

Pitahaya or Dragon Fruit (*Hylocereus spp.*): A New Water Efficient Crop for Southern California Small Scale Farmers

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The Issue:

The drought that has affected California for the past several years has drastically reduced the availability of water for agricultural use in Southern California. The drought, combined with some of the highest prices for agricultural water, have caused a steady decline in profit margins for citrus and avocados, the major crops grown in the region. Many growers have been forced out of production and others are in great need of water efficient, more profitable crop alternatives for their farming operations.



Commercial Pitahaya planting in South Florida

Pitahaya or Dragon Fruit:

Pitahaya or dragon fruit (*Hylocereus spp.* and *Selenicereus megalanthus*) is the name of a vining cactus and the edible fruit it produces. Pitahaya adapts very well to Southern California climates and require less water than traditional crops for commercial production.

Consumer Demand

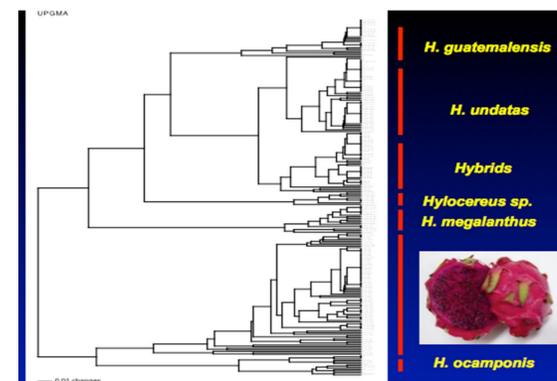
The demand for the fruit has grown as consumers look for new, exotic, nutritious fruits for their diets. The interest for this crop has increased among small-scale producers and the acreage planted has expanded considerably.

Results/Outcomes

Pitahaya research and extension activities have demonstrated that it can be a commercial, profitable crop alternative for small scale producers in Southern California. Specific results from the project include:



Twenty pitahaya cultivars evaluated for adaptation and performance at South Coast REC and are being evaluated in Ventura and Riverside Counties.



Genotyped 280 pitahaya accessions using Amplified Length Polymorphism (AFLP) markers.

- Screened pitahaya plant material for Cactus Virus X (CVX).
- Develop post harvest and pest management information

Organized seminars and field days attended by 200 pitahaya growers and interested farmers annually.



Distributed 10,000 pitahaya cuttings to growers



Two different trellis systems under evaluation at UC South Coast REC

Collaborators:

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- Ben Faber, Farm Advisor – UCCE Ventura
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- Giorgios Vidalakis, Extension Specialist – UCR
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Cactus Virus X (CVX) a new threat to Pitahaya/Dragon Fruit (Hylocereus spp.) production in California

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Introduction

Pitahaya or dragon fruit (Hylocereus spp. and Selenicereus megalanthus), is the name of a vining cactus and the fruit it produces. Pitahaya adapts well to various climates and can be a profitable option for growers in Southern Coastal California Counties, where a growing interest, particularly among small-scale producers looking for alternative crops, has increased and so has the acreage planted to this crop.



Figure 1: Pitahaya or dragon fruit plants in a commercial planting in Southern California.

Field plots were established in three different California locations to address research issues identified as critical for commercial production. However, as the number of commercial growers, the number of acres and the geographic dispersal of the crop increases, so do the challenges for commercial production.

Cactus Virus X (CVX)

Cactus Virus X (CVX), first reported on pitahaya in Taiwan in 2001 (M.R. Liou et al.) is an example of these new challenges. CVX is found worldwide and infects many species in the Cactaceae family (Cereus, Saguaro, Opuntia, Zygocactus and Hylocereus). Infected plants can be asymptomatic or show symptoms like distorted aureoles, deformed spines, necrosis, mottling, and reddening of the stems (Figure 3).



Figure 2: Ripe pitahaya or dragon fruit ready for market.



Figure 3: Left: Stems showing common symptoms associated with CVX on pitahayas. Right: Positive but asymptomatic plant.

Diagnosis

Virus-like symptoms were first observed/documentated at the UC South Coast REC in early 2011 and the presence of CVX in Pitahaya was first reported in California later that year. A set of 54 samples was analyzed/screened by a private laboratory using a Polymerase Chain Reaction (PCR) test and the virus was present in an estimated 90% of the samples analyzed. The availability of an ELISA test to screen for CVX allowed the analysis of an additional 200 samples in a more rapid and cost effective way with the majority testing positive for the virus. Although the effect/impact of the virus for commercial production is still not clear, it represents a significant threat to the growth of this crop.



Figure 4: Tissue type (peeled skin) used for ELISA test and developed ELISA plate with positives.

Three main strains of CVX have been identified to date. There are no known vectors for the virus and its transmission occurs primarily by mechanical means, including but not limited to cultural practices like pruning, harvesting and propagation. Additionally, the virus can be transmitted naturally through plant contact and root grafting beneath the soil. Future research will discuss/present guidelines for field identification and best management practices commercial pitahaya growers can use to manage CVX and prevent further contamination once present in their production fields.



