UNITED STATES VIRGIN ISLANDS
DEPARTMENT OF AGRICULTURE
2011 SPECIALTY CROP BLOCK GRANT
FINAL REPORT

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INSTITUTIONAL SUB-GRANTEES
Institution Name: University of the Virgin Islands Agricultural Experiment Station (UVI AES)
Principal Investigators: Thomas W. Zimmerman, Ph.D., Stafford A. Crossman, M.S.

Project Title: Integrating Pheromone Weevil Traps in Virgin Islands Sweet Potato Production
Project Title: Production and Marketing Potential of Pitaya in the Virgin Islands

Other Projects: Marketing of the 2011 SCBGP
Institutional Sub-Grantee
Project Title: Production and Marketing Potential of Pitaya in the Virgin Islands
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Final Report

November 12, 2014

Project Summary
Pitaya or Dragon Fruit is a cactus, closely related to the native night blooming cerius, with a large succulent fruit. Twenty-six Pitaya varieties were established in a former grape trellis wire system. Plants were set in a replicated trial at either 2 ft or 4 ft intervals. Pitaya were established and proved able to grow to the top of a six foot trellis wire and some flower within a year. Plant growth and flowering were monitored and data recorded. Ripe fruit were harvested and data collected on weight, length, width, fruit flesh color and soluble sugar content. After the first year, 67% flowered and set fruit and all had flowered and fruited during the second and third year. All flowers were naturally pollinated at night by bats and/or moths so no hand pollination was required. Pitaya was proven to have potential for production in the calcareous soils in the Virgin Islands. Of the 26 varieties, six pitaya varieties were selected and recommended based on production, fruit size color and sweetness. These selected varieties are ‘Dark Star’, ‘Delight’, ‘Makisupa’, ‘Natural Mystic’, ‘Physical Graffiti’ and ‘Purple Haze’. The limited local pitaya available at the farmers market sell quickly and at a good price. Farmers are now enthusiastic to grow these selected pitaya varieties in the Virgin Islands.

Project Approach
Twenty-five Pitaya varieties were established in a former grape wire trellis system. (Fig. 1) Plants were set in a replicated trial at either 2 ft or 4 ft intervals in a 6 row plot. Drip irrigation, with 2 ft emitters, was used for watering every other week. Fertilization was applied via an injector three times at a rate of 12.5 lbs of soluble 20-20-20 fertilizer during the trial. Iron was applied in the form of Fe.EDDHA due to the high pH calcareous soils. Six foot Bamboo sticks were used as support for the pitaya. Plants were tied with tape monthly to train them until they reached the top trellis wire. Side branches were removed to promote one stem to the top of the trellis. However, the wire of the trellis was found to cut into the fleshy stems. Most Pitaya flowered and set fruit during the second year from late May through September. Malathion and Sevin were applied to control ants which were found to feed on the fleshy pitaya stems and fruit. During the first year, fruit were not attacked by birds. However, during the second and third year, birds developed a taste for pitaya fruit and caused damage. Being a cactus, pitaya can survive the extended dry season and still be productive during late spring when regular rains occur.
Goals and Outcomes Achieved
We were able to select the best six varieties from the twenty-six grown that are the most productive with varying flesh colors based on the data collected. Pitaya workshops were conducted on both St Croix and St Thomas to instruct young beginning farmers how to grow this succulent tropical fruit. A pictorial handout was developed to assist farmers in growing pitaya. Cuttings of the stock plants are made available to farmers and home-owners to establish single plant or small orchards. Abstracts, posters and papers were presented at local and international research conferences on the production potential of pitaya in the Virgin Islands. Manuscripts of the results were published in international conference proceedings. One morning radio broadcast was centered on Pitaya production.


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**Beneficiaries**
The people of the Virgin Islands as well as the Caribbean community benefited from this Specialty Crops Block Grant pitaya project. Home-owners and farmers were able to obtain cutting to grow their own plants from the 26 varieties in the UVI orchard. Local farmers and backyard gardeners benefitted by receiving instructions on the growing, best varieties recommended and how to establish their own orchards. The local consumers benefitted by having a new succulent tropical fruit. Both farmers and consumers were made aware of the different pitaya varieties available and how they are grown from the radio broadcast and workshops. UVI students, supported by this grant, learned of the night-blooming characteristic and unique pollinators needed for production. The students also learned of the importance of, data collection and data analysis.

