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EVALUATION OF MINOR FRUITS AND NUTS FOR THE U.S. VIRGIN ISLANDS

A. Bulbulla and C. Ramcharan, University of the Virgin Islands, Agriculture Experiment Station, Box10,000, Kingshill, St.Croix, USVI 00850

ABSTRACT. Forty species of tropical fruit and nut species were established from 1997 to 1998 at the University of the Virgin Islands, Agriculture Experiment Station on a 2-acre site with a calcareous soil of pH 7-8 Climatic conditions were an average of 1100 mm rain/year, 25C-28C mean temperature and location at 17N and 61W The area was prepared under minimum tillage and drip irrigation with micro sprinklers installed. Field planting of trees was arranged in rows of 5 plants and included species of *Achras, Annona, Anacardium, Averrhoa, Chrysophyllum, Diospyros, Eugenia, Ficus, Flacourtia, Inga, Litchi, Macadamia, Malpighia, Psidium, Pouteria, Spondias, and Syzygium*. Ongoing data collection include dates of flowering, fruiting and maturity, yield and water usage. Plants are monitored for pest and disease outbreaks and an application of 12-12-12 granular fertilizer made monthly. Early reports indicate that several species showed signs of high pH-induced chlorosis symptoms and foliar analyses were taken to identify minor element nutrient deficiencies. Species that have so far adapted well to the high pH conditions include Black sapote (Diospyros), Sapodilla (Achras), Wax jambu (*Syzygium*), Fig (*Ficus*), Eggfruit (*Pouteria*), West Indian cherry (*Malpighia*), Star fruit (*Averrhoa*), Atemoya (*Annona*), and the Strawberry tree (*Muntingia*). Plants barely surviving are Pitomba (*Eugenia*), Guava (*Psidium*) (Redland, Indian red and Indonesian seedless), Surinam cherry (*Eugenia*), and Red mombin (*Spondias*). Those which have gradually died out even after being twice replanted include Grumichama (*Eugenia*), Governor's plum (*Flacourtia*), Ice cream bean (*Inga*), Jakfruit (*Artocarpus*), Jaboticaba (*Myrciaria*), Lanson (*Lansium*), Lychee (*Litchi*), and Malay apple (*Syzygium*). Trees that have fruited in the first year's growth are Wax jambu, Fig, Redland guava, Yellow cattley guava and Star fruit and those after two years growth Sapodilla, Indian red and Indonesian seedless guava, and Eggfruit.

MATERIALS AND METHODS

Forty species of tropical fruits and nuts were imported from certified nurseries in uerto Rico (Jardines Eneida, Inc., Cabo Rojo, PR) and Florida (Hopkins Nursery, Ft. auderdale, FL) in 1995 and 1996 and kept in 3 gal pots under greenhouse conditions. tarting in 1997, plants were transplanted to a 2 acre site with a Fredensborg clay loam oil with a calcareous subsoil having a pH of 7-8. Because of the calcareous nature, the site was prepared under minimum tillage taking care not to expose any subsoil. Plants were set out in rows of 5 plants at a spacing of 20ft x 20ft and planting holes made by a tractor-operated post hole digger. A preplant herbicide (Roundup) was applied in a circular band 2-3ft around each hole and inter row grass controlled by mowing at regular intervals.

After planting, a drip irrigation system of micro sprinklers (8-10 gal/hr) was installed and water applied at ½ hr/day by battery operated timers. Pest control was done as needed and plants were given a monthly application of 12-12-12 with minor elements starting at 1oz/plant. Growth was recorded as trunk diameter and plant height after the first year's growth and fruit characteristics taken as plants fruited. An average of 10 fruits were sampled for size measurements, % pulp and seed. Sugar content (Brix%) was monitored using a portable digital refractometer. Leaf analysis was also carried out after 1 year's growth and average chlorophyll measurements made with a Minolta Spad-501 chlorophyll meter.

RESULTS AND DISCUSSION

Table 1 shows plant growth and fruit characteristics of those species which fruited 1 year after planting. Among those that showed good growth as reflected by stem diameter and plant height were Wax Jambu, West Indian Cherry, Fig, Sapodilla, Carambola, and Eggfruit. Considerable variation in fruit size was noted from small-fruited species such as West Indian Cherry to those with large fruits such as Eggfruit, Carambola, and Sapodilla. Pulp % varied from 100% in Wax Jambu and Fig to lower values in the highly seeded fruits such as the Guavas and W.I Cherry. These are important characteristics when fruit species are being considered for preservation or processing. Sugar content as reflected by Brix% was quite high for Sapodilla (20.6) and Eggfruit (24.6) as compared with the more acidic fruits such as W.I Cherry (8.7) and the medium sweet fruits such as Fig (14.3) and Wax Jambu (11.9). These are also important factors considered in processing potential.

