

Management of Banana Bunchy Top Virus in Hawai'i

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Title: Management of Banana Bunchy Top Virus in Hawai'i

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Situation:

Hawai'i is the nation's largest banana-growing state producing 16.5 million pounds a year worth \$8.1 million (2004).

The biggest threat to the crop is banana bunchy top disease (BBTD), which occurs throughout the Pacific Basin and was first reported in Hawai'i in 1989. The disease is caused by banana bunchy top virus (BBTV), efficiently spread by the banana aphid (*Pentalonia nigronervosa*). Plants infected early do not produce fruit.

BBTV has spread progressively throughout banana-growing areas along the Hawaiian island chain. Banana production declined by more than a quarter from 2003 to 2004, with much of the decline attributed to BBTV.

Growers often relied on guesswork and "grower myths" in attempts to counter the disease. Many failures at control have prompted growers to destroy banana orchards and replace them with less lucrative crops. Mounting concern over the negative impacts of BBTV is prompting increased research.

Objectives:

1. Obtain a better understanding of the banana aphid's biology and ecology
2. Study the patterns of banana bunchy top virus spread in commercial fields
3. Determine disease parameters that are important to the development of virus management practices



Project team members Dr. Eden Perez UH Plant Pathologist and Mr. Steve Fukuda, Extension Specialist collect banana suckers from a farm that will be used to produce tissue cultured banana plantlets.



Dr. Koon-Hui Wang, UH Nematologist, takes soil and root samples from banana plants on the island of Lāna'i to determine nematode populations.

Actions:

A multi-pronged approach has been taken to characterize banana bunchy top virus and its causes, spread and potential control in Hawai'i. Among steps taken:

- Banana plants were sampled to create a farmer friendly sampling plan for the vector of BBTV
- Three field trials were conducted to assess the impact of BBTV on banana growth and physiological parameters and determine the incubation period of BBTD.
- To assess the spread of the disease, samples of BBTV infected plant material were collected from symptomatic banana plants on all islands except Lāna'i, where BBTV had not been reported.
- Experiments were conducted to identify the relative importance of temperature on BBTV acquisition and inoculation efficiency.



Dr. Cerruti Hooks, in plant foliage, UMD Entomologist, and Roshan Manadhar, holding ladder (UH graduate student), count aphids in banana plants.

Results:

The project developed a sampling protocol (a sequential binomial sampling plan) that can be used to scout for aphid populations. During the investigation, aphids were found more frequently beneath the leaf sheath or petiole on the lower areas of banana suckers. This dispelled a previously held belief by banana stakeholders that aphids are readily found on the cigar leaf (newest unfurled leaf).

Preliminary findings from the aphid survey suggest that aphid populations are greater on plants approximately 1.5 meters or less. Data from the survey are currently being used to further advise producers on how to scout their fields for aphids and to spray only when economic thresholds have been reached.

The project team visited 29 farms with banana plantings, conducting field surveys at 26 of them for aphids, nematodes, ants and BBTV. Afterward, farm crews were provided information on how to best manage banana aphid, BBTV and nematodes.

Another finding from the survey dispelled the general assumption that ants found on banana plants are mostly there to tend aphids, and thus protect them from natural enemies. On numerous sampling occasions high densities of ants were found on plants that were not colonized by banana aphids. This suggests that growers need not adopt practices aimed at suppressing ants, which adds to production costs with no apparent benefits in regard to aphid control.



Team members harvest banana bunches and look for plants infected with banana bunchy top virus.



At outreach events, project members discuss the use of known disease-free (tissue-cultured) banana plants as a way to fight BBTV.

Among the most significant findings is that transplanting infected suckers, even though unintentional, is a major source of BBTV spread. Indeed, planting infected banana suckers may have a greater influence on the spread of BBTV than aphids. This has led the project team to widely promote the use of known disease-free planting material (tissue culture banana plantlets).

Once a banana plant has been diagnosed with BBTV, the recommendation is to destroy it as quickly as possible, typically with a bananacide, which growers assumed eliminated the threat within a short period of time. However, project participants found that infected banana plants can remain a source of virus inoculum up to six weeks after the bananacide is injected at the highest recommended label rate, and aphids feeding on plants five weeks after injection can transmit BBTV to healthy plants. So growers are now encouraged to apply an insecticide to bananacide-treated plants. However, future studies are needed to find more nonchemical or organically accepted methods to destroy infected plants.



A banana farm on the island of Kaua'i where banana plants were surveyed for aphids, ants and nematodes.

Potential Benefits:

Based on project findings, these recommendations are being aggressively promoted to banana growers through workshops, on-site visits and news releases:

- Do not transport banana plants from one location to another.
- Do not accept banana plants from others.
- Aggressively scout fields and destroy infected plants immediately.
- Use only banana plants known to be free of BBTV as replant material.
- Share credible information about BBTV and its management with family, friends and other associates.
- Consult an expert if you have questions.



Pots of tissue-cultured banana plants developed by team members are ready for field planting at an O'ahu farm.