



UNIVERSITY OF CALIFORNIA  
Agriculture and Natural Resources

Cooperative Extension

# Pitahaya/Dragon Fruit Pest and Disease Survey

Impacts of CVX and other Pests and Diseases on Commercial Production  
of Pitahaya in Southern California

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# Introduction

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- Project Goals and Objectives
- Purpose of Field Survey
- Cactus Virus X (CVX) Overview
- Symptoms of CVX in Pitahaya
- Reported Pitahaya Diseases
- Methods
- Results
- CVX prevention and management
- Conclusion

# Project Goals and Objectives

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- Conduct Pest and Disease Survey of Commercial Pitahaya/Dragon Fruit farms in Southern California to determine incidence of Cactus Virus X and identify pest and disease management issues impacting commercial production
- Specific Objectives:
  - Screen plant material of commonly grown varieties for Cactus Virus X (CVX) and for the presence of pathogenic microorganisms
  - Identify common pests and disease issues hindering pitahaya or dragon fruit production
  - Develop IPM Management information and resources to address pest and disease issues identified

# Purpose of Field Survey

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- Determine Cactus Virus X (CVX) and other disease incidence and severity
  - Hoping to find clean plants in each variety sampled to establish a virus free germ plasm collection
- Work towards the creation of an IPM program for SoCal pitahaya growers
- Identify if a need is present to eradicate CVX from commercially grown pitahaya cultivars

# Cactus Virus X (CVX) Overview

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- Common plant pathogenic virus that attacks many species in the *Cactaceae* family
- Found worldwide
- First reported in Taiwan in 2003
- Found alongside other topomoviruses and potexviruses in some cacti species

Reported and confirmed in California at South Coast REC in 2011,  
85% percent of approximately 200 samples analyzed were positive  
for Cactus Virus X (CVX)

# Host plants of CVX

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- Hylocereus
- Austrocylindropuntia
- Cereus
- Echinocereus
- Echinopsis
- Epiphyllum
- Eriocereus
- Ferrocactus
- Lobivia
- Mammillaria
- Notacactus
- Opuntia
- Pereskia
- Platyopuntia
- Saguaro
- Schlumbergera
- Zygocactus

# Host plants of CVX

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- Indicator plants
  - *Chenopodium amaranticolor*
  - *C. quinoa*
  - *Celosia argentea*
  - *Gomphrena globosa*

# CVX symptoms in pitahaya

- Stem distortion
- Distortion of spines or areoles



# CVX symptoms in pitahaya

- Swelling



# CVX symptoms in pitahaya

- Mottling



# CVX symptoms in pitahaya

- Necrosis



# CVX symptoms in pitahaya

- Reddening of the stems
- Purplish stems
  - Possibly end stage infection



# CVX symptoms in pitahaya

## ○ Lesions



# Reported fungal pathogens

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## STEM CANKER- ANTHRACNOSE

- *Colletotrichum gloeosporioides*
- *C. aenigma*
- *C. siamense*
- *C. karstii*
- *C. truncatum*

# Reported fungal pathogens

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## FRUIT AND STEM ROT

- *Fusarium fujikuroi*
- *F. oxysporum*
- *F. proliferatum*
- *F. semitectum*
- *F. solani*

# Reported fungal pathogens

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## FRUIT AND STEM ROT

- *Bipolaris cactivora*
- *Monilinia fructicola*
- *Alternaria alternata*
- *Gilbertella persicaria*
- *Neocosmospora rubicola*
- *Nigrospora sphaerica*
- *Botryosphaeria dothidea*
- *Aureobasidium pullulans*
- *Sclerotium rolfsii*

# Reported bacterial pathogens

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## FRUIT AND STEM ROT

- *Enterobacter cloacae*
- *Paenibacillus polymixa*
- *Xanthomonas campestris*
- *Erwinia carotovora*

# Reported Phytoparasitic Nematodes

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- *Tylenchorhynchus agri*
- *Meloidogyne incognita*
- *M. javanica*
- *Pratylenchus* spp.
- *Ditylenchus* spp.
- *Hoplolaimus* spp.