As expected on a calcareous soil, Ca foliar content was high for most species (Table 2) with maximum levels occurring in Star Fruit (3.8%), Gefner Atemoya (4.8%) and minimum in Lanson (1.06%), and Governor Plum (1.4%). This corresponded to low levels of Mg (0.22%) and K (0.41%), Cu (4.8 ppm), Mn (26.5 ppm), Fe (140 ppm), and chlorophyll (29) for Gefner Atemoya. Other species showing high Ca to low minor element and chlorophyll ratio included Surinam Cherry (Mn), Pitomba (Cu, Mn, Fe), Malay Apple (Mn, Cu), and Soursop (Mn). For this reason minor elements in the form of Peters Soluble Trace Element Mix (Stem) are being injected through the drip irrigation system. Fruits that could not tolerate high pH conditions even after being replaced 2 or 3 times included Grumichama, Governor's Plum, Ice Cream Bean, Jakfruit, Jaboticaba, Lanson, Litchi, and Malay Apple. These would be eliminated from the trial and not recommended to growers.

Species very tolerant to high pH soils were Black Sapote, Sapodilla, Wax Jambu, Fig, Eggfruit, West Indian Cherry, Carambola, Atemoya and the Strawberry tree. These would be high on the list of recommended species for high pH soil sites in the VI. Fruits that would probably do well under high fertilizer maintenance programs include Pitomba, Guava (Redland, Indian Red and Indonesian Seedless), Surinam Cherry, and Red Mombin.

Table 1. Average growth and fruit characteristics of selected minor tropical fruits.

Fruit[1]	Trunk Diameter	Plant Height	Fruit Weight	Fruit Width	Fruit Length	Seed	Pulp	Brix
	(cm)		(g)	(cm)			%	
Wax Jambu	6.1(±.1)	243.4(±7.6)	62.5(±2)	55(±.5)	51.5(±.2)	4(±.2)	99.6(±.2)	11.9(±.3)
West Indian Cherry	5.4(±.6)	226.5(±9.6)	9.7(±.4)	2.8(±.7)	2.3(±.03)	9.4(±.3)	90.6(±.3)	8.7(±.4)
Redland Guava	3.4(±.2)	207.5(±12)	67.7(±8)	5.2(±.2)	6.1(±.3)	12.4(±.1)	87.9(±1.2)	9.2(±.2)
Brown Turkey Fig	5.3(±.2)	169(±13.3)	65.5(±2.2)	5.5(±.1)	5.4(±.2)	-	100	14.3(±.2)
Sapodella	5.9(±.3)	234.5(±8.2)	163.8(±9)	6.8(±.2)	6.4(±.2)	2.7(±.3)	97.3(±.3)	20.6(±.5)
Indian Red Guava	3.4(±.5)	190(±8.1)	83.5(±5.9)	5.2(±.2)	6(±.3)	10.1(±.8)	89.9(±.9)	10.7(±.4)
Carambola	6.5(±.4)	219(±17.9)	118.9(±5.9)	8.7(±.8)	7.7(±.4)	.3(±.04)	99.7(±.02)	11.5(±.3)
Eggfruit	4.9(±.2)	208(±12.3)	472.4(±36)	10.3(±.3)	10.5(±.2)	7.8(±.5)	92.2(±.5)	24.6(±.6)

1. Average taken from 10 randomly selected fruits.

Table 2. Leaf analysis and chlorophyll content of selected minor fruits.

Fruit	Ca	Mg	K	P	Zn	Cu	Mn	Fe	Chlorophyll
			(%)				(ppm)		
Star Apple	2.5	0.2	0.74	0.13	8	2.7	40	126	30
Malay Apple	2.28	0.7	0.64	0.15	19	3.3	41	226	13
Red land Guava	1.98	0.25	1.73	0.14	18	9.4	197	164	16.4
Indonisian Seedless	2.03	0.22	1.38	0.14	16.3	7.6	241	232	20.4
Carambola	3.83	1.84	1.21	0.11	16.5	4	330	95	30.8
Governor's Plum	1.39	0.07	0.72	0.09	11.4	3.7	7.9	116	-
Atemoya on Sugar Apple	4.81	0.22	0.41	0.15	10.2	4.8	26.5	140	29
Sugar Apple	4.47	0.25	0.36	0.13	11.1	5.3	21.4	191	42.6
Soursop	3.04	0.24	1.46	0.14	17.1	6.1	39.8	408	38
Lanson	1.06	0.19	2.11	0.25	23.2	7.8	24.1	383	-
Wax Jambu	1.76	0.23	0.93	0.11	13.7	2.9	31.4	276	33.8
Grumichama	2.63	0.45	1.17	0.11	11.6	1.9	17.4	140	15.4
Pitomba	3.11	0.38	0.67	0.12	19.7	3.4	37.8	360	25.4
Custard Apple on Pond Apple	3.02	0.23	0.55	0.19	21.2	8.4	77.5	306	25.3
Atemoya on Custard Apple	3.3	0.28	0.63	0.13	10.1	7.1	33.4	421	41.5
Pond Apple	3.13	0.3	2.43	0.24	20	5.2	21.9	313	12.3
Cattly Guava	3.66	0.65	0.84	0.09	10.4	3.9	34.4	183	40.4
Fig	3.56	0.36	1.91	0.21	25.6	5.9	22.7	388	29.6
Indian Red Guava	2.7	0.3	1.24	0.14	18.3	13.6	192	204	20.2
Atemoya on Custard Apple	3.86	0.23	0.55	0.13	10.1	6.3	68.5	144	33.6
Surinam Cherry	3.78	0.53	1.01	0.19	35.7	10.8	23.4	205	17.4