**Lessons Learned**
Pitaya is a dynamic plant with multiple varieties, fruit sizes and flesh colors. Pitaya is an excellent crop for UVI farmer and back-yard gardeners because of its low maintenance, great productivity and high valued fruit. Pitaya has self-incompatible varieties that require cross pollination between varieties to set fruit. Self-pollinating varieties were most productive and are recommended. After three years of evaluating 26 varieties, one variety, ‘Natural Mystic’, was found to be susceptible to a rust disease. Ants like to feed on the fleshy stems and succulent fruit especially during dry times to obtain moisture. Pitaya grew and tolerated the high pH calcareous soils which can be a limiting factor in some fruits. However, it may need supplemental iron or it could experience chlorosis. Being a cactus, it can tolerate extended drought. Six varieties are recommended based on production, fruit size and sweetness. These six varieties selected have fruit color from white, pink to deep red.
**Name of Project:** Integrating Pheromone Weevil Traps in Virgin Island Sweet Potato Production  
**Name of Point of Contact:** Thomas W. Zimmerman  
**Type of Report:** Final Report  
**Date Report Submitted:** December 30, 2013

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**Institution Name:** University of the Virgin Islands Agricultural Experiment Station (UVI AES)  
**Principal Investigators:** Thomas W. Zimmerman, Ph.D., Stafford A. Crossman, M.S.

**Project Summary**  
Sweet potato weevil is the most serious pest of sweet potato, not only in the Virgin Islands but also throughout the Caribbean. It causes damage in the field to leaves, stems and tuberous roots. The objective was to monitor weevil populations during production and evaluate harvest date and weevil damage in 21 sweet potato varieties. Fifteen sweet potato varieties were from in vitro virus-free material and six were Caribbean farmer varieties. The varieties were established from six node cuttings in a replicated trial at one foot in-row spacing and five feet between rows.  
Weevil traps, with a pheromone to attract males, were distributed throughout sweet potato plantings and monitored weekly. Harvest was conducted at 100, 120, 130 and 150 days.  
Weevils were found to increase during the initial four weeks and stabilized during the rest of the growing season. Through the course of the trial, over 2,000 male weevils were captured and destroyed. These numbers however indicate that sweet potato weevils were at a high pressure throughout the growing period. All varieties had weevil damage at 100 days (4-15%), however by 150 days the weevil damage ranged from 15-95%. Overall, marketable production was reduced, due to weevil damage, the longer the sweet potato remains in the field after 100 days.

**Project Approach**  
Sweet potatoes were obtained from USDA Germplasm Repository as virus-free material and from State Universities or local farmers. The majority were red-skinned types. At UVI, replicated trials were set up at different times of the year that coincided with short day (<12 hrs) and rainy season and long days (>12 hrs) dry season. The varieties were B-14, Craneal, Evangeline, Francia, Gonime, Kawogo, Liberty, Mojave, Murasaki, Okinawa, Pujol, PR406, PR9802, Ruddy, Self Fertile, St Kitts, Sweet James, Toquecita, Wanoman, White Jewel and Yellow Sunflower. Cutting were taken from two month old virus-free stock plants and planted at one foot spacing with five feet between rows to accommodate harvester. Drip irrigation was used to apply fertilizer and water to the plants. Marketable tuberous roots had a diameter greater than 1.5” and weevil-free. Varieties with poor production or tuberous root quality were eliminated from the second trial.

Pheromone traps were distributed throughout the field to monitor weevil populations weekly (Figure 1). The pheromone traps have a sex attractant for the male weevils that accumulate and become trapped in the base of the container. The pheromone weevil traps only provide an indication of the weevil population but is not used as a means of weevil control.
Goals and Outcomes Achieved
Weevil populations increased during the first month of sweet potato establishment. The lack of a feed source from maintaining a clean field for two months after harvest reduced but doesn’t eliminate the weevil population. As the sweet potatoes become established and grow, the weevil population increases and then becomes stable throughout the production cycle (Figure 2). Through the course of the trial, over 2,000 male weevils were captured and destroyed. Since the pheromone traps only attract male weevils, the total population including females cannot be determined. These numbers however indicate that sweet potato weevils were at a high pressure throughout the growing period.

