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## **TRIALS OF PASSIONFRUIT IN THE US VIRGIN ISLANDS**

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**ABSTRACT:** Passionfruit (*Passiflora edulis*) is a local tropical fruit used in juice, jelly and ice cream in St. Croix. However, almost all of the juice used for making passion fruit drinks comes from imported concentrate. A field trial was developed to evaluate fifteen passion fruit varieties of red, yellow and red/yellow hybrids in the US Virgin Islands. The passion fruit vines were grown on either a single wire or three wire trellis system. All varieties tended to produce within nine months, with production peaking in October-November. Production was greater for some varieties on the three-wire trellis system than a single wire system. During the first two years, multiple varieties were lost due to lack of tolerance to high pH, calcareous soils and St. Croix's climatic conditions. 'Noel's Special', a yellow selection from Hawaii, had a deep orange pulp and was a consistent producer. The fresh juice of all varieties was in a range between pH 2-3. Four varieties: 'Noel's Special', 'Panama Gold', 'Rainforest', and 'TWZ hybrid' are recommended for passion fruit growers. A single-wire trellis system can be as productive as a three-wire system and provide the added advantage of lower installation cost and wind tolerance.

### **INTRODUCTION**

The genus *Passiflora* is indigenous to the American tropics and over 400 species are known to exist (Martin and Nakasone, 1970). The most commonly used species for commercial production is *Passiflora edulis*. Passionfruit is a vine that requires support and comes in two forms: *P. edulis f. edulis* (purple or red fleshed) and *P. edulis f. flavicarpa* (yellow fleshed) (Vanderplank, 1991). Passionfruit is used in the Caribbean in juice, jellies, ice cream and liqueurs.

In the USVI, passion fruit is grown by farmers and backyard gardeners for local consumption. However, local production does not meet the local demand. Two of the constraints to production of passion fruit are the high pH, calcareous soils and semi-arid conditions. A germplasm evaluation trial was conducted at UVI in 1997 using seven different varieties (Zimmerman, 1998). The plants were trained onto T-trellis recommended by Colon-Velez (1997) and Robin (1992). This production plot was destroyed by Hurricane Georges in September 1998.

To resist tropical storm forced winds, new trellis was designed utilizing a one-wire system. The objectives of this study were (a) to evaluate fifteen varieties of passion fruit for fruit quality, production level and pest and disease susceptibility and (b) compare production between a 1-wire trellis and 3-wire T-trellis system.

### **MATERIALS AND METHODS**

Seeds were obtained for fifteen varieties of passion fruit (Table 1) and germinated in the greenhouse, with the exception of 'Noel's Special'. 'Noel's Special' is a hybrid and is propagated by nodal cuttings. The plants were transplanted in the field at two months of age.

Plants were planted in 2-m tall one-wire trellises. There were three meters between rows and two meters between plants within the rows. Eight varieties were also planted into a 2-m tall 3-wire T-shaped trellis system (Table 2). The plants were trained up to the wire using bamboo stakes. The plants were watered as needed using drip irrigation. Water-soluble fertilizer (12-12-12) was used during establishment, with the addition of chelated iron. Wood chip mulch was applied between the rows for weed suppression and water conservation. Harvest began in June of 2000 and continued three times per week as necessary. Total weight and number of fruit per variety were taken at each harvest. From each variety five fruit were randomly selected and weighed. The pulp volume, husk weight, brix and pH were also recorded.

## RESULTS AND DISCUSSION

### Yellow Varieties

Most varieties began production in June 2000 (the rest of the varieties began in July). Different varieties peaked at times but mostly in the month of October, November and December. Production dropped off dramatically in December, with zero production for any variety from January-April of 2001 (Figure 1).

There was a range of husk mass and pulp volume (Table 4). The trend of percent pulp tended to be 40-65% total pulp. 'Noel's Special' contained a deep orange colored pulp, which was very different from the other yellow varieties. The pH of all varieties fell between the pH of vinegar and lemon juice. All of the varieties had a brix of at least 12.

### Red Varieties

The red varieties followed a similar trend as the yellow varieties for monthly production with flowering beginning in April of 2000 and production beginning in June 2000 (Figure 3). The varieties had different peaks in monthly production, but fruiting for all varieties came to an abrupt halt in December with no production from January 2001-April 2001. Production was resumed in May 2001.

