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INTRODUCTION of NEW TOMATO VARIETIES into AMERICAN SAMOA for the 1990s Part 1

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Vegetables are in increasing demand in American Samoa. They are mainly imported from the United States and New Zealand. Because of American Samoa's remoteness from these sources, vegetable prices are high but quality is generally poor. The tomato is one vegetable not amenable to long-term storage and transport, but tomatoes are in particularly high demand. Consequently, tomato commands a good market price and is recognized by local farmers as a good cash crop despite many serious problems facing its production. These problems can be categorized as poor cultivation techniques and lack of appropriate varieties.

Samoan farmers are familiar with the care of low-input traditional crops like banana, taro, and coconut where management techniques such as applying chemical fertilizers, mulching, staking, pruning, and pesticide application are little, if ever, used. But to produce high yields of good quality tomatoes, these skills must be applied. Techniques for growing tomatoes in the tropics are well documented by such institutions as the Asian Vegetable Research and Development Center (AVRDC), Taiwan, R.O.C. However, the local environment, pests, and available resources are sufficiently different to warrant extensive modification of the documented management practices before presenting them to farmers.

Farmers have a limited number of tomato varieties and seed sources. The Land Grant Program currently supplies two varieties: King Kong and Vanguard (both from Known-You Seed Co., Taiwan). They are heat tolerant, disease resistant, and adapt well to the local environment. Their fruits are large and sell well. But they are indeterminate, vine-types that require intensive labor and pest control, so local farmers have difficulty growing them.

Variety stores in American Samoa also sell seed of varieties from the United States and New Zealand. These are usually not bred for the tropics, so they lack heat tolerance and disease resistance. Some farmers simply save seed from the fruit of hybrid varieties, unaware that succeeding generations of tomato plants will lack uniformity and give poorer yields.

One solution to the lack of appropriate tomato varieties is to have a reliable source of hybrid seeds which include determinate, bush-type varieties with good heat tolerance and disease resistance, and informing farmers about gene segregation from hybrid parent plants. Another solution is to introduce self-pollinating varieties that perform well in American Samoa so farmers can save seed for subsequent planting.

This study will compare vine- and bush-type tomato varieties from Known-You Seed Co. and AVRDC. Those with high yield, good bacterial wilt resistance, and minimum-input management will be selected for further study.

MATERIALS AND METHODS

Seeds of 9 vine- and 9 bush-type tomato varieties from Known-You Seed Co., 26 Chung Cheng Road, Kohsiung, Taiwan, R.O.C., and from AVRDC, P.O. Box 42, Shanhua, Tainan 741, Taiwan, R.O.C., were sown in 5 x 5 x 10 cm peat pots filled with Jiffy Mix Plus on 23-OCT-89 and transplanted 32 days later.

A 12 x 14 m field, meanwhile, was fertilized 20 days before transplanting by plowing 14 kg of fresh chicken manure into the upper layer of soil. Immediately before transplanting, 7 g of 0-46-0 and 16 g of 12-5-20 fertilizers were placed in each planting hole, while 4 g of 15-0-0 and 16 g of 12-5-20 fertilizers were applied as side-dressing 14, 28, and 42 days after transplanting. Coconut and banana leaves were placed in a 30 cm ring around each plant as mulch, and the remainder of the field was mulch with cardboard. Rainwater was sufficient throughout the growing season, and drainage was generally adequate.

Bush-type varieties were planted in single rows; 150 cm between rows and 30 cm between plants. Vine-type varieties were planted in paired rows; 60 cm within and 90 cm between paired rows, and 45 cm between plants. Plants were placed next to a support built of purse-seiner net. A replicate comprised 4 plants of each variety grouped in a rectangle. There were 4 replicates for each variety.

Harvesting began 01-JAN-90. During Hurricane Ofa (02 to 04-FEB-90), the plants suffered severe flooding and wind damage. All fruit, mature and immature, was harvested 07-FEB-90. Four early varieties--Season Red, FMTT32, CLN657BC$_1$F$_2$-267-0-3-12-7, and CL143-0-10-3-0-1-10--were at the end of fruit productivity, but the other varieties suffered yield losses. These losses were estimated to represent one-third of the last-time harvest weight for late varieties and one-fourth of the last-time harvest weight for medium varieties.

Ten representative fruits were weighed to determine unit fruit weight. Due to the small number of plants of each variety, bacterial wilt resistance could not reliably be determined but is included in Table 1 for comparison.

RESULTS AND DISCUSSION

All varieties tested had at least as good a yield, and sometimes a significantly higher yield, than the two local favorite varieties, King Kong and Vanguard (Figure 1). The estimated fruit yields, which includes the harvested yield and the estimated yield due to losses, are listed in Table 1.