The weevil damage to the tuberous sweet potato roots increases with time on most susceptible sweet potato varieties as B-14, Craneal, Evangeline, Francia, Mojave, PR406, PR8023, Pujol, and white Jewel (Figure 3). Most of these susceptible varieties produce tuberous roots near the soil surface where weevils have easier access to cause damage. As sweet potatoes mature, the leaves on the vines begin to senesce and the weevils burrow down through the vine into the tuberous roots near the surface to feed. The varieties Liberty, Murasaki, Okinawa, Ruddy, St Kitts, Sweet James, Toquecita and Yellow Sunflower have resistance to the weevils (Figure 3). This resistance is most likely from the deeper setting of the tuberous roots. Though the variety Yellow Sunflower had resistance to weevils, it is susceptible to cracking of the developing tuberous roots making them unmarketable. The days to harvest play a key factor in weevil damage to the tuberous roots. At 150 days, even the varieties with resistance have great reduction in marketable roots due to weevil damage. Some varieties had total crop loss. The varieties Kawogo, Self Fertile and Wanoman had minimal production and were very susceptible to the weevils so they were eliminated after the first trial.
Figure 2. Male Weevil populations collected using pheromone traps over time.

Figure 3. Influence of harvest date on percentage sweet potato development for small, marketable and weevil-damaged roots.

Sweet potato production also indicated reduction over time on weevil susceptible varieties (Figure 4). The goal was two pounds marketable tuberous roots per plant or 8,000 lb/acre.
Harvesting at 100 days, B-14, Francia, Mojave, PR 8023, Pujol and Toquecita were at the desired level. These indicate early maturing varieties that avoid weevils. Harvesting at 130 days, Liberty, Ruddy, St Kitts and Toquecita averaged two pounds per plant. These varieties are most weevil resistant and later varieties. Toquecita is a good all-around variety for either early or late harvest. Goni and Yellow Sunflower had irregular shape or prone to cracking, respectively and not recommended. The one purple variety, Okinawa, did poorly with low production that averaged only one pound per plant over the harvest dates.

![Figure 4. Weight per plant of marketable sweet potatoes over time. The decreased production with time was due to weevil damage.](image)

A taste evaluation was held with 18 sweet potato varieties that were cooked (Figure 5). Students, faculty, Dept. of Agriculture and local farmers participated in the evaluation. Results from the first year were presented at the National Sweetpotato Collaborators meeting February, 2012 and at the Caribbean Food Crops Society meeting July, 2013.

![Figure 5. Taste panel evaluated both baked and boiled sweet potatoes.](image)
Virus-free sweet potato vines and weevil traps were made available throughout the term of the project to farmer. This complimented and enhanced a previous project that had focused on virus-free sweet potatoes.

A 50 minute video was developed on sweet potato production and weevil control that is periodically run on the government channel television broadcast. Workshops on weevils and sweet potato production were conducted on both St Croix and St Thomas that was attended by over 80 growers. Virus-free sweet potato vines were distributed to all in workshop attendance as well as interested farmers responding to the TV broadcasts. A short video was posted on YouTube illustrating sweet potato harvest that a UVI student compiled (http://www.youtube.com/watch?v=IZVYHtW4d2s)

**Beneficiaries**
Local farmers and backyard gardeners benefitted by receiving instructions on the growing, best varieties recommended, use of pheromone weevil traps and virus-free sweet potato vines to establish their own plots from the most productive and weevil resistant varieties.
The local consumers benefitted by having an expanded variety of locally grown sweet potatoes available over a longer period. All Virgin Islanders benefitted from the sweet potato video produced and run on the government channel. Both farmers and consumers were made aware of the different sweet potato varieties available and how they are grown.
UVI students, supported by this grant, that learned sweet potato production, data collection and data analysis as well as compile a short video for youtube.

**Lessons Learned**
The sweet potato weevil is persistent and survives when the fields are void of sweet potatoes. Though instructed that the pheromone weevil traps only monitor weevil populations, farmers still thought they were controlling populations. The local population will buy sweet potato varieties other than the traditional red skin white flesh types.

