field Day in Fairhope, AL. Dr. Balkcom spoke about cover crop management tips growers should consider for the upcoming cover crop fall planting season. Participants included growers, scientists, and industry representatives (~30 people).

Dr. Kip Balkcom was invited to present at the 2025 Row Crops Field Day in Belle Mina, AL. Dr. Balkcom spoke about cover crop management tips growers should consider for the upcoming cover crop fall planting season. Participants included growers, scientists, and industry representatives (~60 people).

Drs. Kip Balkcom and Andrew Price were invited to present at the 2025 Row Crops Field Day in Headland, AL. Dr. Balkcom spoke about the importance of planting cover crops early, while Dr. Price and his graduate students talked about weed suppression benefits from cover crops. Participants included growers, scientists, and industry representatives (~75 people).

Send updated contact information, questions, comments, and/or suggestions to: NSDL-Highlights@ars.usda.gov