COOPERATIVE EXTENSION
UNIVERSITY OF HAWAI'I AT MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

# Use of Resistant Varieties in Combination with Screen Systems

Sugano, J., L. Okumura, J. Silva, J. Uyeda, T. Radovich, S. Motomura-Wages, R. Corrales and K.H Wang

**SUMMARY**

Screen units are an effective tool in minimizing larger agricultural pest such as birds, Chinese rose beetle, fruit flies, and *Lepidoptera pest* from damaging crops which may result in reduced productivity, crop and financial losses. It serves as a non-chemical, physical barrier which puts the pest at a disadvantage. Screen can be placed flat on the ground to prevent bird damage or joined together to cover a structure for pest protection. Sewing or greenhouse wiggle wire material can be used to extend the original dimensions of the screen to cover larger units.

CTAHR field trials conducted to date have shown that the management of small insect pest within these systems are difficult using weekly applications of various organic crop protection chemistries. Many producers who are interested in using screen systems are often looking for organic or reduced risk crop protection options. Integration of a non-organic, systemic insecticides in combination with screen systems may prove to be a highly effective approach in managing both, large and small agricultural pests.

https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=29445&dt=3&g=12
https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=2972&dt=3&g=12

**METHODOLOGY**

We installed an observational field trial at the Waimanalo Research Station in March 2018 to evaluate the use of resistant varieties in managing small insect pest which vector plant viruses.

Tomatoes are an important economical crop for many small and large-scale producers in Hawaii. Tomato Yellow Leaf Curl Virus (TYLCV) is a devastating disease of tomato worldwide (Melzer, et al, 2009). Susceptible varieties become chlorotic with interveinal discoloring, stunted due to shortened internodes, leaflets curl or cup upwards at the leaf margins and suffer from reduced fruit set due to premature flower abortion.

TYLCV is transmitted by sweet potato (*Bemisia tabaci*) and silverleaf (*Bemisia argentifolii*) whiteflies but is not transmitted by the greenhouse whitefly (*Trialeurodes vaporariorum*). TYLCV is not spread through mechanical means.

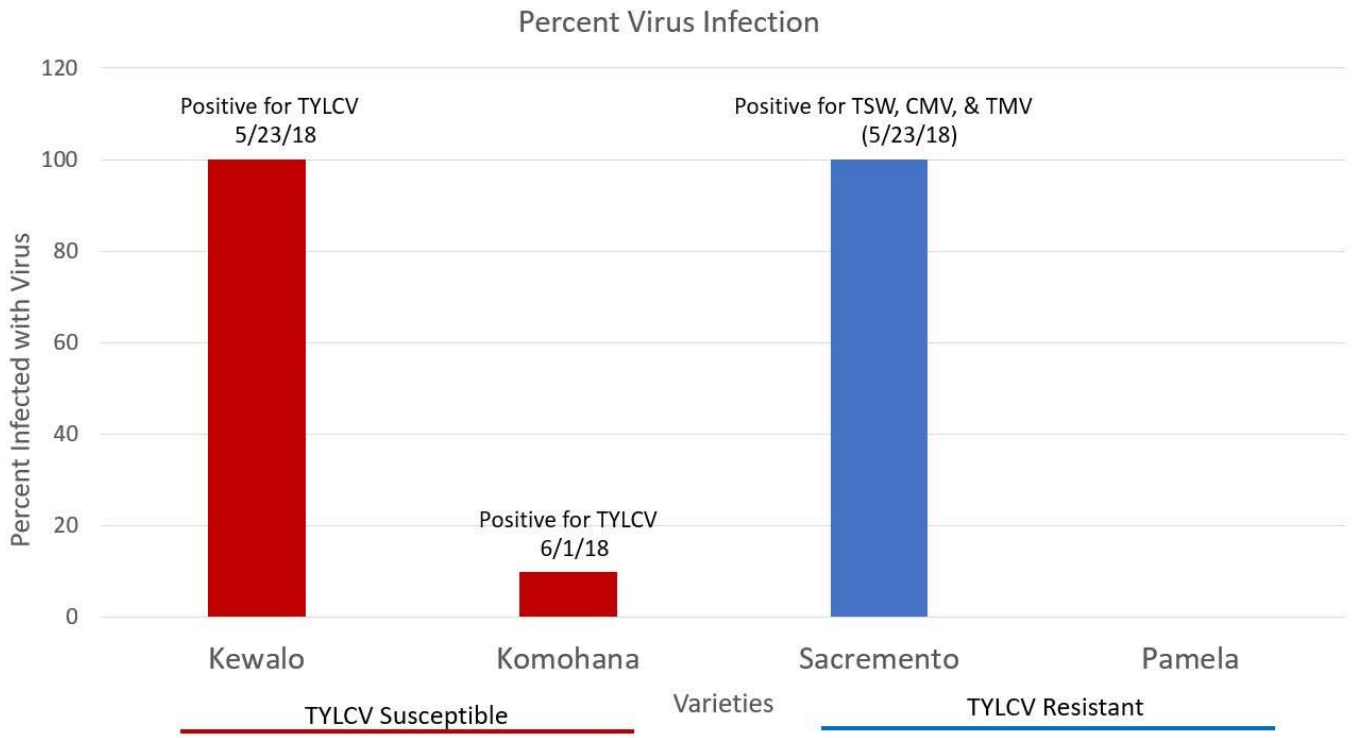
For this trial, we selected two varieties of tomatoes (UH Kewalo and Komohana) with no disease resistance against TYLCV. We also selected Pamella and Sacramento, two organic tomato varieties with field tested resistance to TYLCV (Uyeda et al, 2012) in Hawaii. Pamella (NE Seeds) had a disease resistance package which included tolerance to TYLCV, tomato spotted wilt, tobacco mosaic virus, verticillium wilt, nematodes, and fusarium wilt. Sacramento (NE Seed) was tolerant to tobacco mosaic virus, fusarium wilt, verticillium wilt and TYLCV.

