

Land-Grant Technical Report No. 12, DEC89

CONTAINER TOMATO VARIETY TRIAL:
BASKET KING, TOY BOY, AND PATIO

Don Vargo
Soil Specialist

American Samoa Community College Land Grant Program, American Samoa Government,
P.O. Box 2609, Pago Pago, American Samoa 96799.

ABSTRACT

The tomato (*Lycopersicon esculentum*) is highly prized in American Samoa for its fresh fruit, but is not extensively grown by households where space is severely limited. This study tests three container tomato varieties to determine whether they will produce acceptable yields in small containers suitable for patios and porches. Basket King, Toy Boy, and Patio varieties were grown outdoors in 9 L of artificial medium between July and November, 1989. Fruit sizes and yields were recorded over a 9-week period. Basket King and Patio gave average yields of 1780 and 1637 g per plant of a cherry-type and a medium-sized fruit, respectively. Toy Boy produced an average of 1299 g of a cherry-type fruit per plant. Toy Boy was the highest producing variety in a similar trial held in Puerto Rico. Basket King and Patio varieties may prove popular among American Samoa residents who have little or no land for gardening.

In the United States, 93% of the 33 million gardening households grow tomatoes (Raymond and Raymond, 1978). The tomato (*Lyopersicon esculentum*) is popular worldwide. For those who have no land or whose land is severely limited, tomatoes can be grown in containers placed wherever there is 6 to 8 hours of direct sunlight daily. Though any variety will grow given a large enough container, those specially bred for containers and small gardens do best

Tomatoes are difficult to grow in the hot, humid Tropics. The best of five container varieties known to be heat resistant, Toy Boy and Patio, were only marginally acceptable in greenhouse trials held in Puerto Rico (Martin and Ruberte, 1981). Outdoors, though, Toy Boy proved to be an excellent, vigorous, long-living tomato when containers were large enough. Oddly, container size was not specified except to say that 4 L containers were too small and that probably 19 L of soil would be optimal. Using Better Bush variety, other researchers found that after 12 weeks, plants in 9 cm (3.5 inch) containers averaged six tomatoes and those in 28 cm (11 inch) containers produced nine (Sanchez, 1988). These height sizes convert into volumes of approximately 1 L and 27 L, respectively (see Appendix).

The purpose of this experiment is to compare fruit yield and size for three tomato varieties grown in containers of adequate size for the plants and the porch gardener.

MATERIALS AND METHODS

Three hybrid tomato varieties--Basket King, Toy Boy, and Patio--(Table 1) specially bred for containers and small gardens, were seeded 25-JUL-89 in peat pots filled with Jiffy-Mix Plus, a lightweight growing medium compounded of shredded peat moss, vermiculite, and 7-40-6 controlled release fertilizer. Six

plants of each variety were transplanted 09-AUG-89, when plants had 6 true leaves, to individual polypropylene containers, 23 cm deep with drainage and saucer, filled with approximately 9 L of moist Jiffy-Mix Plus topped with a 5 cm layer of sphagnum moss to reduce evaporation loss. Soil was omitted to preclude a possibility of bacterial wilt disease (*Pseudomonas solanacearum* E.F. Sm. 1914). Plants were fertilized (Table 2) and watered as needed to ensure healthy growth, but were neither pruned nor supported

The 18 containers were randomly arranged in 4 rows, 0.5 m between containers and 1 m between rows, in a sunny location. Each 4- or 5-plant row was draped with light nylon netting 06-SEP-89 to protect the developing fruit against birds, bats, and the fruit-piercing moth (*Othreis fullonica* (Cl.)). Generally, two harvests were made weekly beginning 26-SEP-89. Fruits were picked at the first sign of reddening. Each fruit was weighed to the nearest gram on an Ohaus C3001 Port-0-Gram electronic balance. Harvesting was discontinued 27-NOV-89 because of dwindling yield and a high incidence of fruit rot.

