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2024 Guidelines for Whitefly / CYSDV Management on Fall Melons

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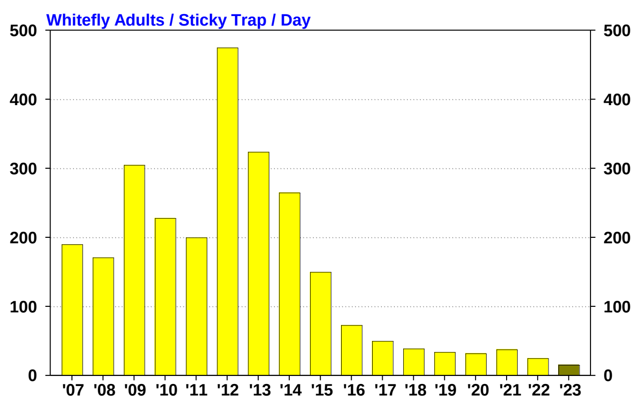
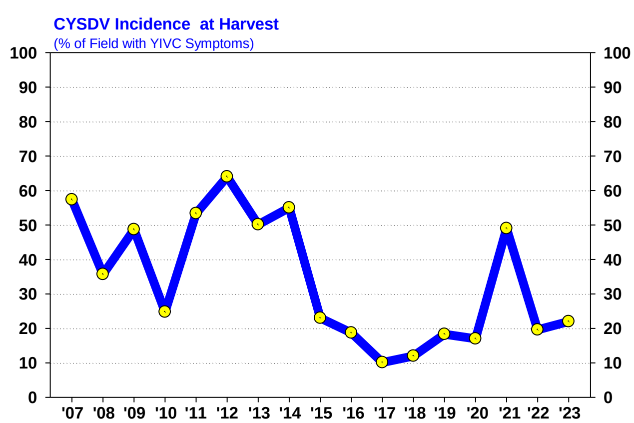
The sweet potato whitefly, *Bemisia tabaci* can transmit many types of plant viruses. Since 2007, this pest has been responsible for vectoring Cucurbit yellow stunting disorder virus (CYSDV) and Cucurbit chlorotic yellows virus (CCYV) in fall melons throughout the growing regions of Arizona and southern California. CYSDV is vectored semi-persistently by whitefly adults and is hosted by several plants including cucurbits, alfalfa, lettuce, and numerous common weed species. CYSDV has the potential to cause significant reductions in yields/quality and requires intensive insecticide use in fall melons. To manage CYSDV, growers have focused on avoiding virus transmission by whitefly adults using cultural growing practices and aggressive chemical control approaches that rely on soil, systemic and foliar-applied insecticides.

