IDENTIFICATION OF WEED RESERVOIRS OF TOMATO YELLOW LEAF CURL VIRUS IN FLORIDA

Jane E. Polston[1], David J. Schuster[2] and James E. Taylor[2]
[1] University of Florida/IFAS, Dept. of Plant Pathology, Gainesville, FL, jep@ufl.edu
[2] University of Florida/IFAS, GCREC, Wimauma, FL

The recognition of wild plant reservoirs can be a very important component of the management of plant viruses. The role and relative importance of weed reservoirs in virus ecology varies with the virus, the crop and the location. The ecology of Tomato Yellow Leaf Curl virus (TYLCV), a virus which appeared in Florida in 1997 (Polston et al., 1997), is not well understood. The whitefly vector has a very wide reported range of plants upon which it will feed (more than 500 plant species). While we do know that there are alternative crop hosts for TYLCV, we do not know if wild plant species play any role as reservoirs. This information is important for the improvement of the management of TYLCV. One option that has been proposed is a crop-free period in the summer, between the spring and fall crops. This crop-free period will not be effective if there are wild plant species present during the summer that will serve as reservoirs of TYLCV.

We conducted a survey of possible TYLCV reservoirs and collected plants in 2008-2009. This is a challenging project because there are hundreds of wild plant species in the Manatee-Hillsborough Counties area. Many species are widely dispersed. In addition, we are expecting that only a small percent of the plants of a susceptible species would be infected. To focus our collection and keep within the budget allotted, we did not collect from grasses or plants known not to be hosts of the whitefly vector. Most of the plant species were selected based on their ability to serve as hosts for whiteflies, and/or the presence of virus-like symptoms. We were looking for plants that could serve as sources of virus for young tomato plants. Different species of wild plants are present at different times of the year so we collected samples from plants at the early part of the spring season, and then at the end of the spring season in the Ruskin tomato production region. Five sites in Manatee Co. and one in Hillsborough Co. were sampled. Plants were sampled in and around tomato fields and came from the following types of locations: tomato field, ditch bank, edges of tomato fields, edges of other fields, woody field edge, fallow fields, and fence rows. The sites selected were those where we had observed TYLCV-infected tomatoes early in the season, and therefore where it was likely a weed host might exist.

RESULTS TO DATE

Samples were collected, identified, and frozen for laboratory analyses for the presence of TYLCV. All samples were assayed for the presence of TYLCV using a nucleic acid spot hybridization assay (NASHA). Briefly, nucleic acid was extracted from frozen samples, blotted onto nylon membranes, and hybridized with a radioactively-labeled probe made from the genome of TYLCV. While this assay allows the rapid processing of many samples, it is known to give false positive results, especially on plant samples that have a lot of latex and polysaccharides (present in many tropical wild plants). Therefore, the more specific and sensitive polymerase chair reaction (PCR) using primers which will amplify TYLCV, was conducted on all samples that gave a positive result in the NASHA. DNA was extracted from samples that were positive in the dot spot assay and a PCR was run using appropriate primers. Samples positive by this assay will be retested using a different set of primers to confirm the first results.

Between February 2008 and February 2009, we collected 1,920 plants from 45 known species of wild plants from 15 different plant families (Table 1). We are in the process of identifying the species of approximately 227 of those samples. All of the samples have been tested by NASHA for the presence of TYLCV. Approximately 326 samples gave a positive result in the NASHA. Of those 103 have already been tested by PCR and the rest are in the process of being tested. TYLCV was not detected in any of the plants tested. We conclude that the samples which were positive by NASHA were probably the result of non-specific binding of the probe to the sample.

This study will be completed within the next few months. As of today, we do not have any evidence that would suggest that there is a wild plant species that is an important reservoir for TYLCV in the summer months. If our data continue along this trend, it would suggest that there are no obvious impediments, in terms of wild plant species, to the success of a tomato-free period. This is not to say that there are no wild plant hosts, since our study was not exhaustive, but that we did not find any likely candidates. At this point, it might be worth implementing a host free period in the summer months on a trial basis. ✻

REFERENCE

Polston, J.E., R. J. McGovern, and L.G. Brown. 1999. Introduction of Tomato yellow leaf curl virus in Florida and implications for the spread of this and other geminiviruses of tomato. Plant Disease 83:984-988.