Temperature was continuously recorded on a shaded Belfort hygromograph, and rainfall recorded daily from a Tru-Chek rain gauge. A one-way analysis of variance of total fruit weight for each plant, and a Student's t Least Significant Difference comparison of group means were performed using MSUSTAT, a statistical analysis package (Lund, 1988). Graphs were made directly or indirectly using Lotus 1-2-3 software

RESULTS AND DISCUSSION

Basket King and Toy Boy produced several small, cherry-like fruit with a mean weight and sample standard deviation of 16.6 ± 5.7 g and 16.8 ± 6.8 g, respectively. The fruit differed in shape; Basket King had the oblong shape of

a paste-type tomato, while Toy Boy fruit was globular. Patio produced fewer but larger globular fruit measuring 65.2 ± 30.0 g. Soon after harvesting began it was evident that a Patio plant had mistakenly been labeled as Basket King. This resulted in having 5, 6, and 7 replicates (i.e., plants) of Basket King, Toy Boy and Patio, respectively, instead of 6 of each variety.

Fruit weight frequency distribution histograms (Figure) show Basket King and Toy Boy to be nearly normally distributed with modes in the 16 to 20 g range. Patio, too, is approximately normally distributed with a mode in the 51 to 75 g range, but skewed right toward heavier fruit

Kilgore Seed Company estimates 70 days from planting to first harvest for Toy Boy and Patio (Table 1). Interestingly, Watkins Seeds Ltd. estimates 100 days for Basket King while another supplier, W. Atlee Burpee & Co. (300 Park Avenue, Warmister, PA 18974, which sells Basket King at \$1.30/package) lists 55 days. Each variety gave ripening fruit by 65 days during this trial.

Maximum fruit production occurred over a 4-week period for all varieties, beginning 8 weeks after transplanting for Toy Boy, and a week later for Basket King and Patio (Figure 2). During this 4-week period, peak production occurred in the third week for each variety

Basket King outperformed Toy Boy in the average number of fruits produced per plant, with 111 and 76 fruits per plant, respectively, over the 9-week, 17 harvests period. Since both varieties had similar fruit weights, the difference in fruit numbers had a significant effect on total yield (Table 3).

Patio, with fewer but larger fruits per plant, had a yield comparable to that of Basket King. Also, Patio fruit production began to rebound following its 4-week period of maximum production (Figure 2), but the fruits may have been predisposed to rot in response to increased rainfall (Figure 3). Because of

their heavier fruit, Patio plants should be supported to minimize the possibility of stem breakage

The performance of Toy Boy and Patio differed markedly and unexpectedly from the average total yields of 3540 g from 16 harvests for Toy Boy and 807 g from 6 harvests for Patio in the Puerto Rico study (Martin and Ruberte, 1981); Toy Boy produced an average of 60% less fruit and Patio an average of 200% more fruit.

A common problem with tomato plants is delayed reproductive growth with excess vegetative growth, or a case of "all vine and no fruit." Until recently this was ascribed to too much nitrogen and water during early growth stages, but evidence now implicates temperature as a principal cause.

If unfertilized, tomato blossoms drop off and fruit set fails, but the plant continues to grow. Tomatoes are self-pollinating and are aided by the wind for transferring pollen from stamens to pistil. Gentle shaking of the blossom may aid fertilization for the same reason. When pollen contacts the pistil, a minimum of about 50 hours is required for the pollen tube to reach the ovary. But if night temperatures are below 13°C (55°F) (Doty, 1980; Raymond and Raymond, 1978) or 18°C (65°F) (Lorenz and Maynard, 1988; Mortensen and Bullard, 1970), or above 24°C (75°F) (Raymond and Raymond, 1978), blossom abscission occurs first.

