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Establishment of Two New Vectors of Citrus Pathogens in Florida

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Abstract. **In the past 5 years, two homopteran pests of citrus have become established in Florida. Both are pests primarily because of their ability to transmit serious citrus pathogens. Brown citrus aphid [*Toxoptera citricida* (Kirkaldy)], the vector of citrus tristeza virus (CTV), was found in Florida in late 1995. The original infested area included parts of Dade and Broward Counties in south Florida. In 2 years, it had colonized most of peninsular Florida. First finds in most counties were on outdoor citrus trees. The rate of colonization for brown citrus aphid in Florida was similar to the rate published for other invasive aphid species. Asian citrus psyllid [*Diaphorina citri* Kuwayama], the vector of citrus greening pathogens, was first found in Florida in June 1998. The original infested area included coastal Palm Beach County, and parts of northern Broward and southern Martin Counties. In 2 years, it colonized the southern half of the Florida peninsula. In south Florida, Asian citrus psyllids could be found in the landscape, but in central Florida, only plants for sale in retail stores were found infested. Thus, it appears that the natural rate of colonization for Asian citrus psyllid is slower than that for brown citrus aphid; however, Asian citrus psyllid was more likely than brown citrus aphid to be moved on plants for sale in Florida. Surveys have been made for the pathogens transmitted by these pests. There is no evidence of citrus greening disease in Florida; however, we have seen an increase in both incidence and severity of CTV in areas where brown citrus aphid has been present 2 years or longer.**

Toxoptera citricida (Kirkaldy) is the most efficient vector of citrus tristeza virus (CTV). Introduction of this aphid into various regions of the Western Hemisphere has preceded serious outbreaks of CTV. Similarly, *Diaphorina citri* Kuwayama is a serious pest of citrus primarily because it is a vector of the pathogens that cause citrus greening disease or huanglongbing. Citrus greening has not been found in the Western Hemisphere, but *D. citri* has been present in South America for several decades. Florida is at risk for introductions of exotic pests and diseases due to the large amount of incoming commercial and tourist traffic. Additionally, Florida residents sometimes may smuggle plant materials from overseas. The Florida Department of Agriculture and Consumer Services, Division of Plant Industry (DPI), employs over 100 inspectors whose job it is to find new pests. This paper reports the establishment of two new citrus pests, *D. citri* and *T. citricida*. Prior to the arrival of *T. citricida*, there was a statewide baseline survey done to determine the incidence and make-up of CTV strains in Florida (Brown and Davison, 1997). No surveys had been done for citrus greening prior to the introduction of *D. citri*.

Materials and Methods

Surveys for new citrus pests were done in several ways. First, DPI and USDA inspectors monitored citrus in dooryards on a routine basis. Second, DPI inspectors monitored pests in nurseries and stock dealerships as part of their routine inspections. Third, after a new pest was detected, there was a special delimiting survey done by DPI inspectors. In the case of *T. citricida*, USDA inspectors also participated. Surveys for CTV were done by collecting eight newly expanded leaves per tree, two per quadrant. The leaves either were ground fresh or petioles were extracted and dried prior to grinding and testing by enzyme-linked immunosorbant assay (ELISA). ELISA antibodies included a polyclonal mixture that detects all CTV and monoclonal antibody 13 (MCA-13), which detects most decline and stem-pitting CTV found in Florida. Visual surveys were conducted for citrus greening after the discovery of *D. citri*.

