

## Research Note

### YIELD RESPONSE OF FOUR BEEFSTEAK TOMATO CULTIVARS IN THE U.S. VIRGIN ISLANDS<sup>1,2</sup>

Dilip Nandwani<sup>3</sup>

J. Agric. Univ. P.R. 97(3-4):181-184 (2013)

Tomato (*Solanum lycopersicum* L.) is a leading vegetable crop in the U.S. Virgin Islands (USVI) grown for the fresh market. Tomato ranks second in production after cucumber and third in terms of planted area in the USVI. Over 75% of total tomato production is grown in St. Croix because of availability of flat agriculture land in that island. The latest Virgin Islands Census of Agriculture (2007 Census of Agriculture, 2009), report that 19,179 kg of tomatoes were harvested from 4 ha of planting, which was 314 kg less compared to 2002 when 19,493 kg was harvested in same area of planting. The data indicate that tomato yield is low (4.7 t/ha) in the USVI. Tomato production in the USVI has been severely affected by high labor and management cost, diseases and pests, weeds, natural disasters, limited irrigation water, and declining economy.

Vegetable cultivar trials have always been a component of the Horticulture Program at the University of the Virgin Islands Agricultural Experiment Station. Several cultivars of tomato were tested in the 80's and 90's (Ramcharan, 1981; Palada et al., 1993). There is continuous need for new cultivar testing in tomatoes for high yield, production, marketability, insect pest and disease resistance, heat tolerance and overall suitability to grow in the USVI. Reports on cultivar trials of tomato are available in the literature from the Caribbean region (Fornaris et al., 1991; Colberg-Rivera et al., 1996; Bucknor and McGlashan, 1998). This paper discusses results of field trials conducted on four cultivars of tomato in the USVI.

Experiments were conducted in field plots at the University of the Virgin Islands Agricultural Experiment Station, Kingshill. Four cultivars (hybrid, beefsteak, determinate plant type) were evaluated during the October 2011 to January 2012 winter/spring season. Cultivars were chosen for their suitability for fresh market. 'Celebrity', 'Sun Master II', 'Keepsake' and 'PS01522942' were the cultivars selected for the study. Seeds were procured from Twilley Seeds Co., SC<sup>4</sup>, and planted in seedling trays containing 'Pro Mix' potting mix. Two seeds per hole of each cultivar were sown and flats were kept in the

<sup>1</sup>Manuscript submitted to Editorial Board 22 April 2013.

<sup>2</sup>This research was conducted under a Hatch grant received from USDA-NIFA. The author wishes to thank Vanessa Forbes, Paulino (Papo) Perez and Victor Almodover from the horticulture program staff for their assistance in the field trials, maintaining, harvesting and collecting data.

<sup>3</sup>College of Agriculture, Human and Natural Sciences, Tennessee State University, 3500 John A. Merritt Blvd., Nashville, TN 37209

<sup>4</sup>Company or trade names in this publication are used only to provide specific information. Mention of a company or trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

greenhouse. Seeds were watered as needed. Seedlings were thinned to one plant per hole two weeks after germination. Seedlings with four to five true leaves were transplanted in the field three weeks after germination. The field was disk harrowed, roto-tilled and soil mixed with N-P-K (20:20:20) a week before transplanting. Plots consisted of three rows spaced 120 cm apart, with 12 plants per row spaced 60 cm between the plants within a row. Plants were tied and supported with T-posts (1.8 m). The experimental design was a randomized complete block, with three replications. Plants were drip irrigated two to three times in a week as necessary. Weeds were controlled manually or mechanically. Insect pest and disease control was done applying Mycotrol, Venom and Malathion and fertilizer (20-20-20) was applied during the growing season through fertigation. Data on days from seeding to maturity, total fruit weight, number of marketable fruits (US#1), and fruit weight, brix and acidity (average of three fruits from each harvest) was collected by harvesting the second to the eleventh plants of the center row of a plot. There were a total of eight harvests. Fruits were harvested at the turning ripe or fully ripened stages. Grading of harvested tomatoes was done according to United States Standards for Grades of Fresh Tomatoes (United States Department of Agriculture, 1997). Maturity of fruits was measured at the first harvest from days after transplanting (DAT). Data on total soluble solids of tomato fruits, brix ( $^{\circ}$ B) and acidity (pH) were collected from the three marketable fruits of each harvest. Fields were scouted and monitored for insect pests and diseases by staff and Extension entomologists periodically.

Yields were not significantly different among the four cultivars evaluated (Table 1). However, fruit weight was significantly higher in 'PSS0152294' (198.7 g) and 'Sun Master II' (196.6 g) than in 'Keepsake' (175.6 g) (Table 1). Radial cracks in fruits and culls were observed in 'Celebrity'. Among the four cultivars, 'Keepsake' was the first cultivar harvested, 60 days after transplanting, whereas 'Celebrity' was harvested 70 days after transplanting (Table 1). No significant differences in brix or acidity were recorded among cultivars (Table 2). Common tomato pests, such as hornworms (*Manduca quinquemaculata*), armyworms (*Spodoptera praefica*), stink bugs (*Euschistus conspersus*), and leaf miner (*Liriomyza sativae*) were observed. No serious diseases occurred during the trial. Venom and Malathion were effective in keeping the pest population low.

