

Whitefly (*Bemisia tabaci*) transmitted Squash vein yellowing virus (SqVYV): a component of Watermelon Vine Decline in South Florida.

P. D. Roberts¹, Philip A. Stansly², Scott Adkins³, Susan Webb⁴, Carlye Baker⁵, Benny Bruton⁶, Rosa Muchovej¹, Diann Achor⁷, C.S. Kousik⁸, Alicia L. Whidden⁹, Gene McAvoy¹⁰, and Phyllis Gilreath¹¹.

¹University of Florida, Department of Plant Pathology, SWFREC, Immokalee, FL, USA

²University of Florida, Department of Entomology & Nematology, Immokalee, FL, USA

³United States Department of Agriculture-ARS, USHRL, Fort Pierce, FL, USA

⁴University of Florida, Department of Entomology & Nematology, Gainesville, FL, USA

⁵Florida Department of Agriculture, Division of Plant Industry, Gainesville, FL, USA

⁶United States Department of Agriculture-ARS, Lane, Oklahoma, USA

⁷University of Florida, CREC, Lake Alfred, FL, USA

⁸US Vegetable Lab, USDA, Charleston, SC, USA

⁹University of Florida/IFAS, Hillsborough County Extension Service, Seffner, FL, USA

¹⁰University of Florida/IFAS, Hendry County Extension Service, LaBelle, FL, USA

¹¹University of Florida/IFAS, Manatee County Extension Service, Palmetto, FL, USA

Watermelon production has been greatly impacted in South Florida since 2003 when symptoms were first observed of a severe watermelon vine decline (WVD) that killed plants as the crop approached first harvest (Roberts et. al., 2005; Huber 2006). Since 2003, watermelon plants have been affected in each fall (September-December) and spring (January-May) season. Symptoms of WVD occur as fruit are approaching harvest or soon thereafter. Foliage initially turns a slight yellow, then scorched and brown, followed by wilting and collapse of the entire vine. The xylem exhibits a uniform dark tan to light brown discoloration which is distinct from the discoloration of the xylem caused by races of *Fusarium oxysporum* f. sp. *niveum*. Although there are no external symptoms, the fruit on the declining vines frequently have rinds with greasy and discolored (brown and/or watersoaked) internal blotches. The non-macerated flesh is distinctly off-flavor, inedible, and non-marketable. However, symptoms of WVD are variable in that foliage decline symptoms can occur in the absence of fruit rot symptoms and vice-versa. Disease progress is normally very rapid although variations in the rate have also been observed. In some fields, vine decline increased from 10% affected plants to greater than 80% within a week. In other fields, the disease progressed through the yellowing, wilting phase and then stopped. Yield losses have been typically high; losses of 50%-100% are not uncommon in affected fields. The disease has occurred at epidemic levels in southwest and south central Florida since 2003 and poses a significant threat to production of this economically important crop. Losses to Florida growers are estimated at more than \$60 million in the past four years (Huber, 2006).

Abiotic and biotic causes of WVD were examined. Nutritional testing indicated soil and plant tissue nutritional deficiencies in most samples collected from affected fields. However, results varied from site to site, indicating that deficiencies may only have contributed to weakening the plants, thus increasing their susceptibility to disease. Examination of cultural practices did not uncover common links to fungicides, insecticides, herbicides, irrigation, cultivars, transplant production, fumigation, or other practices. Likewise, environmental conditions (rainfall,

temperature) were variable from season to season, and while it does not appear that there is an environmental cause of this disease, the environment may play a role in WVD.

Several fungi and bacteria have been recovered from affected vines and fruit which caused mortality of watermelon seedlings and decay of fruits in controlled environmental studies. *Plectosporium tabacinum* was frequently isolated from the xylem of affected plants that caused a seedling disease under greenhouse conditions. Several *Fusarium*, *Pythium*, *Phytophthora*, and *Rhizoctonia* spp. have been recovered but none of these were consistently isolated from symptomatic plants. Although race 0, 1, and 2 of *Fusarium oxysporum* f. sp. *niveum* were often isolated from symptomatic plants, symptoms of WVD are distinct from Fusarium wilt. Strains of *Serratia* and *Pseudomonas* spp. and an unidentified bacterial strain caused tissue maceration, necrosis, or brown blotches on fruit rind similar to field symptoms. However, neither fungal nor bacterial pathogens appeared to be the primary cause of WVD, but the role of these and other factors continue to be investigated.

Recent research by Adkins and colleagues (2006) identified a novel ipomovirus dubbed Squash vein yellowing virus (SqVYV) associated with WVD. In addition, they showed that SqVYV was transmitted by the silverleaf whitefly *Bemisia tabaci* (Biotype "B"). Watermelon death and fruit rot symptoms of WVD were evident in SqVYV greenhouse-inoculated plants (Adkins et al. 2006). A field study conducted in the spring 2006 at SWFREC showed that watermelon plants grown adjacent to SqVYV-infected squash plants developed vine decline symptoms, including fruit rot, and eventually died. Plants which were grown in the same field, but protected by screened walk-in cages to prevent infestation by whitefly, did not develop symptoms of vine decline. Initial analysis of declining watermelon plants in the field study confirmed the presence of SqVYV in these plants. Insecticide applications of Admire and Fulfill did not prevent vine decline on treated plants. This failure could have been due to inadequate whitefly control obtained in this field trial, or, as is the case with many potyviruses transmitted by aphids, due to the inability of insecticides to act quickly enough to prevent virus transmission. Experiments to confirm these preliminary field results and target management of WVD by insecticidal control of whiteflies are being conducted.

Adkins, S., S.E. Webb, D. Achor, P.D. Roberts, and C.A. Baker. 2006. Identification and characterization of a novel whitefly-transmitted member of the family *Potyviridae* isolated from cucurbits in Florida. *Phytopathology* 96:In press.

Huber, M. 2006. Taking vital vines. *Citrus and Vegetable Magazine*, February 2006, Vol 70, no 6:22-24.

Roberts, P., R. Muchovej, D. Achor, C.A. Baker, B. Bruton, and S. Adkins. 2005. Investigation into a mature watermelon vine decline and fruit rot. *Phytopathology* 95:S89.

Contact Information: P.D. Roberts, Department of Plant Pathology, University of Florida/IFAS, Southwest Florida Research and Education Center, Immokalee, FL, 34142, USA, Phone: 239-658-3400; Fax: 239-658-3469, Email: pdr@ifas.ufl.edu