BIOLOGY, ECOLOGY, AND MANAGEMENT OF THE COTTON APHID IN THE SOUTHEASTERN U.S. AND STATUS AS A VECTOR OF *COTTON LEAFROLL DWARF VIRUS*

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Abstract

A new detection of an RNA cotton virus in Alabama was reported from samples collected in 2017. Partial gene sequences recovered from infected cotton plants showed high sequence similarity to *Cotton leafroll dwarf virus* (CLRDV) (Family Luteoviridae, Genus *Polerovirus*) (Avelar et al. 2018), which is the causative agent of Cotton Blue Disease reported in South America, India, Thailand, and Timor-Leste (Corrêa et al. 2005, Distéfano et al. 2010, Mukherjee et al. 2012, Sharman et al. 2015, Ray et al. 2016). A late-season survey in 2018 resulted in detections of this virus across the state of Alabama (Brown et al. 2019). Cotton plants infected by this virus exhibited internodal shortening, leaf distortions including leaf curling, rolling, and crinkling, petiole and vein reddening, abnormal top growth, and a reduced number of bolls.

CLRDV is transmitted in a persistent and non-propagative manner by aphids. Closely related poleroviruses have not been reported to be seed or mechanically transmitted (Reddall et al. 2004). The cotton aphid, *Aphis gossypii* Glover, is the primary vector of CLRDV. Previous experiments reported *A. gossypii* alates transmitting CLRDV to cotton in less than 40 seconds, and that they were capable of transmitting the virus for 12 days (Michelotto and Busoli 2007). The short transmission times, long persistence in the vector, and long-distance dispersal behavior reported for aphids likely contributed to the spread of this virus across Alabama (Brown et al. 2019), and may also facilitate spread of the virus to other areas across the cotton belt. In India, the cowpea aphid, *Aphis craccivora* Koch, and green peach aphid, *Myzus persicae* Sulzer, were also reported to transmit CLRDV (Reddy and Kumar 2004, Mukherjee et al. 2016), but their role as vectors in other areas has not been reported.

Aphis gossypii infests cotton annually across the U.S. cotton belt, and is managed when populations persist mid-late season to prevent sticky cotton (Abney et al. 2008, Gore et al. 2013, Kerns et al. 2015). Six other species, including *A. craccivora* and *M. persicae*, have been observed on cotton (Stoetzel et al. 1996), but these other species are seldom reported, not considered to be of economic importance, and status as vectors of CLRDV is unknown. It is important to understand the contribution of primary versus secondary spread on final incidence of virus in cropping systems to design effective virus management strategies. The primary spread of virus from overwintering hosts into crops by insect vectors is determined by the amount of inoculum in the landscape, the number of vector species, seasonal population dynamics and dispersal behavior of the vectors, timing of virus movement in relation to crop phenology, transmission efficiency of the vectors, distance of inoculum from the crop, susceptibility of the crop to the virus, and abiotic factors that drive crop health and population dynamics of reservoir hosts and vectors. Managing CLRDV primary spread, caused by colonizing aphids spreading the virus from overwintering hosts into cotton fields, is unlikely to be effective due to the short feeding periods required for *A. gossypii* to transmit CLRDV. Managing populations of aphids within the crop may reduce secondary spread that occurs from source plants infected during primary spread (Galbieri et al. 2017), but only if populations persist in the crop and spread the virus to plants that were not infected by initial flights of aphids into the crop field. Research efforts are needed to better understand the epidemiology of CLRDV in the U.S., and determine the impact of aphid management on reducing final virus incidence and season-long insect pest management programs.

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