The percentage of bacterial wilt (Pseudomonas solanacearum) infection is also listed in Table 1. All Sugar Pearl and CL5915-93D$_4$-1-0-3 plants succumbed to this disease. The other varieties, because of their lower infection rates, were deemed bacterial wilt resistant. Bacterial canker (Corynebacterium michiganense) also contributed to high mortality rates, appearing randomly among all varieties.

Unit fruit weight is also listed in Table 1. Fruits with weights greater than 80 g were considered large. The price per unit weight of large fruit is higher than for small fruit. Thus, farmers have a strong preference for the large fruit varieties, but farmers and consumers accept a wide range of fruit sizes. In one survey (Unpublished data), consumers usually rejected fruits weighing under 30 g, yet cherry tomatoes, with a fruit weight of 10 g or less, command a good price.

Because of their growth habit, bush-type tomato plants generally do not require a support, while vine-type plants do. However, some bush-types with long branches may benefit from staking (Table 2). Varieties that require pruning and staking are high-labor-input types and should be substituted with low-input types.

In a fragile island ecology, pesticide use should be minimized to avoid ground water contamination. Using early and uniform ripening varieties shortens the time plants are exposed to pests, so varieties that reach peak productivity in the shortest time are preferred to those requiring longer periods to mature (Table 2).

CONCLUSIONS

Two hybrid tomato varieties from AVRDC, FMTT32 and FMTT138, have very impressive performance: high yield, large fruit size, relatively early maturity, and low maintenance (Table 2). However, the seed resource for these varieties is limited. For this reason, they were not selected for study in a second trial.

But five self-pollinating varieties from AVRDC--CLN65-349D_4-2-0, CL143-0-10-3-0-1-10, CLN657BC_1F_2-274-0-15-4, CLN657BC_1F_2-267-0-3-12-7, and CL5915-206D_4-2-5-0--have good yield, good fruit size, and are easy to manage, so will be included in a second trial.

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Table 1. Variety, source, genetic type, average actual plant yield, average estimated plant yield, and rate of bacterial wilt infection for the tomato plants.

Variety	Source[1]	Type[2]	----Yield (kg)---- Actual	Estimated	Wilt (%)
CL143-0-10-3-0-1-10	A	SP	1.38	1.43	0
CL5915-93D_4-1-0-3	A	SP	-	-	100
CL5915-93D_4-1-0-L-2	A	SP	1.11	1.49	0
CL5915-206D_4-2-2-0	A	SP	1.88	2.13	12
CL5915-206D_4-2-5-0	A	SP	1.09	1.29	8
CL5915-223D_4-2-1-0	A	SP	1.51	1.83	0
CL6046BC_3F_2-51-1-1-15-1-0	A	SP	0.89	1.02	0
CL6047-1-1-2-3-2-7	A	SP	0.37	0.40	25
CLN65-349D_4-2-0	A	SP	1.52	1.89	0
CLN657BC_1F_2-267-0-3-12-7	A	SP	0.84	0.96	16
CLN657BC_1F_2-274-0-15-4	A	SP	0.91	1.14	0
FMTT32	A	HY	1.45	1.48	8
FMTT138	A	HY	2.53	3.09	12
King Kong	K	HY	0.57	0.63	6
Red Cloud	K	HY	0.48	0.55	18
Season Red	K	HY	0.55	0.57	16
Sugar Pearl	K	HY	-	-	100
Vanguard	K	HY	0.11	0.12	18

[1] A is AVRDC, K is Known-You Seed Co.
[2] HY is hybrid, SP is self-pollinating

Table 2. Variety, average fruit weight, days after transplant to peak harvest, plant type, and management requirements for the tomato plants.

Variety	Fruit Weight(g)	Days	Type	Pruning	Staking
CL143-0-10-3-0-1-10	39	50	bush	no	no
CL5915-93D_4-1-0-3	--	--	bush	no	no
CL5915-93D_4-1-0-L-2	31	75	bush	no	yes
CL5915-206D_4-2-2-0	53	75	vine	medium	yes
CL5915-206D_4-2-5-0	87	75	vine	medium	yes
CL5915-223D_4-2-1-0	59	60	bush	no	yes
CL6046BC_3F_2-51-1-1-15-1-0	32	60	vine	medium	yes
CL6047-1-1-2-3-2-7	58	75	bush	no	no
CLN65-349D_4-2-0	80	65	bush	no	yes
CLN657BC_1F_2-267-0-3-12-7	82	50	bush	no	no
CLN657BC_1F_2-274-0-15-4	92	65	vine	medium	yes
FMTT32	90	45	bush	no	no
FMTT138	83	60	vine	medium	yes
King Kong	95	75	vine	low	yes
Red Cloud	10	60	vine	high	yes
Season Red	13	45	bush	no	no
Sugar Pearl	--	--	vine	yes	yes
Vanguard	67	75	vine	medium	yes