Ten plants of each variety were planted within an EZ corner screened unit and sprayed with a weekly rotation of organic crop protection chemicals which included potassium salts of fatty acids, azadirachtin and sulfur. Spray applications were made with a Maruyama mist blower. Plants were transplanted on March 12, 2018 and weekly application began on April 6, 2018. Despite heavy rains and flooding, mites, mealybugs and thrips were observed on the underside of leaves and stems within the screen system. White flies were not observed.

Evaluations on May 23, 2018 showed that UH Kewalo was 100% infected with the TYLCV. UH Komohana was slower to contract the TYLCV virus with 10% affected, on June 1, 2018. Sacramento expressed strange symptoms of spotting, blotchy-ness and necrotic leaf edges. Samples were submitted to Dr. Michael Melzer at the University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources in May 2018. Sacramento tested positive for tomato spotted wilt virus, cucumber mosaic virus, and tobacco mosaic virus.

Samples were analyzed twice with similar results. All samples were negative for potyviruses. Pamella's disease resistance package proved to be the best among the four varieties when grown under the screened system.

**MEASUREMENT:**
Effect of weekly spray applications on minimizing vectors and virus transmittal within the screened unit.





Kewalo (before virus)


Kewalo (after virus)


Sacramento


Sacramento


Thrips


Mites


Nematodes


Tree hopper


Komohana-Infected


Komohana


Field Day: May 30, 2018

A field day was held for producers on May 30, 2018 with USDA NRCS. Growers were able to see the tomato field trial, different screen systems and talk to USDA NRCS cost share opportunities for high tunnel systems.

**SUMMARY-MAIN FINDINGS**

- Small insect pests were able to move in and out of the screen units and/or were transported into the units at transplant.
- The use of a mist blower in combination with weekly organic crop protection chemicals was not sufficient in stopping small insect populations from infecting plants within the screened units with one or more plant viruses (with the exception of Pamella).
- In previous trials we used a $CO_2$ sprayer. Changing to a mist blower system did not yield a higher level of control of small insects within the screened system.
- Many small insects do not need to mate to reproduce such as aphids, thrips, etc. Growers should manage small insects in a timely manner especially when using organic insecticides, which have short residual activity.
- Ongoing field evaluations for disease resistant varieties is important for tomato production in Hawaii.
- The adoption of a virus resistant variety such as Pamella with a broad disease protection package helped to heighten the efficacy of pest and disease management.
- Kewalo is highly susceptible to TYLCV. Komohana is also susceptible but the onset of the virus seems to be delayed when compared to Kewalo.
- Sacramento has excellent TYLCV resistance in Hawaii but is highly susceptible to a combination of plant viruses including tomato spotted wilt virus, cucumber mosaic virus, and tobacco mosaic virus.
- Foliar application of insecticides is not an effective way to manage virus vectoring insects.
- Future work includes increasing the frequency of organic insecticide applications and combining virus resistant varieties to improve control against virus vectoring insects.

**REFERENCES**

Melzer, M.J., D. Y. Ogata, S. K. Fukuda, R. Shimabuku, W. B. Borth, D. M. Sether, and J. S. Hu. Tomato Yellow Leaf Curl. University of Hawaii at Manoa. College of Tropical Agriculture and Human Resources. Plant Disease Dec. 2009 PD-70. Available online: https://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-70.pdf

Sugano, J., M. Melzer, A. Pant, T. Radovich, S. Fukuda, and S. Migita. Evaluations of Tomato Yellow Leaf Curl Virus Resistant Varieties for Commercial Production. Sustainable and Organic Agriculture Program. Hanāi 'Ai Newsletter. June - July - August 2011. University of Hawaii at Mānoa, College of Tropical Agriculture and Human Resources. Available online: https://www.ctahr.hawaii.edu/sustainag/news/articles/V8-Sugano-TYLCV.pdf

Sugano, J., M. Melzer, A. Pant, T. Radovich, S. Fukuda, S. Migita, and J. Uyeda. Field Evaluations of Tomato Yellow Leaf Curl Virus Resistant Varieties for Commercial Production. University of Hawaii at Manoa. College of Tropical Agriculture and Human Resources. Plant Disease. November 2011. PD-78. Available online: https://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-78.pdf

A. Tateno, L. Kaufman, M. Wright, J. Sugano, T. Radovich. Field screening of tomato varieties resistant to Tomato Spotted Wilt Virus and Tomato Yellow Leaf Curl Virus in Hawaii. Sustainable and Organic Agriculture Program. Hanāi 'Ai Newsletter. December 2014-February 2015. University of Hawaii at Mānoa, College of Tropical Agriculture and Human Resources. Available online: https://www.ctahr.hawaii.edu/sustainag/news/articles/V22-Tateno-tomato.pdf

Uyeda, J., T. Radovich, J. Sugano, K.H Wang, M. Melzer, and L. Cox. Preliminary Screening for Virus Resistance in Organic Field Grown Tomatoes. Sustainable and Organic Agriculture Program. Hanāi 'Ai Newsletter. June-July-August 2012. University of Hawaii at Mānoa, College of Tropical Agriculture and Human Resources. Available online: https://www.ctahr.hawaii.edu/sustainag/news/articles/V12-Uyeda-OrgTomato.pdf