During this trial night temperatures straddled the 24°C critical temperature, remaining below it the first 5 weeks after transplanting, then rising above it until again dropping below it the thirteenth week (Figure 3). The maximum fruit yield period between 8 and 12 weeks after transplanting resulted from blossoms fertilized when night temperatures were below 24°C. The end of the maximum fruit yield period coincides with a rise in the night temperatures above 24°C, assuming a 4 to 6 week lag between blossoming and harvesting. This would

imply that optimal tomato production may be limited to those months when night temperatures are below 24°C during blossoming. In Samoa this would generally be between June and September (Unpublished data). Conversely, tomato yields may be optimized by lowering the night temperature below 24°C during the warmer months. With plants in containers this can be accomplished by transferring them indoors to an air-conditioned room. The gradual rise again in fruit production for Patio suggests that this variety may be more heat tolerant than either Basket King or Toy Boy.

At high daytime temperatures (30°C or 85°F) the fruit becomes soft but color development is slow. Tomato fruit should be picked at the first appearance of red and allowed to ripen in an air-conditioned room to produce a red, firm fruit (Splittstoesser, 1984)

The nylon net proved to be extremely beneficial in protecting the fruit against pests. A concomitant tomato experiment, less than 50 m from this trial, had a high incidence of fruit-piercing moth damage on exposed plants (Ali, Fatu-esi, and Vargo, unpublished data). A frame-supported net would be more effective than, as in this trial, simply draping the plants. The net often had to be pulled away from the plants, which grew through the net openings as well as pushed the net upward and outward. Also, fruit in contact with the net were vulnerable to pests

ACKNOWLEDGEMENTS

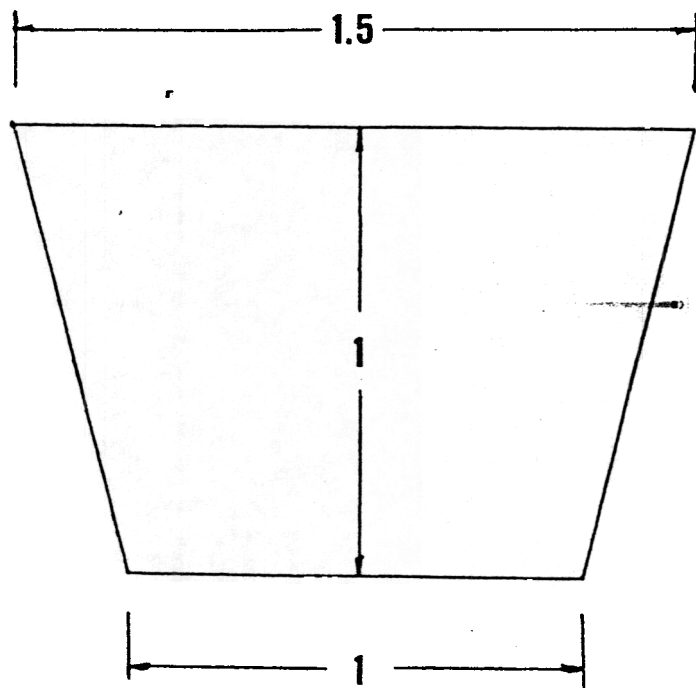
I wish to thank Sione Matau Sr. for his assistance in caring for the tomato plants, Wen Hsui Kuo for her help in harvesting, and Ike Sagaga for the temperature recordings. This experiment was funded by a United States Department of Agriculture Hatch Grant, CRIS Accession No. 0137657.

REFERENCES

- Doty, W.L. 1980. All about vegetables. Ortho Books, Chevron Chemical Company, San Francisco.
- Lorenz, O.A. and D.N. Maynard. 1988. Knott's handbook for vegetable growers. 3rd. ed. John Wiley & Sons, New York.
- und, R.E. 1988. MSUSTAT Statistical Analysis Package. Research & Development Institute, Inc., Montana State University, Bozeman.
- Martin, F.W. and R.M. Ruberte. 1981. Growing food in containers in the tropics United States Department of Agriculture, New Orleans.
- Mortensen, E. and E.T. Bullard. 1970. Handbook of tropical and subtropical horticulture. Department of State, Agency for International Development, Washington, D.C.
- Raymond, D. and J. Raymond. 1978. The gardens for all book of tomatoes. Gardens for All, Inc., Burlington, VT.
- Sanchez, D. 1988. Small tomato pots are perfect space savers, Agricultural Research, April 1988.
- Splittstoesser, W.E. 1984. Vegetable growing handbook. 2nd. ed. AVI Publishing Company, Inc., Westport, CT.

