

# Auburn University research team tackles new cotton virus

■ By Paul Hollis, College of Agriculture, Auburn University, Alabama

**S**INCE a potentially devastating cotton virus was first detected in Alabama fields in 2017, a group of Auburn University researchers and Alabama Extension specialists has been working tirelessly to learn everything they can about it so farmers can minimise their risks.

The team has worked so diligently, in fact, that Auburn has been designated as a USDA Center of Excellence for its focus on the virus – cotton leaf roll dwarf virus, or CLRDV.

The virus was first detected through the work of Kathy Lawrence, professor in Auburn's Department of Entomology and Plant Pathology, and crop consultant Drew Schrimsher, who collected field samples that were identified by Judith Brown, a virologist and University of Arizona Reagents Professor.

The effort then took on a sense of urgency with a call in October 2018 from Extension Plant Pathologist Austin Hagan, who had just seen extreme symptoms of the virus in a Baldwin County cotton field. First symptoms of the virus can be drooping leaves that eventually become crinkled.

"His exact words were, 'Holy cow!'" said Jenny Koebernick, assistant professor and cotton breeder in the College of Agriculture's Department of Crop, Soil and Environmental Science. "I called for a field day to be held the next week. The field in Loxley had nearly 100 per cent incidence and yield loss, and it was the kind of thing where you had to see it to believe it."

Jenny invited researchers from the University of Georgia, University of Florida, Louisiana State University, Mississippi State University, University of Tennessee, Cotton Inc., USDA and private seed company representatives to see first-hand the damage caused by CLRDV.

A meeting followed in November 2018 with representatives from Cotton Inc, the Alabama Farmers Federation and various researchers, Jenny said.

"All disciplines came together to discuss this complex issue and how to possibly approach it," she said. "We requested and received funds from the College of Agriculture that allowed us to collect cotton plants and confirm the presence of CLRDV in 13 counties."

Since that time, Auburn has been awarded various grants, with funds being used specifically for research to help farmers successfully battle CLRDV.

## Bringing expertise together

"We proposed a Centre of Excellence (COE) that brings together expertise at Auburn University and the University of Georgia that integrates insect population ecology, virology, vector-virus-plant interactions, integrated pest management and agronomic expertise to better understand the epidemiology of aphid-transmitted viruses and investigate virus disease management in cotton agroecosystems," said Alana Jacobson, associate professor in the Department of Entomology and Plant Pathology and a leader on the research team.

"This represents a novel approach that will creatively address critical challenges posed by insect-transmitted plant viruses associated with invasive viral diseases that threaten agricultural production at local, state, regional and national levels," Alana said.

The proposal, she said, works toward developing an integrated pest management program for an emerging disease that preserves the economic viability of US cotton production.

"A major component of this project will be minimising the chemical footprint of insect-management practices in a production system that has become wholly dependent on prophylactic pesticide use that has a cascading impacts on pests, beneficial organisms and the environment," Alana said.

"This multidisciplinary and transdisciplinary AU-UGA cotton team is comprised of faculty at all career stages and is uniquely positioned to lead CLRDV research and extension efforts in the US due to their complementary skill sets and knowledge."

The Auburn team has forged collaborations with extension and research entomologist, plant pathologists and agronomists in Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Mississippi, Arkansas, Louisiana and Texas, along with leading experts in virology and vector biology at the University of Arizona and the USDA Boyce Thompson Research Center at Cornell University.

## What is known about CLRDV

What the team knows about the virus is that it has been reported in Africa, India, Timor Leste and Brazil and Argentina in South America. The isolates found in Alabama fields are most related to the ones in South America.

It's difficult at this time, Alana said, to quantify exact losses to the virus because yield losses due to the virus cannot be separated from other abiotic and biotic factors. Only extreme cases can be easily quantified, making it impossible to make good estimates and to understand the range of yield loss that may be caused by the virus.



Auburn University College of Agriculture researchers Jenny Koebernick, left, and Alana Jacobson, are leading a nationally recognised team that is working to battle a new cotton virus.



**First symptoms of cotton leaf roll dwarf virus, or CLRDV, include drooping leaves that eventually become crinkled.**

"Diagnostic methods are still cost prohibitive, so many people have made assessments based on symptoms that are poorly classified and highly variable," she said. "Incidence can be 100 per cent even in areas where symptoms are not apparent – this has been observed in research trials. It is safe to say it is widespread."

The virus is transmitted by cotton aphids, but replicated trials last year at Auburn and Georgia showed that foliar applications of insecticides did not reduce the incidence of the virus.

"There are no other control methods that are supported by scientific data for reducing virus incidence or disease loss," Alana said. "Field research for management of this virus began in 2019 when we learned that aphid management was not going to reduce virus transmission to the crop."

But there are several ongoing studies investigating the virus, including sentinel plots that will help researchers better understand the interactions between cotton variety and planting date on aphid populations, symptom severity and yield loss.

Another study is using aphid-exclusion cages to control the timing of infection to determine how crop age at the time of infection influences symptom severity and yield loss. Also, breeders are plant phenotyping for CLRDV infection and symptoms. Koebernick is currently screening nearly 1500 cotton varieties at research sites in Tallassee and Fairhope looking for resistance to the virus.

"We are also conducting lab studies on the vector in an attempt to discover how long it takes to acquire and transmit the virus," Alana said. "Field studies are focusing on overwintering/ reservoir hosts in our cropping systems, including cover crops, weeds and regrowth on cotton stalks. In 2021, studies will try to address the impact of vegetation management on reducing CLRDV incidence."

"This group of Auburn professors is working with research and extension scientists in more than 10 states to address this problem from a range of disciplines," Jenny said. "We are dedicated to understanding and solving this very complex problem. It is important to focus not only on long-term solutions such as breeding for resistance but also on developing management strategies for minimising grower risk."



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