Figure 5: Pitahaya or dragon fruit flower ready for

Best Management Practices

- Establish new plantings with clean plant material
- Scout routinely for symptoms
- Isolate particularly susceptible varieties
- Immediately remove and destroy infected stock
- Use good sanitation practices to prevent mechanical transmission due to handling, tools, pots and plant debris
- Decontaminate tools and work surfaces with bleach, quaternary ammonium, chlorhexidine, etc. (always follow label instructions)

References

- Liou, M.R. C. L. Hung, and R.F. Liou (2001). "First Report of Cactus virus X on Hylocereus undatus (Cactaceae) in Taiwan." The American Phytopathological Society APS Net. Volume 85, Number 2. February 2001.
- Liou, MR. C.L. Hung, and R.F. Liou. (2004). "Characterization of a Cactus Virus X infecting Hylocereus undatus and its detection by DAS-ELISA. Plant Pathology Bulletin 13: 17-34. Department of Plant Pathology and Microbiology, National Taiwan University, Taipei, Taiwan.

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Susceptibility of Pitahaya Species to the Southern Root-knot Nematode



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Introduction:

Pitahaya (Dragon fruit, *Hylocereus* spp.) are vining and climbing cacti native to tropical America. They are new crop alternatives for Southern California because of their drought tolerance and fruit quality. However, various soilborne pathogens may pose a challenge. Our objective was to evaluate cultivars from 5 different species for their susceptibility to *Meloidogyne incognita*.

Pitahaya spp. tested

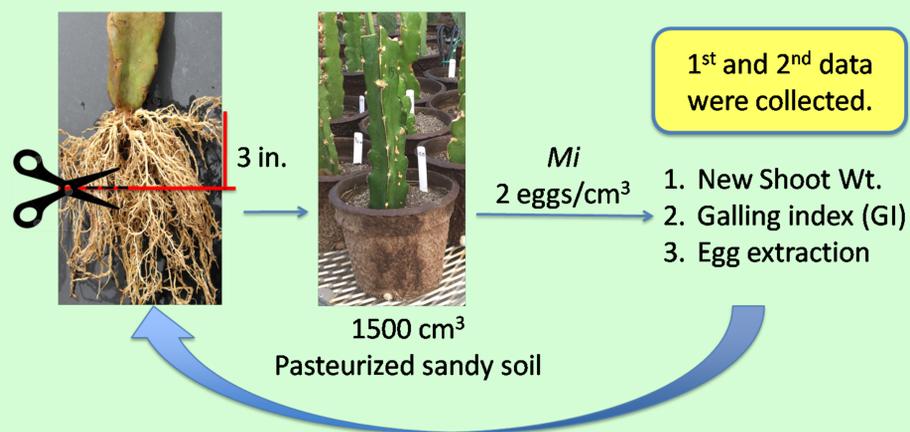
- #4 *Hylocereus polyrhizus* 'Lisa'
- #5 *Hylocereus* sp. 'Sin Espinas'
- #9 *H. ocamponis* 'Valdivia Roja'
- #12 *Hylocereus* sp. 'Delight'
- #13 *H. guatemalensis* 'American Beauty'
- #15 *Hylocereus* sp. 'Physical Graffiti'
- #16 *H. undatus* 'Vietnamese Giant'
- #817 *H. megalanthus* 'Colombiana/ Yellow Dragon'