APPENDIX

ESTIMATING VOLUME FROM CONTAINER HEIGHT



Volume is estimated using the assumption that the ratios of the (top diameter: bottom diameter: height) of a typical planting container are (1.5: 1.0: 1.0). Expressing the top and bottom radii, i.e., half the diameters, as a function of the container height and using the equation:

$$V = (\pi/3) (r^2 + rR + R^2)h$$

where V is container volume
 r is the bottom radius
 R is the top radius
 h is container height

the volume can be calculated as:

$$V = 1.2435 h^3$$

Examples:

- a. What is the estimated volume of a container whose height is 9 cm?

$$V = 1.2435 h^3$$

$$V = 1.2435 (9 \text{ cm})^3$$

$$V = 906 \text{ cm}^3 \text{ or } 0.906 \text{ L}$$

- b. What is the estimated volume of a container whose height is 28 cm?

$$V = 1.2435 (28 \text{ cm})^3$$

$$V = 27,297 \text{ cm}^3 \text{ or } 27.297 \text{ L}$$

Table 1. Sources of container tomato seed, catalog descriptions of plants, and 1989 prices.

Watkins Seeds Ltd

P.O. Box 468 New Plymouth NZ

17-585 BASKET KING HYBRID 100 days a
 A unique extra-early variety with excellent plant habit for hanging baskets and container plantings - Superb in the garden too. Sturdy cascading branches bear clusters of tomatoes, 4.5cm across, thin-skinned, sweet and flavour-some.

PRICE CODE SEE OUR TERMS ON PAGE 71	A = \$1.15	B = \$1.35	C = \$1.50
	D = \$1.60	E = \$1.70	F = \$2.25
	G = \$3.25	H = \$3.75	I = \$4.75

Kilgore Seed Company
 1400 W. First Street
 Sanford, FL 32771

TOY BOY - VF (70 days) A novelty hybrid tomato, with candy-sweet ping-pong ball size fruit on unusual small plants. Adapted to growing in hanging baskets, pots, small gardens, window boxes, etc. It grows fast and sets fruit quickly. The attractive semi-rugose foliage and beautiful little fruit trail gracefully from pots and baskets. Three to four plants can be grown in a single 10-inch hanging basket. Tolerant to Verticillium and Fusarium Wilt

Pkt. (25 seeds) \$.95 1/64 oz. \$1.45 1/32 oz. \$2.25
 1/16 oz. \$3.85 1/8 oz. \$7.00

PATIO - F (70 days) Patio has a distinctive, compact, upright growth habit ideally suited for growing in containers or limited garden areas. Produces a large quantity of smooth, firm and flavorful medium sized tomatoes. Tolerant to Fusarium Wilt.

Pkt. (25 seeds) \$.95 1/64 oz. \$1.55 1/32 oz. \$2.45
 1/16 oz. \$4.25 1/8 oz. \$7.90

Table 2. Fertilizer schedule for container tomatoes. An unspecified amount of a controlled released 7-40-6 fertilizer was present in the transplant medium.