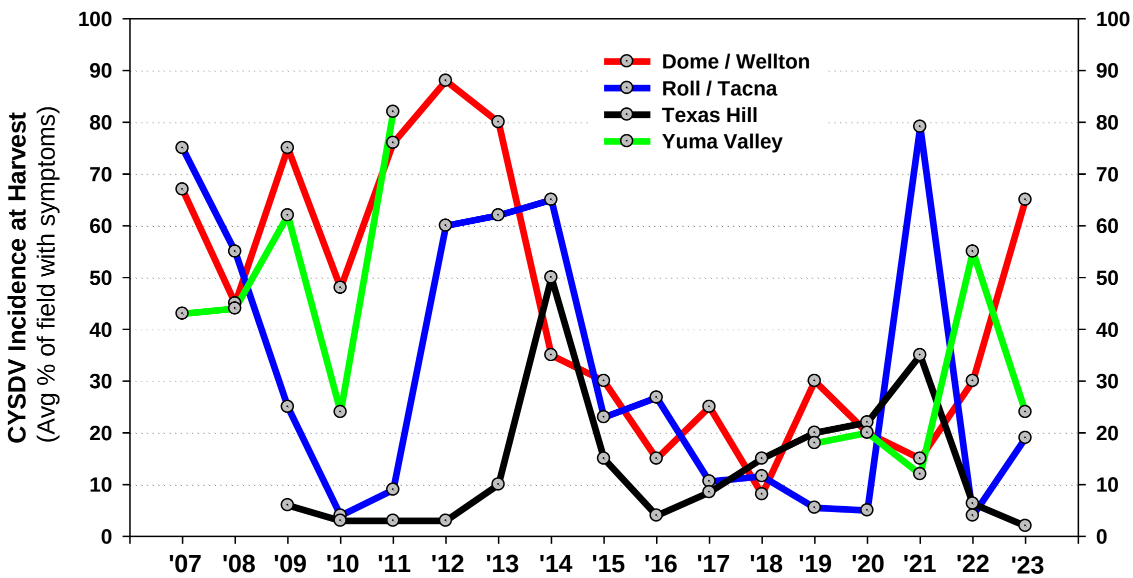
Status of CYSDV in Yuma County

A project was first initiated in 2007 to monitor and record the area wide incidence of whitefly movement using yellow sticky traps located throughout the growing regions. In association with the whitefly trapping, a concurrent project was initiated that fall to monitor and record the area wide incidence of CYSDV in melon fields in the Yuma area. At various time intervals throughout the fall growing season the percentage of each field infected with CYSDV was estimated. The graphs below show an overall summary of average whitefly trap counts during the fall growing season (Aug-Oct) and % CYSDV Incidence (*Yellow interveinal chlorosis*) at harvest on fall melons in the Yuma Valley and Dome Valley/Wellton, Roll/Tacna, and Texas Hill areas during the past 17 growing seasons when averaged across all fields and locations. The upper graph shows whitefly trap counts during the fall season where whitefly pressure has varied among years. CYSDV/CCYV incidence has similarly varied from year to year (lower graph). Whitefly abundance and CYSDV infection had declined significantly from 2015-2020 on fall melons in Yuma but increased dramatically in 2021 even though whitefly abundance was light. CYSDV incidence and whitefly numbers were found at much lower levels in the fall 2022 growing season.





Past estimates of viruses show that CYSDV incidence and WF numbers peaked in 2012. By the 2013 season, growers were seeking more isolation by planting fall melons in the eastern-most regions of the Yuma area where CYSDV incidence has traditionally been lighter. However, even in these isolated areas moderate levels of CYSDV were present in 2013. In 2014, two of the 3 blocks of melons in the eastern most part of the region had levels of CYSDV > 50%. Not surprising, in areas where CYSDV incidence was the highest, had been grown within 0.5-1 mile the previous spring. Since 2015 CYSDV incidence and WF abundance declined considerably, likely a result of lower cotton acreage in the area. CYSDV reached their lowest abundance in 2017 but increased 2-fold in 2019 and occurred at similar levels in 2020. CYSDV incidence increased dramatically in 2021 due to three abandoned watermelon fields (~200 acres) in the Tacna area that were left untreated all summer. In fall 2022 and 2023, whitefly numbers remained low, and CYSDV incidence was returned to areawide levels around 20%. Virus incidence was considerably higher in Dome/Wellton last season, and least abundant in the Texas Hill area.



Cultural Management / Avoidance One important key to managing CYSDV and avoiding economic losses in fall melons is to effectively avoid whitefly populations migrating from infected alternative hosts (i.e., weeds, cotton, alfalfa, volunteer melons) onto fall melons After CYSDV first appeared in the desert, local growers attempted to abate whitefly movement onto fall melons by creating of a 25 day “host-free” period where melons were not grown during July. Unfortunately, establishing this melon-free bridge between crops was not successful in suppressing CYSDV in subsequent fall melons due to the preponderance of volunteer melons from previous spring crops, as well as the discovery that alfalfa and several common weeds (common mallow, groundcherry and silverleaf nightshade) serve as reservoirs for CYSDV. However, several cultural tactics can be employed when practical to minimize the host-availability for both CYSDV and whiteflies during the summer.

Sanitation Prompt removal of CYSDV host plants and weeds in areas where fall melons will be grown can reduce the availability of virus. This includes rapid destruction of plant residue following harvest of spring melons which not only serves as a reservoir of CYSDV, but for whiteflies too. The destruction of volunteer melons between spring and fall crops can reduce the source of virus inoculum available. This can be done by disking or applying a contact, burn-down herbicide to fields. Emerging volunteer plants should be destroyed as soon as practical. Research has shown that fall melons grown near spring melons with volunteers (<1.8 miles) are at a high risk of CYSDV infection.

Row Covers Lightweight, fabric row covers have been successfully deployed in both experimental plots and commercial fields to delay virus incidence and severity. Covers must be present on the seed bed prior to plant emergence to prevent adult whiteflies from feeding on seedlings and transmitting CYSDV. Covers must be removed prior to blooming to ensure adequate pollination of the crop. Use of a soil insecticide at planting/side dress and foliar sprays immediately following removal are recommended.

<u>Crop Placement / Isolation</u> Whenever possible, fall melons should be planted as far away from previously grown spring melons. As noted above, fall melons are at a high risk of CYSDV when planted within 2 miles of spring melons. Also, when practical, fall melons should be planted as far away from cotton, alfalfa and other host crops that serve as a reservoir for whiteflies. Recent research has indicated that fall melons grown within 1 mile of cotton is at a higher risk of CYSDV infection. This is due to cotton being a potential source of large whitefly populations, as well as harboring virus infected weeds and volunteer melons. Also consider avoiding planting near residential subdivisions and orchards, both of which may contain sources of infected weed hosts.