# Methods

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- Survey of diseases in southern California commercial pitahaya
- AgDia Labs, Johanna Del Castillo Munera at UC Davis
- Potex-Allexivirus group PCR test, sequenced positive samples

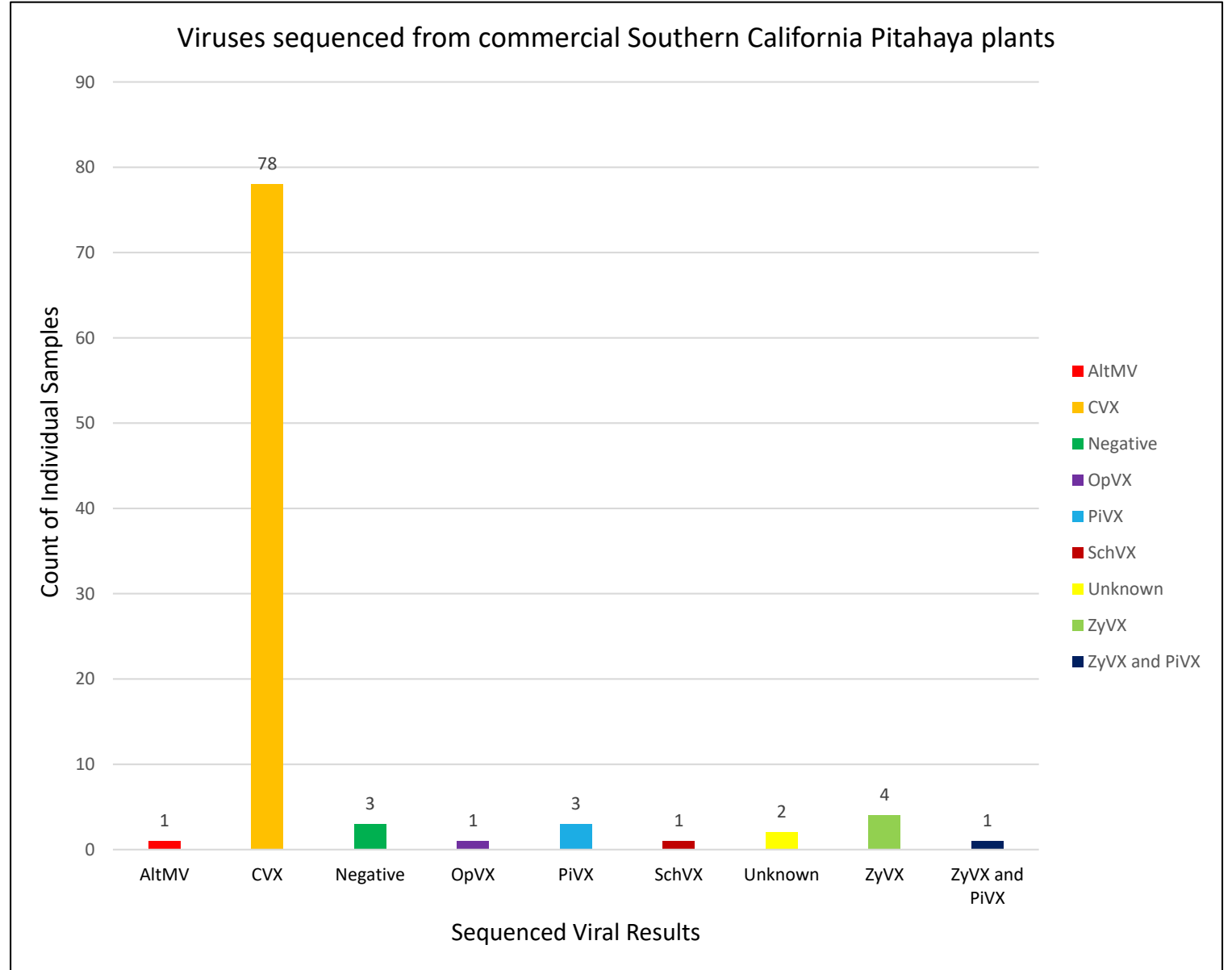
# Methods

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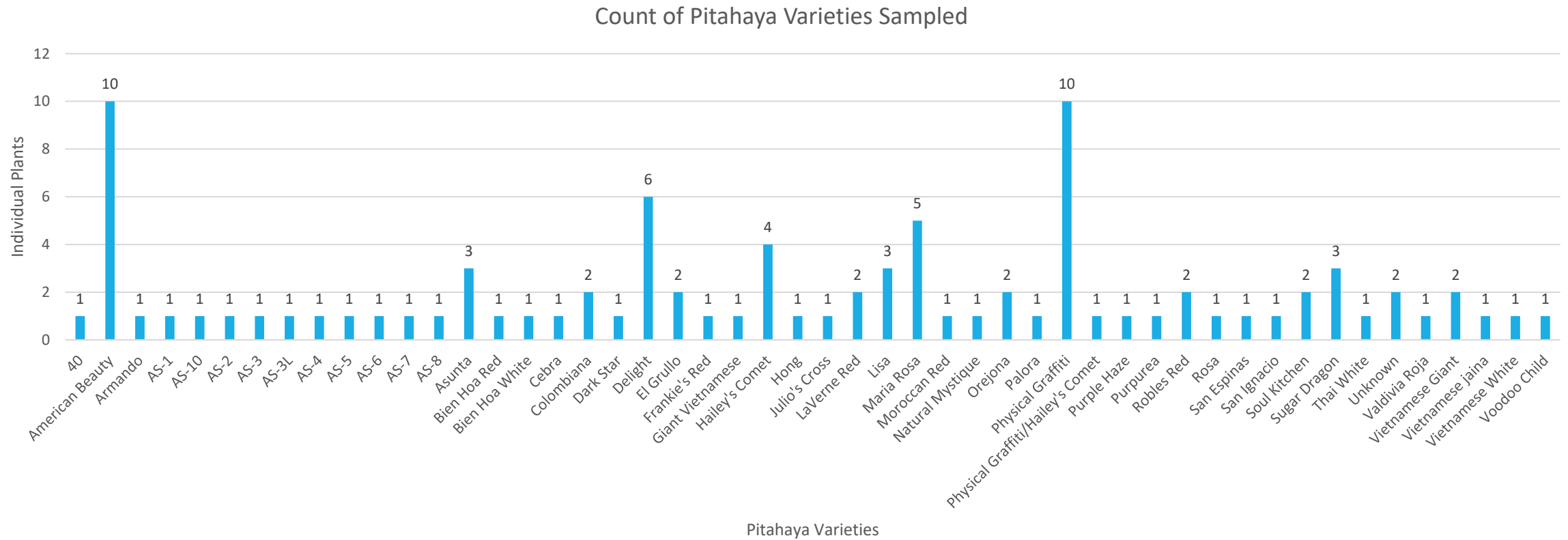
- Replicate samples collected for viral, fungal and bacterial testing
- Chose healthier-looking plants and more diseased-looking plants
  - Hoping to be able to match symptoms to CVX
- Tissue samples packed in quart size Ziploc bag
  - Disinfected between each plant
- Photographed whole plant and labeled samples
- The labs directed our procedure in packaging, storing, and sending each sample
  - Shipped overnight

# Results from Agdia

- 7 Commercial farms or Backyard growers
- 94 samples total
- CVX positive dominates
- Some samples had a low sequence identity %
  - Presence of multiple related viruses
  - Low virus titer



# Results



# Results from Johanna Del Munera

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- UC Davis
- Many different organisms