DATE	D.A.T.*	FERTILIZER ADDED TO EACH PLANT	(mg)		
			N	P	K
28-AUG	19	300 ml 0.4% 15-15-15	180	180	180
12-SEP	34	750 ml 0.3% 17-0-0**	380	0	0
19-SEP	41	750 ml 0.3% 17-0-0	380	0	0
25-SEP	47	750 ml 0.2% 10-52-18	150	780	270
28-SEP	50	750 ml 0.3% 17-0-0	380	0	0
02-OCT	54	750 ml 0.3% 17-0-0	380	0	0
16-OCT	68	2 L 0.3% 17-0-0	1020	0	0
31-OCT	83	30 g 12-5-20 controlled release	3600	1500	6000

*Days After Transplanting **Ca(NO₃)₂

Table 3. Total fruit yield for three varieties of container tomatoes. Basket King and Patio varieties gave comparable weight yields, but Toy Boy produced significantly less fruit weight.

VARIETY	REPLICATES	MEAN YIELD (g)
Basket King	5	1780 a
Patio	7	1637 a
Toy Boy	6	1299 b

Means followed by the same letter are not significantly different (P < 0.05).

Figure 1. Frequency distribution histograms of fruit weights for each tomato variety. Note Basket King and Toy Boy varieties have the same cell limits, but Patio variety has cell limits 5 times greater, with the last cell (176 - 210 g) 10 g larger than the others in order to accommodate a single 208 g fruit. Histograms were made on a total of 556, 459, and 177 fruits for Basket King, Toy Boy, and Patio varieties, respectively.