Chemical Management The goal of the insecticide management program is aimed at preventing adult whitefly vectors from feeding for prolonged periods of time. Suppression of migrating whitefly adults should minimize primary infection in newly emerging stands, whereas aggressive management during early crop growth (2-lf stage to bloom stage) will aid in suppressing the secondary spread of virus. Because CYSDV is a semi-persistent virus, quick acting systemic and contact insecticides can reduce the incidence of CYSDV by suppressing adult whitefly feeding and consequently their ability to effectively transmit the virus. Research has shown that the longer whitefly feeding is delayed or prevented on young melon plants, the less severe the virus is expressed at harvest. The local standard approach to achieving this has been to prevent adult whiteflies from feeding on emerging melons plants as long as possible (from emergence to bloom) through the combined use of soil and foliar applied insecticides. The proper application and timing of insecticides is important to cost-effective management of the vector and virus. Based on local research, we have developed guidelines for a 3-stage approach for the use of insecticides on fall melons in the desert southwest (see **Table 1** below).

Consideration of Pollinators Because cantaloupes other melons are monecious, pollination by bees is essential for the production of high-quality melons. Colonies of honeybees must be placed in or around fields to ensure pollen transfer from staminate to pistillate flowers. Insufficient pollination will result in misshapen melons and reduced fruit set. To produce high quality melons, it is recommended that 2-3 hives per acre be placed in each field. Consequently, extreme care must be taken with pesticides to prevent the destruction of honeybees. Some insecticides used in melon pest management programs are highly toxic to these pollinators. If insecticides are not applied properly when crops are flowering, bee kills can occur. Losses can result from direct sprays on bees, spray drift onto hives or adjacent fields, and by contamination of drinking water, pollen or nectar.

The following practices are very important in planning pesticide applications.

- Always carefully read the label before applying any insecticide.
- If possible, avoid making pesticide applications when melons are in bloom.
- If applications are necessary during bloom, apply the pesticide that is least toxic to bees and will still control the target pest.
- Only apply insecticides during the evening (10:00 pm-3:00 am) when the bees are not actively working in the field.
- Finally, it is a very important precaution that the beekeeper be notified before spray applications are made to blooming crops. The advanced notice allows beekeepers to take steps to move or protect their hives if necessary.

Table 1. Insecticide Use Guidelines for Whitefly /CYSDV Management in Fall Melons.

Product	IRAC MoA	Rate/ac	Use patterns
I. At Planting *(Stand Establishment)*			
Venom / Scorpion	4A	6.0-7.5 oz 10.5 oz	**Furrow:** apply at planting, 3-4 inches directly below seedline in 10-20 gpa of water **Drip:** chemigate at, or just prior to, seedling emergence
Sivanto	4D	28 oz	
II. Seedling Emergence to Bloom (*Prior to honeybee placement in field)*			
Venom Scorpion	4A	4.5-6.0 oz 10.5 oz	**Furrow:** Shank application at side-dress. Do not spray these products if applied at-planting. **Drip:** Chemigation at 7-14 d following emergence. *Do not apply more than 12 oz of Venom, or 10.5 oz of Scorpion per crop season.*
Transform	4C	2.25 oz	Apply as foliar sprays. Most effective on 1-2 leaf stage plants. Can expect ~3 days of adult knockdown residual. Tank-mix with a pyrethroid for added flea beetle control.
Methomyl	1A	1.0 lb	
PQZ	9B	3.2 oz	Apply as foliar sprays to plants at 2-leaf stage or older. Can expect ~7 days residual adult knockdown. Reapply at shorter intervals when whitefly migrations are heavy. Make no more than two applications of any product during the crop season.
Sefina	9D	14 oz	
Assail SG	4A	8.0 oz	
Exirel Minecto Pro	28 28+6	20.5 oz 10 oz	
III. Bloom to Netted Fruit *(During and after Pollination)*			
Sefina	9B	14 oz	Apply as foliar sprays to blooming plants at night when bees are not active. Reapply as necessary to control adults. Make no more than two applications of any product during the crop season.
PQZ	9D	3.2 oz	
Assail SG	4A	8.0 oz	
Oberon	23	8.5 oz	Apply as foliar sprays to control immature whiteflies. Will not provide control of adults or suppression of CYSDV transmission
Courier	16	13.6 oz	

Acknowledgements Research on the cultural and chemical management of whiteflies and CYSDV used to develop these guidelines was supported by the California Melon Research Board, and by an Arizona Department of Agriculture, Specialty Crops Block Grant provided by the USDA Agricultural Marketing Service under the award number SCBGP 10-10. To view the research reports from the CMRB, visit https://CMRB.org and the following scientific papers for results contributing to these guidelines:

1) Carriere et al. 2014, J. Econ. Entomol. https://academic.oup.com/jee/article/107/1/1/823200
2) Carriere et al. 2017, J. Econ. Entomol. https://academic.oup.com/jee/article/110/5/2002/4102307
3) Castle et al. 2017, Pest Management Sci. https://onlinelibrary.wiley.com/doi/full/10.1002/ps.4478
4) Castle et al. 2017. Virus Research. https://doi.org/10.1016/j.virusres.2017.03.017