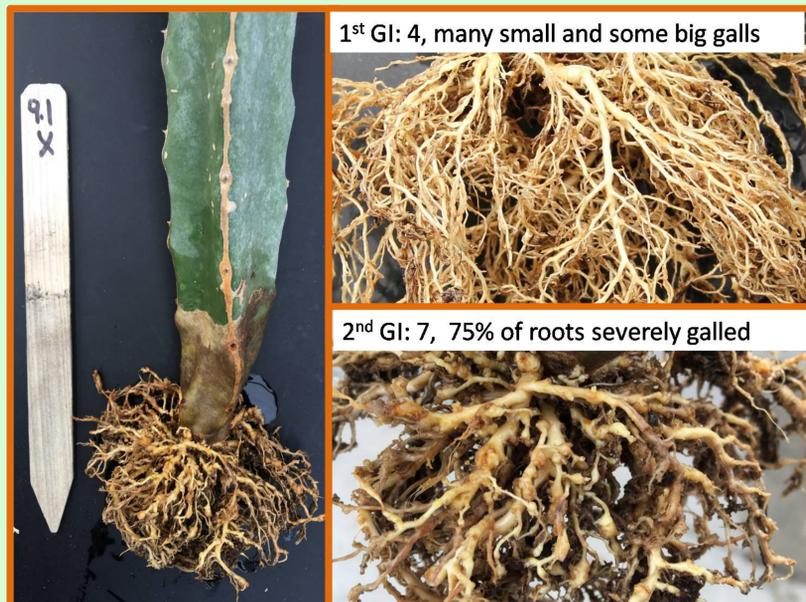
Fruits of tested Pitahayas

Materials & Methods

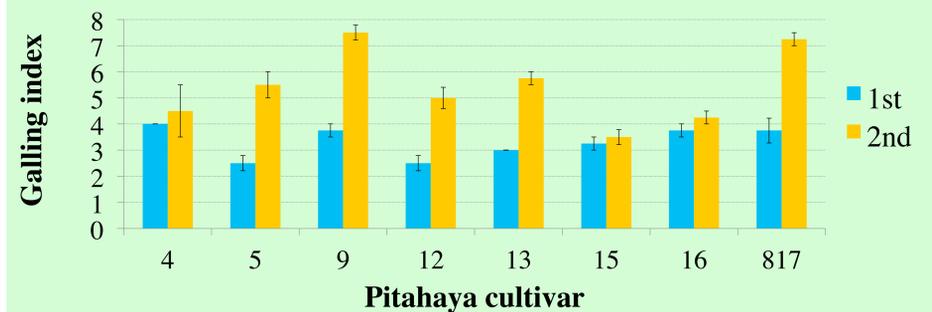
- Rooted Pitahaya cuttings in pasteurized sandy soil infested with 200 *M. incognita* J2/100 cm³.
- Incubated at 26°C±3°C in greenhouse; RCB design, 4 reps.
- Evaluation after 2 months: gall rating (0-10), egg extraction, new shoot weight.
- Replanted, evaluation repeated after 2 months.



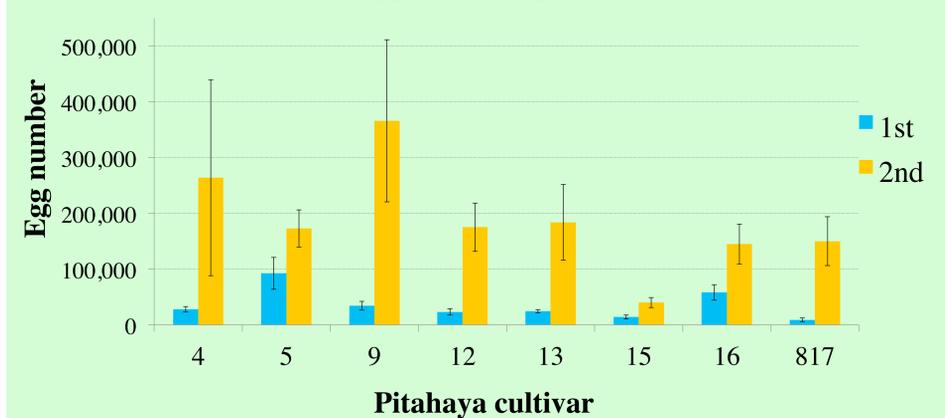
Results



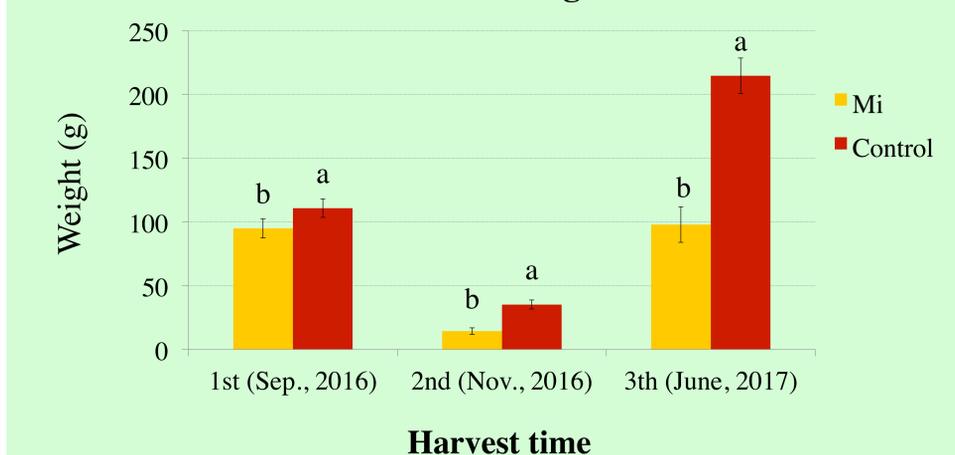
Galling index



Egg number/g root



New shoot weight



Summary

All tested cultivars were susceptible to *M. incognita*. The nematodes induced considerable root galling, reproduced well and reduced new shoot growth compared to the pathogen-free controls. Through field days and workshop presentations, we educated growers and pest control advisors about this potential threat to Pitahaya production.

Acknowledgements

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