Results and Discussion

Toxoptera citricida was discovered in Florida in the late autumn of 1995 (Halbert et al., 1998, 2000). The northern half of Miami-Dade County and the southern third of Broward County were found to be infested. We estimate that we detected the infestation within about

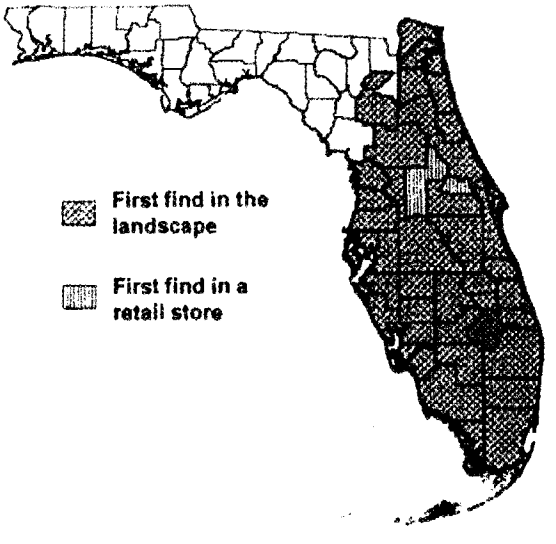

Fig. 1. Distribution of *Toxoptera citricida* (Kirkaldy) in Florida, Nov. 2000.

6 months. of the original introduction. Within about 2 years after the original detection, most of the Florida peninsula was colonized. The initial infestations discovered in the counties were nearly always in the landscape, mostly in dooryards (Fig. 1). In the few cases where *T. citricida* was discovered first in a retail store, there had been landscape infestations found further north prior to the discovery in the store. *Toxoptera citricida* colonized peninsular Florida at a rate of about 250 km per year, the same rate proposed for other aphids (Wellings, 1994). There was no detectable movement of *T. citricida* on plants for sale.

Diaphorina citri was discovered in Florida in June of 1992. The original delimiting survey showed that the eastern part of Palm Beach County and the northeastern quarter of Broward County were infested. One infested site also was found in the southeastern corner of Martin County. We estimate that the infestation was detected about 6 months to 1 year after the introduction.

Within the next year, infestations were found in the landscape in adjoining counties; however, most new infestations were found in discount retail outlets (Fig. 2). *Murraya paniculata* (L.) Jack (Rutaceae), a popular ornamental plant, is a particularly good host for *Diaphorina citri*. In southern Miami-Dade County, there are many nurseries that produce *M. paniculata*. After the area became infested with *D. citri*, the insects moved very readily on *M. paniculata* plants. The discount stores that sell *M. paniculata* usually also sell citrus, so *D. citri* moved into the landscape on both *M. paniculata* and citrus for sale in the discount stores.

DPI attempted to require treatment of *M. paniculata* plants prior to sale, but there were too many small nurseries and too few inspectors to keep up with the volume of plants being sent north for sale. The result was that nearly every discount store we inspected had infestations of *D. citri* at one time or another. Infestations were even found in the extreme northwest counties of Florida, where neither citrus nor *M. paniculata* will grow outdoors for any length of time without vigilant freeze protection.

CTV surveys indicated an increase in incidence both of general CTV infection, and of strains that react with MCA-13 since the introduction of *T. citricida*. Surveys for citrus greening disease failed to turn up any infected plants.

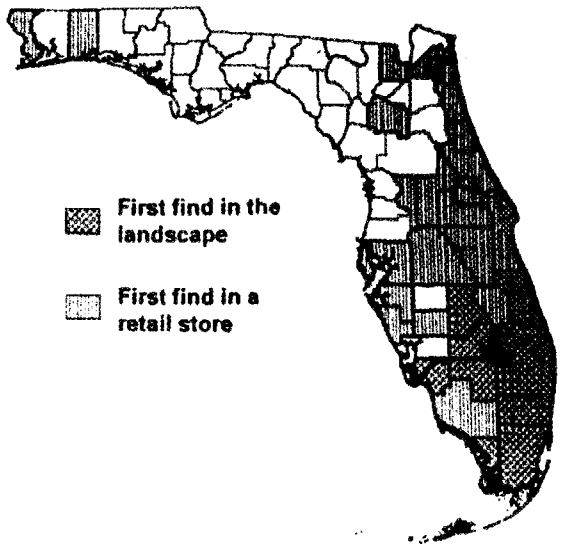

Fig. 2. Distribution of *Diaphorina citri* Kuwayama in Florida, Nov. 2000.

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