

CHEMICAL, PHYSICAL, AND SENSORY PROPERTIES OF FOUR GRAPE TOMATO VARIETIES

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ABSTRACT

According to a recent article in *Food Technology* (Volume 57, 2003), the consumption of fresh vegetables has increased 26% over the last thirty years. According to the National Restaurant Association, salads have been the most frequently ordered menu items for two consecutive years. These trends also hold with fast food chains, which are starting to offer more high-quality salads featuring ingredients like grape tomatoes. The first grape tomato variety widely introduced, Santa Hybrid, has nearly the same flavor as other tomatoes, but is much sweeter due to an almost 10% sugar content.

The objective of this study was to characterize the chemical, physical, and sensory attributes of four grape tomato varieties: Chiquita, Sweet Olive, Red Grape, and Tami-G.

A sensory evaluation (seven point hedonic rating of color, flavor, texture, and overall acceptability) was conducted with statistical analysis completed using Compusense[®] computer software program. Additionally, Hunter color, pH, and Brix measurements were collected for all varieties.

Chiquita was found to be significantly less appealing ($P < 0.05$) with regard to color than any of the other varieties. Since the colorimeter results showed that both high a and b values are desired, red and yellow hues are significant when deciding which variety to use. Similarly, a significant difference ($P < 0.05$) between Chiquita and the other three varieties was found with regard to overall acceptability. However, flavor and texture were not significantly different. The results showed that both pH and Brix did not differ across variety.

These results suggest that when flavor, texture, pH, and Brix of grape tomatoes do not differ, color is a strong driver of overall acceptability. Bluish hues were not readily accepted by the consumer; consequently, growers should select varieties with the brightest, most red and yellow color because those are preferred by consumers.

INTRODUCTION

According to a recent article in *Food Technology*, the consumption of fresh vegetables has increased 26% over the last thirty years. Vegetables remain the most regularly served side dish, accompanying 26% of suppers. Additionally, salads have held the top spot on the National

Restaurant Association's (NRA) list of menu items ordered more frequently than any other food item in the last two years. NRA also reported that approximately 90% of restaurants with an average check of \$25 and higher offer locally grown produce in their salads. However, this trend in the increasing number of salads ordered is not only found in high-end restaurants, but also popular fast food chains like McDonald's and Wendy's. With fast food chains under pressure from critics who blame them for contributing to the nation's growing obesity problem, top officials resolved to start offering a more high-quality salad featuring ingredients like grape tomatoes. These are supposed to be similar to salads found in casual dining restaurants. Grape tomatoes also are known as Santa Hybrid and grow the same way that grapes and other tomatoes grow. While they aren't resistant to diseases, grape tomatoes can tolerate heat, leaf spot, and viruses. The Santa Hybrids have nearly the same pure tomato flavor intensity as other tomatoes, but are much sweeter due to an almost 10% sugar content. This feature is what makes grape tomatoes an attractive and healthy snack that is a hot item on the supermarket shelves and one of the newest items to show up on restaurant menus. The objective of this project was to find out what variety of grape tomato the consumer most prefers.

MATERIALS AND METHODS

Experimental Design. Four varieties of grape tomatoes, which were harvested in August of 2003, were planted in a whole-plot, sub-plot design, where the whole-plot represents a marked-off area of field at the farm. The sub-plots were divided by variety and replication. The varieties that were planted include Chiquita, Sweet Olive, Red Grape, and Tami-G.

Hunter Colorimeter. Three replications of each of the four grape tomato varieties were analyzed in triplicate for color using the Hunter colorimeter.

pH and Brix. Three grape tomatoes for each replication and all varieties were crushed in a mortar using a pestle and then pH was determined using a pH meter. The soluble solids content was evaluated using a dual scale Brix refractometer (Dela Technology, Worthington, OH).