'Panama Red' produced significantly more fruit (164) than any other varieties. 'Lacy' produced the least number of fruit (Table 5). There was also a wide range of average fruit weights with 'HI x Brazil' producing the heaviest fruit at 107 g and 'Lacy' producing the lightest (19 g). The red varieties also entered decline after the first year, with only 'TWZ' having any significant production in 2002. The red varieties all had a relatively high pulp percentage. They all had brix of at least 12.5 (Table 6).

### 1 vs. 3 Wire System

The number of fruit produced varied widely (Table 3) on the 3 or 1-wire system. 'Rainforest' produced the greatest number of fruits with (199) and also one of the larger sized fruit (81g). 'UVI' produced the least number of fruits (72) but had one of the larger-sized fruit (80g). After year one, some of the yellow varieties began to decline and die (Figure 2). However, 'Panama Gold' was consistent each year.

Of the varieties that survived on the 1 wire vs. 3-wire system 'Noel's Special' and 'Panama Gold' showed no significant differences in production (Table 7). However, 'UVI

'Yellow' did have a significantly lower production level on the 1 wire system than the 3 wire system. The amount of vine mass was much lower on the one wire system than on the three, making it easier for wind to flow through the plants without damaging them.

#### Disease and Pests

Some pests and disease were noted, however there wasn't any difference in pest infestation of the one-wire system vs. the three-wire system. Spider mites caused limited damage during the dry season. Barnacle scale was also occasionally present. It was treated with Malathion. The red passionfruit varieties seem more susceptible to the scale. Bortytis mold was present during the wet season. No treatment was used and the mold subsided once conditions became drier. Passion fruit were also very susceptible to any type of mechanical damage such as weed whacker or lawn mower damage.

#### CONCLUSIONS

Many of the varieties died out within the first two years, particularly the red varieties. These varieties included: 'Columbian Market', 'Gold Giant', 'Fredrick', 'HI x Brazil', 'Jamaica', 'Lacy' and 'Yellow Sweet'. These varieties were unable to tolerate the high pH calcareous soils found on St. Croix. Based on the fact survival rate and production levels the following varieties are being recommended to farmers and homeowners: 'Noel's Special', 'Panama Gold', 'Rainforest' and 'TWZ Hybrid'. A single wire trellis system can be as productive as a three-wire system. It also cheaper to install and has a higher wind tolerance.

#### REFERENCES

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Table 1. The varieties of passionfruit evaluated and their characteristic fruit color

Yellow		Red	Pink
Columbian Market	Panama Gold	Fredrick	TWZ Hybrid
Espino	Rainforest	HI x Brazil	
Gold Giant	UVI Yellow	Lacy	
Jamaica	Yellow Sweet	Panama Red	
Noel's Special		VI Red	

Table 2. Passionfruit varieties used in comparing production between 1-wire and 3-wire systems

Variety	Color
Fredrick	Red
HI X Brazil	Red
Noel's Special	Yellow
Panama Gold	Yellow
Panama Red	Red
UVI Yellow	Yellow
VI Red	Red

Table 3. Fruit production and size for yellow passionfruit varieties (ave. of one year cycle) on a one-wire system

Variety	# Fruit/Plant*	Fruit Weight(g)*
Columbian Market	77 e	66 ab
Espino	111 d	75 a
Gold Giant	178 b	80 a
Jamaica	138 d	62 b
Noel's Special	164 bc	81 a
Panama Gold	182 ab	56 b
Rainforest	199a	81 a
UVI Yellow	72 e	80 a
Yellow Sweet	162 bc	82 a

Table 4. Fruit Quality-Yellow

Variety	Husk (g)	Pulp (mL)	Pulp (%)	pH	% Brix
Columbian Market	36.5	39.3	46	3.12	16
Espino	31.3	39	59	3.26	14.7
Gold Giant	41.9	37.7	48	3.07	14.7
Jamaica	23.4	36.3	63	3.21	15.3
Noel's Special	40.6	47.3	51	3.27	14.3
Panama Gold	27.8	33.1	52	3.41	15.7
Rainforest	37.6	39.7	53	3.06	14.7
UVI Yellow	34.5	50.7	63	3.13	12.7
Yellow Sweet	31.0	43	63	2.69	13.7

Table 5. Fruit production and size for red passionfruit variety (ave. one year cycle) on a one wire trellis system

Variety	# Fruit/Plant	Fruit Weight (g)
Fredrick	123 b	26 c
HI x Brazil	147 b	107 a
Lacy	42 d	19 c
Panama Red	164 a	71 b
TWZ Hybrid	136 b	91 ab
VI Red	86 c	88 ab