TABLE 1. Wild plants sampled from the fields and tested for presence of TYLCV in and around tomato fields in Manatee and Hillsborough Counties, Florida.

Family	Species	Common Name	County	No. of Samples Tested	No. Positive by NASHA
Amaranthaceae	*Amaranthus viridis*	Slender amaranth	Manatee	40	10
	Amaranthus. spp.			10	0
Anacardiaceae	*Schinus terebinthifolius*	Brazilian pepper	Manatee	20	0
Asteraceae	*Ambrosia artemisiifolia*	Common ragweed	Manatee	50	0
	Bidens pilosa L.	Spanish needle	Manatee, Hillsborough	170	0
	Bidens spp.		Manatee	61	0
	Heterotheca subaxillaris	Camphorweed	Manatee	40	0
	Lactuca canadensis	Wild lettuce	Manatee	20	0
	Pseudognaphalium sp.	cudweed	Manatee	20	0
Chenopodiaceae	*Chenopodium album L.*	Lambs quarters	Manatee	19	0
	C. ambrosioides L.	Mexican tea	Manatee	80	0
	C. sp.	chenopodium	Manatee	40	0
Commelinaceae	*Commelina diffusa Burm. f.*	Spreading dayflower	Manatee	20	0
Euphorbaceae	*Euphorbia hirta L.*	Garden spurge	Manatee	10	0
	Euphorbia spp.	spurge	Manatee	40	0
	Poinsettia cyanthophero (Murray) Bartling	Wild poinsettia	Manatee	30	0
	Ricinus communis L.	Castorbean	Manatee	14	0
Fabaceae	*Crotalaria spectabilis Roth*	showy crotalaria	Manatee	10	0
	Indigofera hirsuta L.	Hairy indigo	Manatee, Hillsborough	127	71
	Melilotus alba	White sweet clover	Manatee	40	0
	Phaseolus sp.	(narrow leaf) phasebean		20	0
	Phaseolus sp.	(broad leaf) phasebean		10	7
	Sesbania sp. Scop	Hemp sesbania	Manatee	71	40
	Trifolium sp.	Clover sp.	Manatee	21	0
Lythraceae	*Lagerstroemia sp.*	Crape myrtle	Manatee	11	0
Malvaceae	*Abutilon permolle*	coastal indian mallow	Manatee	7	0
	Abutilon sp.	Indian mallow	Manatee	20	0
	Sida spinosa L.	Sida	Manatee	31	0
	S. rhombifolia L.	Indian hemp	Manatee	20	1
	Sida. sp.	Sida	Manatee, Hillsborough	50	0
	Urena lobata	Caesar-weed	Manatee	111	23
Myricaceae	*Myrica cerifera*	wax myrtle	Manatee	5	4
Onagraceae	*Ludwigia peruviana*	Primrose willow	Manatee, Hillsborough	70	20
	Ludwigia spp."	"	Hillsborough	63	26
	Oenothera laciniata	Cutleaf primrose	Manatee	60	3
Polygonaceae	*Rumex crispus*	curly dock	Manatee	20	20
Rubiaceae	*Richardia brasiliensis*	Brazilian pusley	Manatee	30	0
	R. scabra L.	Florida pusley	Manatee, Hillsborough	65	10
Solanaceae	*Physalis spp.*		Manatee	20	0
	Solanum americanum Mill.	Nightshade	Manatee	42	0
	Solanum esculentum L.	Cultivated tomato	Manatee	10	10
	S. ptycanthum Dun.	Eastern nightshade	Manatee	21	0
	S. viarum Dunal	Tropical soda apple	Manatee	10	0
Verbenaceae	*Lantana sp.*	Lantana	Manatee	28	0
	Phyla nodiflora	Mat lippia	Manatee	10	0
Unknown	Unknown	unknown	Manatee	233	80