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YELLOWING VIRUSES INFECTING CUCURBITS IN TEXAS

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INTRODUCTION

Diverse cucurbit vegetables (e.g., watermelon, squash, pumpkins, cucumbers, and melon) are produced across all growing regions of Texas. However, diseases caused by viruses can be major limiting factors to their sustainable and profitable production. Virus diseases can negatively impact yields, cause detrimental effects on fruit quality, and increase production costs due to additional efforts for managing virus insect vectors. There are two major types of cucurbit virus diseases (based on foliar symptoms): mosaics (factsheet PLPM-PU-094) and yellowing diseases. The field diagnosis of yellowing diseases is more difficult because their symptoms resemble abiotic disorders—especially nutritional deficiencies, or diseases caused by other pathogens. Mixed infections of yellowing and/or mosaic causal viruses can also occur and could increase disease severity. Such mixed infections also complicate diagnoses. Cucurbit varieties resistant to yellowing viruses are also currently lacking, as some of the yellowing viruses have only recently emerged.

SYMPTOMS

Yellowing viruses cause various types of symptoms, which include yellowing or chlorosis of foliage, interveinal chlorosis, and leaf mottling (Fig. 1). Fruit yield and quality can also be affected—with reduced sugar—causing poor taste and unmarketability. The yellowing viruses of cucurbits produce similar symptoms, making the diseases they induce visually indistinguishable from each other.

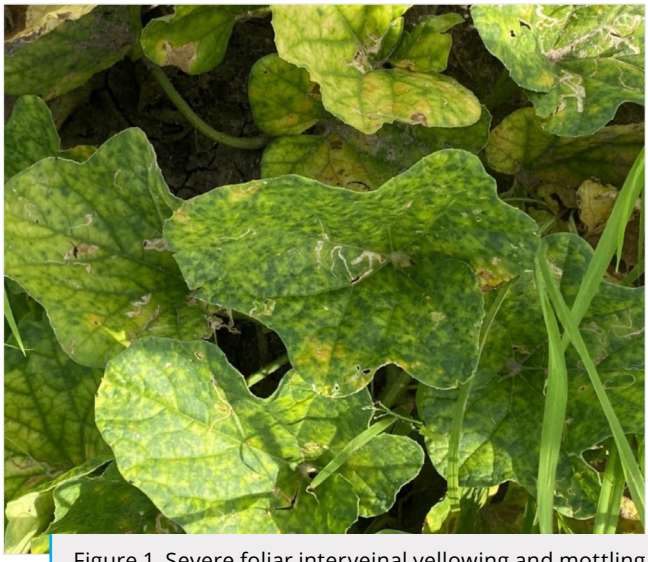

Figure 1. Severe foliar interveinal yellowing and mottling symptoms on cantaloupe with mixed infection of two whitefly-transmitted cucurbit yellowing viruses.

CAUSAL VIRUSES

Viruses are classified based on their morphology and composition. Several distinct virus species have been characterized from cucurbits affected by yellowing disease. They include: cucurbit yellow stunting disorder virus (CYSDV), genus *Crinivirus*, family *Closteroviridae*; cucurbit chlorotic yellows virus (CCYV), genus *Crinivirus*, family *Closteroviridae*; cucurbit aphid-borne yellows virus (CABYV), genus *Polerovirus*, family *Solemoviridae*; lettuce infectious yellows virus (LIYV), genus *Crinivirus*, family *Closteroviridae*; melon yellowing-associated virus (MYaV), genus *Carlavirus*, family *Betaflexiviridae*; and beet pseudo-yellows virus (BPYV), genus *Crinivirus*, family *Closteroviridae*. Among them, only CYSDV and CCYV have so far been detected in Texas cucurbit fields. Both viruses and the other criniviruses are vectored by whiteflies of the *Bemisia tabaci* species complex (Fig. 2).

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Figure 2. Adult silverleaf whiteflies of the *Bemisia tabaci* MEAM1 (Middle East Asia Minor 1; formerly biotype B) species.

YELLOWING VIRUSES PRESENT IN TEXAS CUCURBIT FIELDS

Cucurbit yellow stunting disorder virus (CYSDV). CYSDV is transmitted by whiteflies and the vector can retain the virus for 7 to 9 days once acquired during feeding. The primary hosts of CYSDV include members of the cucurbit family, while bean, lettuce, and some weed species can serve as reservoir hosts for the virus (with or without symptoms). In the U.S., CYSDV is a major constraint to cucurbit production in California and the Southeastern states, including Texas.

Cucurbit chlorotic yellows virus (CCYV). CCYV is another whitefly transmitted virus of cucurbits. The vector can retain the virus for up to 11 days after feeding on the infected plant. CCYV can infect the entire Cucurbitaceae family, but not all species may produce symptoms. Certain weeds, sugar beets, lettuce, and spinach can harbor the virus, with no apparent symptoms. CCYV has been detected in cucurbit fields in California and some Southeastern states, including Texas.

Diagnosis. Diagnosis based on symptoms is nearly impossible, due to other viruses mimicking symptoms, mixed infection (multiple viruses within one sample), and resemblance to other pathogens/abiotic disorders. Hence, laboratory analysis of leaf tissue is required to confirm infection and to determine the identity of the virus(es) involved. This includes the use of serological (i.e., double antibody sandwich enzyme-linked immunosorbent assay [DAS-ELISA]) and molecular techniques (i.e., reverse transcription polymerase chain reaction [RT-PCR]) techniques. Please contact the diagnostic laboratory for instructions on proper sample collection, handling, and shipping.

Management. In general, approaches other than resistant varieties may often have limited or no effectiveness in virus disease management. Integrated pest management strategies that combine resistance (where available) with other management approaches are more effective than any single approach.

Resistant varieties and avoidance of infection. Currently, there are no commercially available resistant varieties against CYSDV and CCYV. Some of the strategies for avoidance and delay of infection include propagation of virus-free transplants, protection of the seedlings with row covers to exclude the vector, the use of reflective mulch, and shifting of the planting date to avoid peaks of vector migrations and abundance. Proper monitoring, or scouting for symptoms or vector presence, can be useful to guide field management decisions.

Removal of wild cucurbits, alternative hosts, and weeds. Certain susceptible host crops (mentioned above), wild cucurbits, and weeds have been identified to harbor yellowing viruses and serve as a source of inoculum during the season—and as "green bridges" for virus and vector survival during the off season. Removal and destruction of these plants can help reduce virus spread. Susceptible host crops should also not be planted adjacent to (or in rotation with) cucurbits.

Chemical treatments. Insecticides are commercially available for managing whiteflies. Suppression of whitefly populations may slow infection and virus disease progression rates within cucurbit fields, but this approach may be more useful for spring crops than fall crops. Rotation of insecticides with different modes of action is necessary to prevent development of insecticide-resistant insect populations. Follow the insecticide label for the correct rate, timing, and approved crops. Use of horticultural (e.g., stylet) oils and vector biocontrol agents—when combined with the non-chemical approaches mentioned above—are good options for organic cucurbit production.

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