Table 6. Fruit Quality-Red

Variety	Husk (g)	Pulp (mL)	Pulp (%)	pH	% Brix
Fredrick	11.2	14	57	3.11	15
HI x Brazil	55.5	43.5	48	2.96	12.7
Lacy	7.2	11	62	3.3	15.3
Panama Red	32.8	34	53	2.94	13.7
TWZ Hybrid	45.5	44.7	50	3.12	15.7
VI Red	22.7	33.3	73	3.27	14.3

Table 7. Production /Plant: 1 wire vs 3 wire (kg/plant)

Variety	1 wire	P=0.05	3 wire
Fredrick	6.7	*	2.5
HI x Brazil	14.2	ns	16.3
Lacy	1.7	*	.01
Panama Red	10.3	ns	13.2
VI Red	6.9	*	21.9
Noel's Special	11.8	ns	13.2
Panama Gold	13.6	ns	11.0
UVI Yellow	5.6	*	12.5

Figure 1. Monthly production of yellow passionfruit varieties over a yearly cycle on a one-wire system.

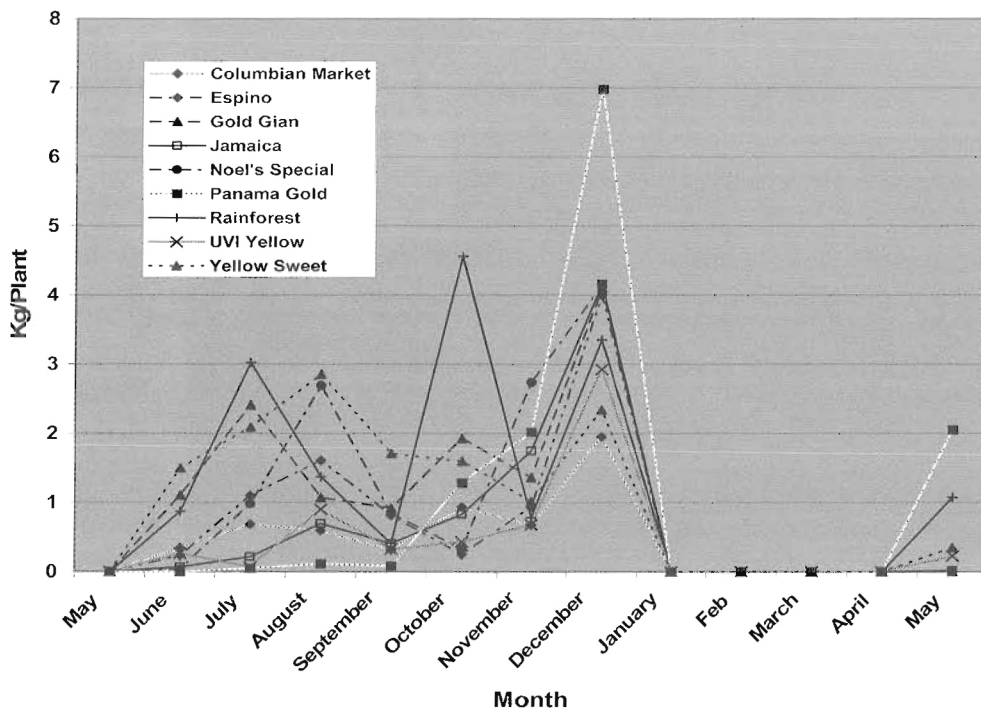


Figure 2. Average total production per plant over a three period for the yellow passionfruit varieties one a one-wire system.