Sensory Analysis. The sensory panel consisted of 39 students/faculty from Purdue University who evaluated the grape tomato varieties for appearance, texture, flavor, and overall acceptability using a seven-point hedonic scale (7 = extremely acceptable, 1 = extremely unacceptable). A randomized complete block design for the analysis was conducted using Compusense Five version 4.4 software $\alpha = 0.05$ (Compusense Inc., Ontario, Canada).

RESULTS

Data obtained for chemical, physical, and sensory analyses conducted on the four varieties of grape tomatoes are reported below in tables and figures. The bars in Figures 1-4 represent means and the different letters represent significant difference with 95% confidence.

Table 1. Brix and pH data from four different grape tomato varieties.

Variety	pH ^a	Brix ^a
01	4.55±0.1	6.08±0.4
02	4.34±0.1	6.15±0.3
03	4.37±0.1	6.28±0.4
04	4.35±0.1	6.32±0.4

a=Mean ± standard deviation with n=6

Table 2. Hunter colorimeter L, a, and b values^a for four different grape tomato varieties.

Variety	L	a	b
01	23.41±1.22	16.24±1.49	7.37±0.48
02	22.72±1.48	18.47±3.06	11.41±0.86
03	22.64±1.66	20.71±2.97	12.00±1.13
04	22.54±1.63	19.61±2.94	11.50±0.96

a=Mean ± standard deviation with n=18

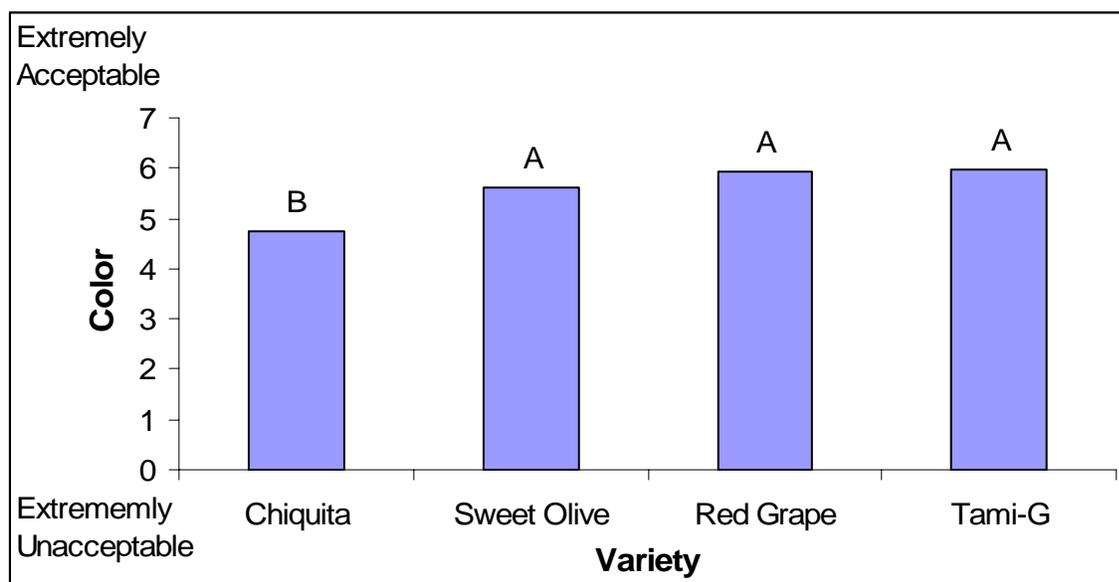


Figure 1. Sensory evaluation of color for four different grape tomato varieties.