Bucknor and McGlashan (1998) evaluated four open pollinated AVRDC tomato cultivars under Jamaican conditions. 'Alafua Winner' and 'Tomatoll', two of the AVRDC cultivars were the best yielding in trial 1; however, 'Alafua Winner' was the consistent high yielder in trial 1 and trial 2. Palada and Davis (2001) conducted on-farm trials during the spring season of 1999 and 2000 and evaluated yield performance of tomato cultivars under the organic management system in the USVI. Among the twelve cultivars

TABLE 1.—Mean days to maturity, marketable yield (US #1) and average fruit weight of tomato cultivars grown at the University of the Virgin Islands Agricultural Experiment Station, St Croix, USVI, from Oct.2011-Jan. 2012

Cultivar	Fruit maturity (days from seeding) <sup>1</sup>	Marketable yield (kg/ha) <sup>2</sup>	Average fruit weight (g)
'Celebrity'	70 a	37,024 a	187.1 ab
'Sun Master II'	65 a	40,701 a	196.6 b
'Keepsake'	60 a	39,474 a	175.6 a
'PS01522942'	67 a	35,800 a	198.7 b

<sup>1</sup>Data are mean of fruits harvested from thirty plants.

<sup>2</sup>Within the same column, means followed by the same letter are not different at the 0.05 probability level according to ANOVA.

TABLE 2.—*Brix and acidity of tomato fruits<sup>1</sup> of four cultivars grown at the University of the Virgin Islands Agricultural Experiment Station.*

Cultivar	Brix <sup>1</sup>	Acidity <sup>1</sup>
'Celebrity'	4.20 a	3.90 a
'Sun Master II'	4.47 a	3.89 a
'Keepsake'	4.00 a	4.04 a
PS01522942'	4.13 a	4.20 a

<sup>1</sup>Data are mean values of three marketable fruits per plant per harvest.

<sup>2</sup>Within the same column, means followed by the same letter are not different at the 0.05 probability level according to ANOVA.

evaluated, the top three cultivars, 'Bonita', 'Empire', and 'Sunmaster', produced over 40 t/ha. The organic pesticides used were not very effective in controlling fruit worms in the organic management system used. Sajjapongse and George (1985) reported the evaluation of tomato cultivars in St. Lucia for the hot wet season and cool season of the tropical lowlands. Thirty cultivars were evaluated and the highest yield of 43.99 t/ha was obtained from the CL5915-229D<sub>4</sub>-1-5-0.

In Puerto Rico, eight fresh market tomato cultivars were evaluated and cultivar trials demonstrated that location, season, and year influence a cultivar's overall performance (Fornaris et al., 1991). Five tomato cultivars 'Calypso', 'Celebrity', 'Caraibo', 'Floradade' and 'UH-N69' were evaluated for growth characteristics and productivity in the U.S. Virgin Islands (Collingwood et al., 1992). The highest total yields of 44.9, 41.7 and 40.3 t/ha was produced by 'UH-N69', 'Floradade' and 'Celebrity', respectively. Tomato yield and quality were traits that were quantified and evaluated in the UVI-AES tomato cultivar trial (Ramcharan, 1981). Good yields and high quality fruit are important for a tomato cultivar to be economically viable to a farmer. No significant differences in yield and quality attributes were observed among cultivars in this study (Ramcharan, 1981). Cultivars differed amongst each other for fruit weight, fruit dimensions and culls. In USVI there are two seasons, a wet season between May and November, and a dry season between December and April. During the wet season, high temperature, flooding, and disease limit tomato production and explain the low average yields reported. Temperatures may go as high as 44°C, which is not suitable for tomato growth and production. Tomato plants bear fruits two to three months after transplanting depending on the cultivar. The most suitable season for initiating a tomato planting in the USVI would be from November to January so that the crop matures during the cooler dry season. The results of the present study suggest that the cultivars tested have the potential to produce yields comparable to top yields reported from other locations in the humid tropics when planted during the dry season of the USVI. By growing adapted cultivars during the appropriate season, USVI farmers will be able to fulfil a commercial niche market for locally grown fresh tomatoes.

#### LITERATURE CITED

- Bucknor, C. and D. McGlashan, 1998. Evaluation of four pollinated AVRDC tomato cultivars under Jamaican conditions. *Proc. Caribbean Food Crops Soc.* 34: 35-39.
- Colberg-Rivera, O., R. Vélez-Colón, C. Álamo-González and C. Chao de Báez, 1996. Fresh market tomato cultivar trials at two locations. *J. Agric. Univ. P.R.* 80 (3): 207-210.

- Collingwood, C. D., S. M. A. Crossman and M. C. Palada, 1992. Tomato germplasm evaluation for growth and productivity in the Virgin Islands. *Proc. Caribbean Food Crops Soc.* 28: 232-238.
- Fornaris, G., R. Guadalupe, I. Beauchamp de Caloni and C. Chao de Báez, 1991. Yield and acceptability of eight fresh market tomato cultivars. *J. Agric. Univ. P.R.* 75(1): 93-95.
- Palada, M. C., S. M. A. Crossman and C. D. Collingwood, 1993. Yield performance of vegetable cultivars in the U.S. Virgin Islands 1988-1992. Agric. Exp. Station, Univ. of the Virgin Islands Technical Bul. No. 5.
- Palada, M. C. and A. M. Davis, 2001. Yield performance of tomato cultivars grown under organic management systems. *Proc. Caribbean Food Crops Soc.* 37: 154-160.
- Ramcharan, C., 1981. Virgin Islands tomato, pepper and eggplant cultivar trials in 1978-79. V.I. Agri. Exp. Station Technical Bul. No.3.
- Sajjapongse, A. and C. George, 1985. The evaluation of tomato cultivars in St. Lucia. *Proc. Caribbean Food Crops Soc.* 21: 17-21.
- United States Department of Agriculture, 1997. United States Standards for Grades of Fresh Tomatoes. USDA Agricultural Marketing Service, Fruit and Vegetable Division, and Fresh Products Board. [Internet document], available from <http://www.ams.usda.gov/standards/vegfm.htm>
- United States Department of Agriculture, 2009. 2007 Census of Agriculture. Virgin Islands of the United States Territory and Island Data. National Agricultural Statistics Service.