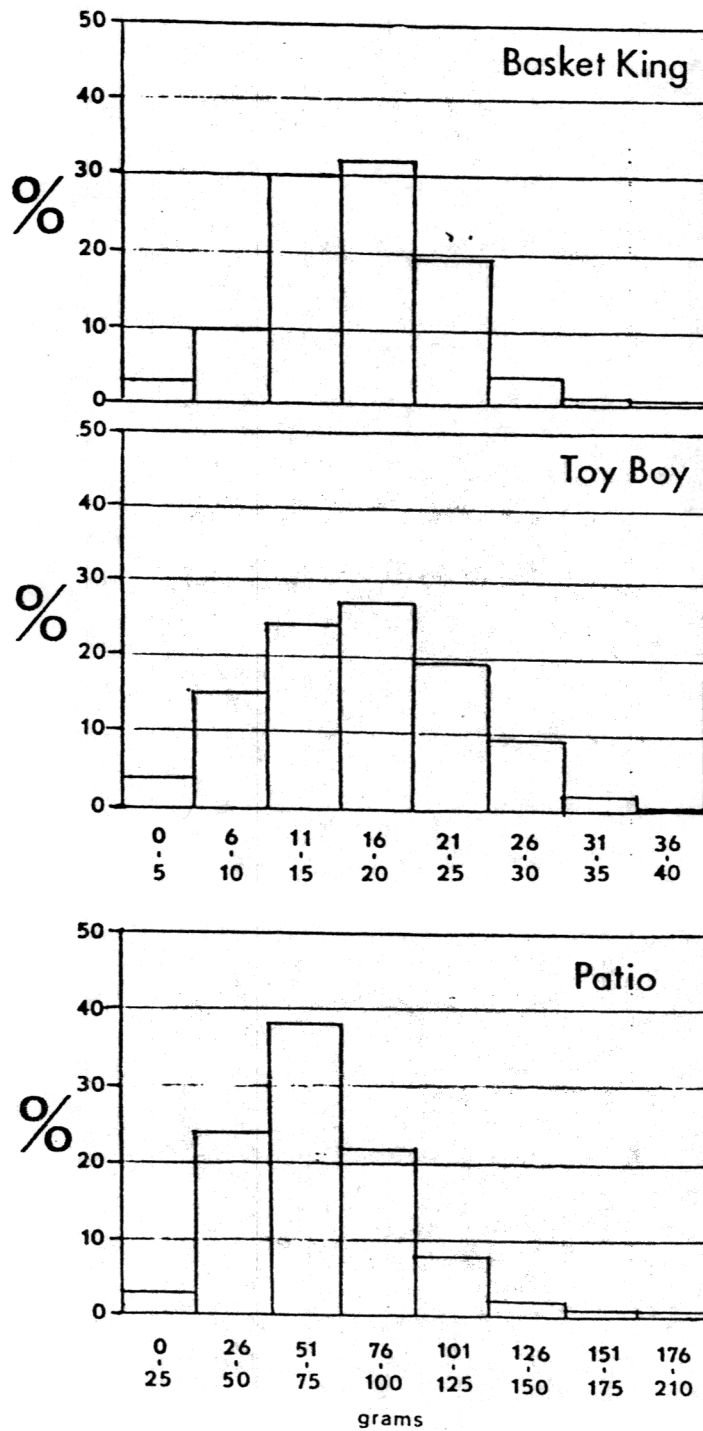


Figure 2. The weekly average number of fruits per plant for each tomato variety, beginning 7 weeks and ending 15 weeks after transplanting. Note Basket King and Toy Boy varieties have the same scale for "Number of Fruit", but Patio variety has a scale about 4 times smaller.

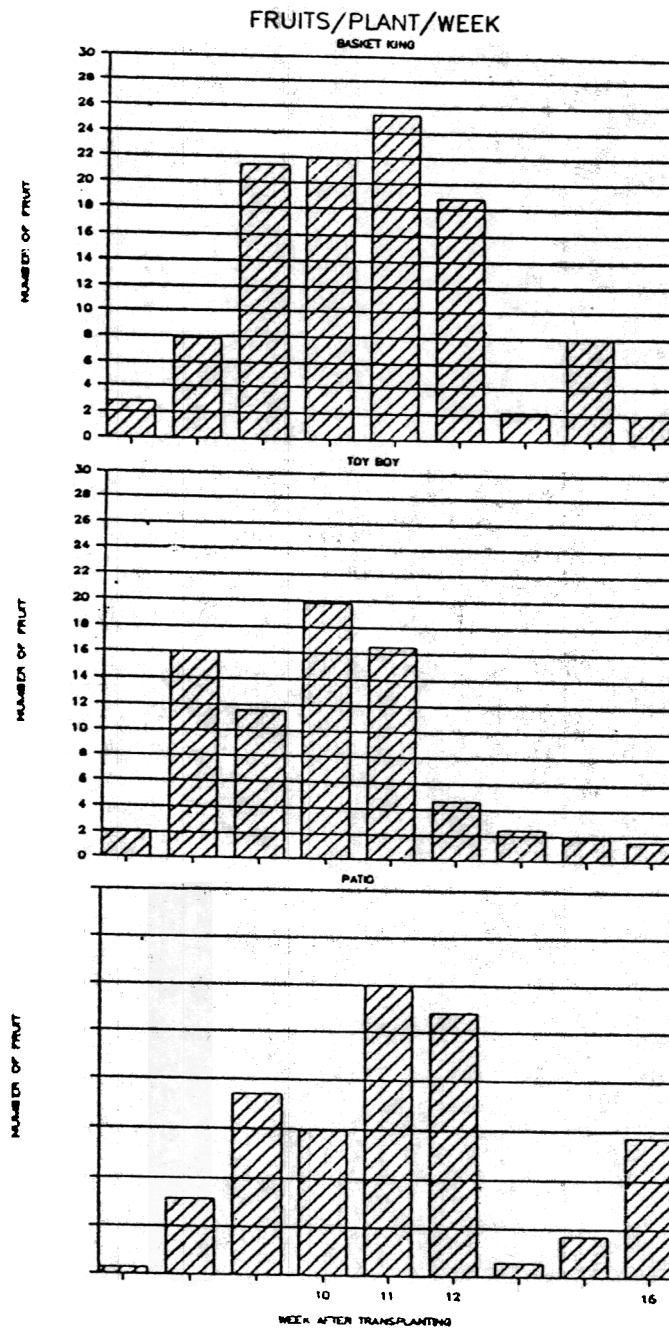


Figure 3. Weekly high and low temperatures, and weekly rainfall record from the time the tomato plants were transplanted (09-AUG-89) until 15 weeks later when harvesting was terminated.