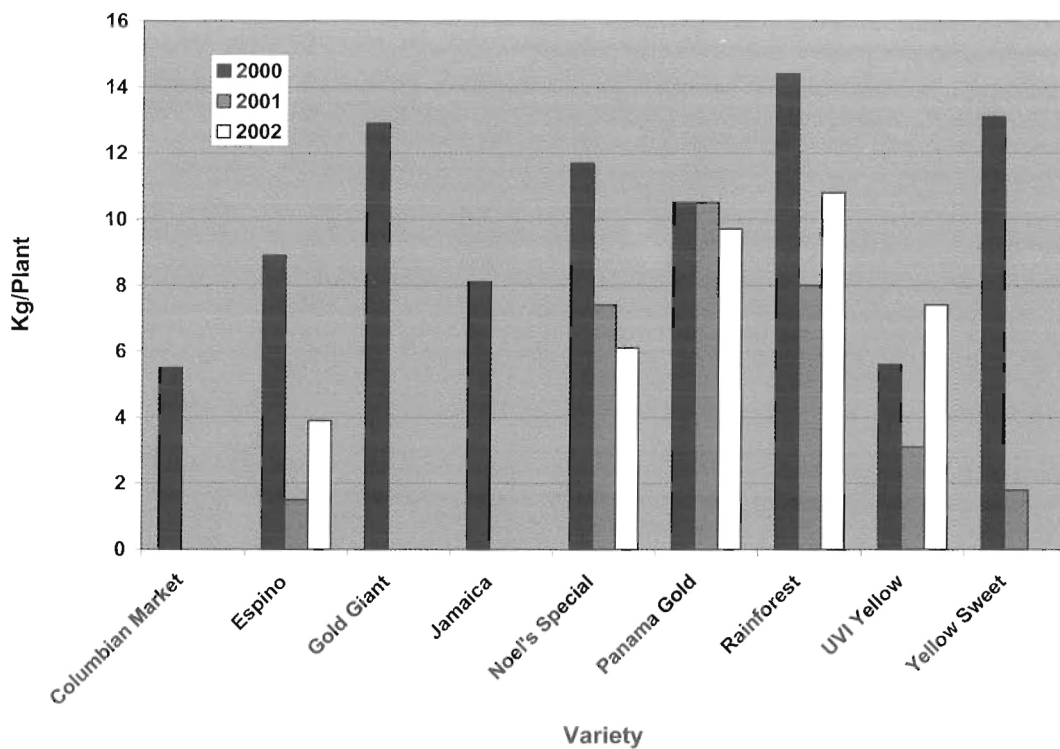




Figure 3. Monthly production of red passionfruit varieties over a yearly cycle on a one-wire system

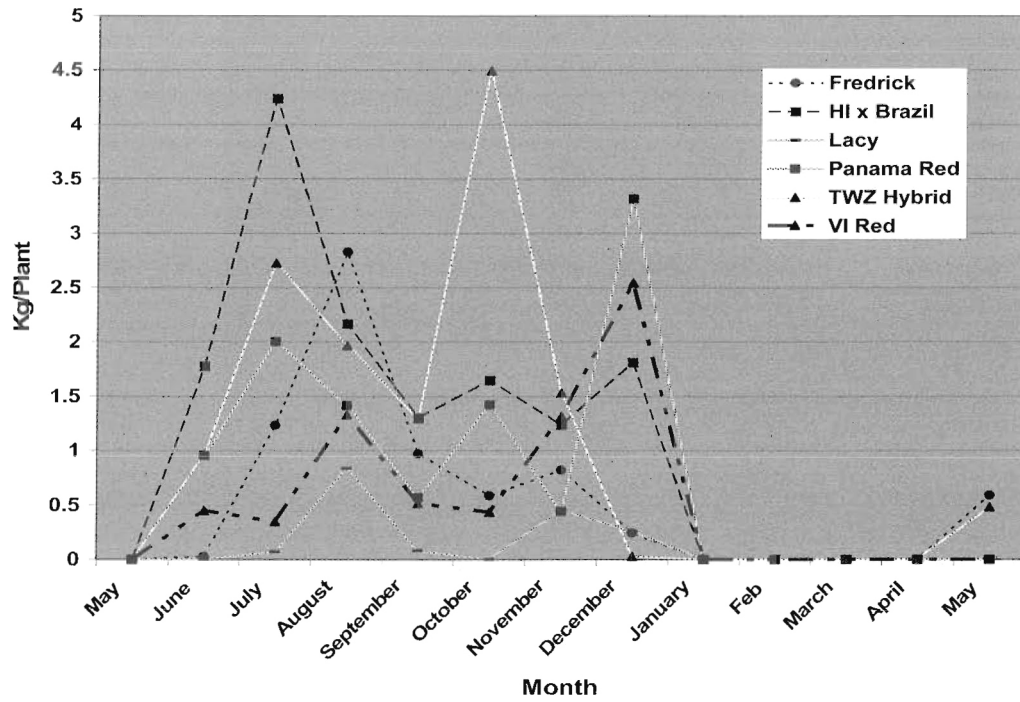


Figure 4. Average of total production per plant over a three-year period for the red passionfruit varieties on a one-wire system