# CVX transmission

- Propagation, pruning, and harvesting



# CVX transmission

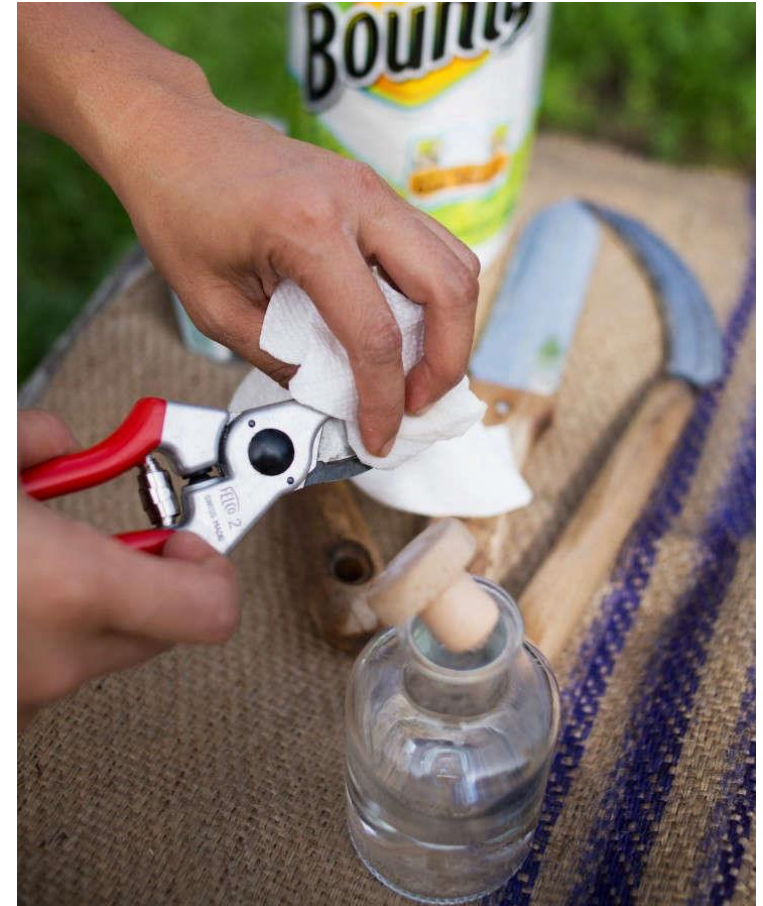
- Propagation, pruning, and harvesting
- Plant contact, root grafting when planted



# CVX Control/Management

## AVOIDANCE PRACTICES

- Scouting for and eliminating symptomatic plants
- Isolating especially susceptible varieties
- Eliminating host plants
- Regular testing
- Avoiding mechanical transmission
- Between each cut, decontaminating tools and surfaces with bleach or another disinfectant solution
- Removing all pruned plant material from growing area



# Concluding Comments

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- Cactus Virus X (CVX) is everywhere
- Pitahaya farming can be done successfully as demonstrated by the farms visited/sampled
- Best practice to have preventative protocols to reduce the spread of the virus
- The comparison of CVX-infected vs non-CVX-infected pitahaya plantings
  - Impact the virus has on pitahaya vigor, longevity and productivity
  - Scarcity of CVX or similar virus negative pitahaya plants, difficulties in accomplishing this

# Future Trials/Research Needs

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- More testing: variety bias in viral susceptibility
- Fertilizer applications effect on disease severity
- Insect monitoring of existing pitahaya plots to determine the impact of insect pests
- Development of an ELISA test for CVX
- Exploration of the factors that influence pathogen spread
  - Pollen, soil, and insects
- Conventional CVX outbreeding or non-conventional (mutation breeding or somatic cell selection) methods
- Cost-benefit analysis – Does pitahaya or Dragon Fruit fits your farm or product/market mix?

# Thank you!

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