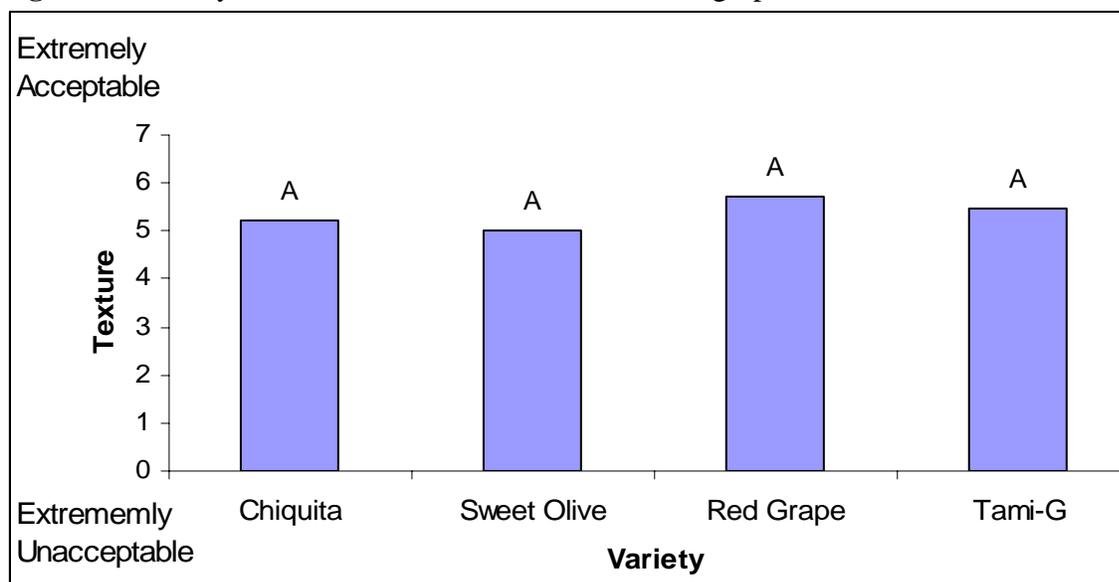


Figure 2. Sensory evaluation of texture for four different grape tomato varieties.

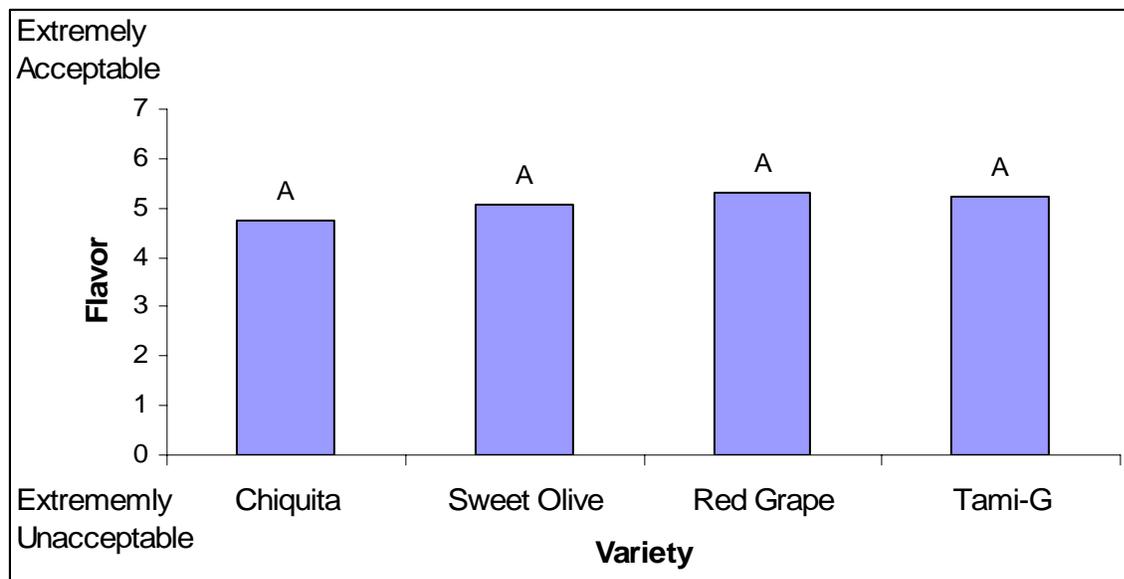


Figure 3. Sensory evaluation of flavor for four different grape tomato varieties.