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MARKETING OF THE SPECIALTY CROP BLOCK GRANT PROGRAM

2011 Specialty Crop Block Grant

Introduction

Besides the SCBG 2011 Pitaya and Sweet Potato Projects, grant monies were used for Marketing and Promotional Services as discussed below.

The objective of this project was to drive community awareness of the newest initiatives of the VI Department of Agriculture.

This project was extremely important and timely as VIDOA embarked on Specialty Crop Program through its establishment of The Virgin FreshTM marketing campaign. The consumers’ knowledge of what products are locally grown and available for sale was expanded. VIDOA has been successful in increasing brand recognition amongst consumers and is stimulating their interest in the USVI specialty crop industry.
The VIDOA as part of the promotion of the Specialty Crop Grant took part in A Taste of St. Croix Event. The Taste of St. Croix Event is the highly touted event that originated the week of Culinary & Wine events known as the “St. Croix Food and Wine Experience.” This island-wide culinary competition and “fete”, is the event of the year where everyone dresses up, reconnects and celebrates St. Croix.

The event promotes and showcases the talent and potential of St. Croix’s hospitality industry through fostering partnerships, sponsoring training and industry events, and building public awareness of the critical role that the service-industry fills in improving the socioeconomic future of St. Croix and the US Virgin Islands. The presence of the Department of Agriculture assisted by the students of the St. Croix Educational Complex High School can be termed a Master Promotional Campaign, as the “Who is Who” of the Virgin Islands visited and asked many questions at the VIDOA’s Booth.

As a prelude to the Taste of St. Croix, the VIDOA in conjunction with producers held a markets day at the department to sensitize participating chefs with locally grown produce in the preparation of their food entries at the annual event (The Taste of St. Croix).

Farmer Chef Market Day

As another promotional activity the VIDOA hosted a Farmers’/Chef Market Day to provide an opportunity for chefs to purchase local produce. This one-stop shopping experience market enable the chefs, cooks and restaurateurs to choose from a wide variety of produce to prepare their local cuisines. This was another opportunity to promote the work being done with the Specialty Block Grant Fund.
**Marketing Campaign**

The Virgin Islands of Agriculture partnered with local radio stations, JKC productions, The VI Vybe, WGOD and WSTA to produce needed radio ads in order to promote specific Agricultural events that showcase, specialty crops and the projects involved in Specialty Crop Block Grant Programs.

VIDOA produced 30 minute radio spots to be played on various radio stations. These radio spots promote the Virgin Fresh Brand and local specialty crop awareness and consumption.

VIDOA currently produces its own radio show “Fresh from the Farm”. Through this media initiative, VIDOA’s Grant Manager and other personnel associated with the grant projects make periodical updates to the radio listeners.

**Website**

VIDOA’s web developer (Bizvi) updated website to include the incorporation of an RSS feed system so that our website can deliver podcasts of radio shows and videos of SCBG-FB project video shoots.

**Tent Purchase**

VIDOA purchased three (3) tents one for each island (St. Croix, St. Thomas and St. John) that is used at all promotional activities sponsored by the department to promote Specialty Crop Block grant activities. The Specialty Crop Tents (as it is called) has been a powerful marketing tool of Specialty Crop Projects throughout the Virgin Islands. This increased our awareness of the specialty crop industry and further the Virgin Fresh branding campaign.
National Agriculture Week

National Agriculture Week 2012 Events included: workshops, farmer’s markets, farm tours and open-houses (March 2012). VIDO A and its partners showcased the SCBG projects, results and findings during National Agriculture Week 2012.

National Farmer’s Week 2012 events as well as local Agricultural events to include: St. Croix and St. Thomas Agricultural fairs promoted SCBG programs. It is estimated that during National Agriculture Week over 300 school children from the St. Croix district visited the Department of Agriculture and learned about the activities that are being done as a result of the funds provided by Specialty Crop Block Grant fund.
Conclusion

These marketing events promoted the 2011 Virgin Fresh Specialty Crop Initiatives promoted community awareness and education. These events allowed for pilot-projects to be showcased as well as results of other specialty crop block grant initiatives. Project partners were involved in these activities and demonstrated or displayed their project work.