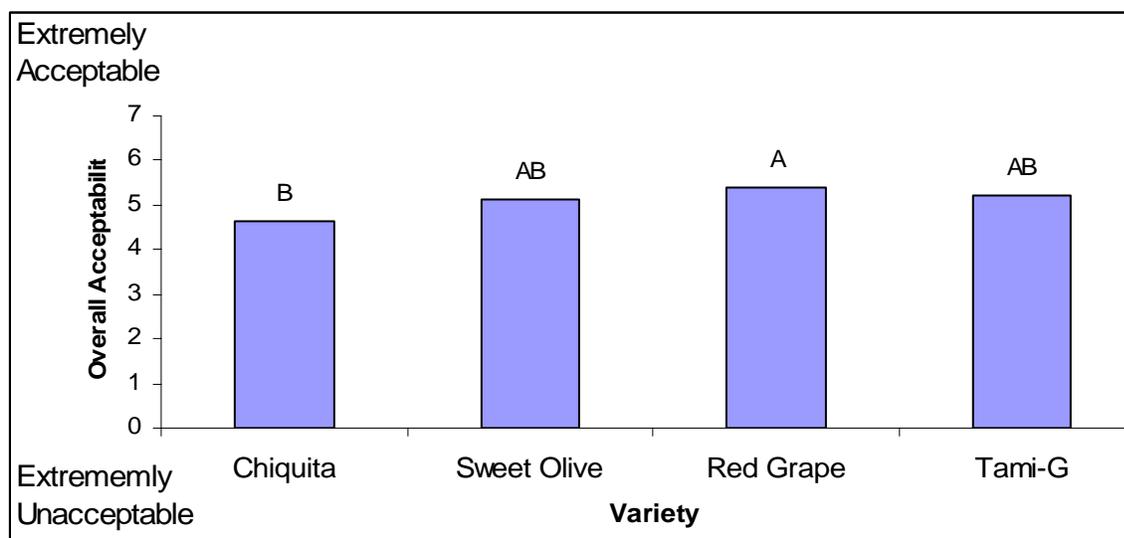


Figure 4. Sensory evaluation of overall acceptability for four different grape tomato varieties.

DISCUSSION

High a and b values are needed as displayed in Table 2, the brightness of red and yellow hues is important when deciding which variety to use. Comparing values from Table 2 and the graph in Figure 1, it can be concluded that Chiquita, with an a value of 16.24, was the most green in color and the least liked. Meanwhile, the a values for Sweet Olive, Red Grape, and Tami-G ranged from approximately 18.5 to 20.7 and showed no significant difference among the three varieties as seen in Figure 1. Similarly, Chiquita had a much lower b value than the other three varieties (7.37 vs. approx. 11.5 to 12.0). This low b value indicates a more bluish hue rather than bright

yellow. Figure 1 shows that such a hue is not readily accepted by the consumer since there is a significant difference between Chiquita and the other three varieties.

Overall acceptability was significantly different for Chiquita and Red Grape while both Sweet Olive and Tami-G could not be deciphered from one or the other. Furthermore, as Figures 2 and 3 show, flavor and texture are not significantly different and therefore not affected by variety.

CONCLUSION

Variety seems to have little effect on texture and flavor acceptability while it does significantly affect overall acceptability and appearance. When it comes to grape tomatoes, color is a strong driver of overall acceptability. Therefore, growers should select varieties with the brightest, most red and yellow color because those are the most influential characteristics behind consumer acceptance.

REFERENCES

- Sloan, Elizabeth A. "Going for the Green: Super Salads." *Food Technology* Jul. 2003:18.
- Sloan, Elizabeth A. "What, When, and Where Americans Eat: 2003." *Food Technology* Aug. 2003: 64.