

Sensory and consumer studies for improving citrus quality

By Laura Reuss, Fred Gmitter and Yu Wang

In Florida, it is necessary to produce large quantities of high-quality citrus fruits in order to keep pace with the projected market growth, as well as to maintain viability of the citrus industry. Successful development of new varieties and pre- and post-harvest practices should be consumer-driven. However, consumer behavior is often affected not only by individual factors (genetics, age, gender, culture, etc.), but also by product-specific factors (sensory) and marketing as well. The University of Florida Citrus Research and Education Center's (CREC) Flavor Program is taking steps to systematically study these factors to understand the market, develop informational resources that can be used directly by the industry (growers, packers, shippers and marketers) and promote the production and marketing of competitive new varieties grown in Florida.

PREFERENCES DRIVE DECISIONS

The consumer is key in driving product success in the contemporary marketplace. Recognition of this fact has, in turn, generated both driver-sensory analyses and consumer insight studies leading to a database of consumer-relevant information, which will be available and quite useful to the industry. To promote citrus fruits successfully in the marketplace, a

thorough understanding of consumer preferences is needed.

As the Florida citrus industry struggles with threats from disease and external competition, new, more disease-tolerant and consumer-preferred varieties, along with improved disease-control practices, provide excellent opportunities to study and build upon the database of consumer preferences in the future. The goal of our Flavor Program is

to develop informational resources that can support industry decisions for adopting new varieties and new pre- and post-harvest practices, with confidence in the fruit products directly targeting consumer preferences. The resources we are now developing will subsequently aid the industry in selecting and producing consumer-preferred varieties, as well as target the appropriate market.

SENSORY TESTS

Currently, numerous kinds of sensory tests are conducted at the CREC. These sensory tests vary, depending on the focus of desired attributes and the citrus varieties that are of interest. For example, a triangle test is used to determine whether any perceptible difference exists between two or more samples when comparing cultivars, rootstocks or treatments.

A descriptive analysis is used when descriptions of the perceived sensory attributes (appearance, overall flavor, texture and mouth feel) are desired. These sensory attributes are used in further descriptive analyses, specifically a standard nine-point scale (1 = none, 9 = strong) intensity rating of those attributes. Additionally, a quantitative consumer test is used to map preference, and a means-end chain analysis is a market research technique that is used to make a connection between consumer values and product-

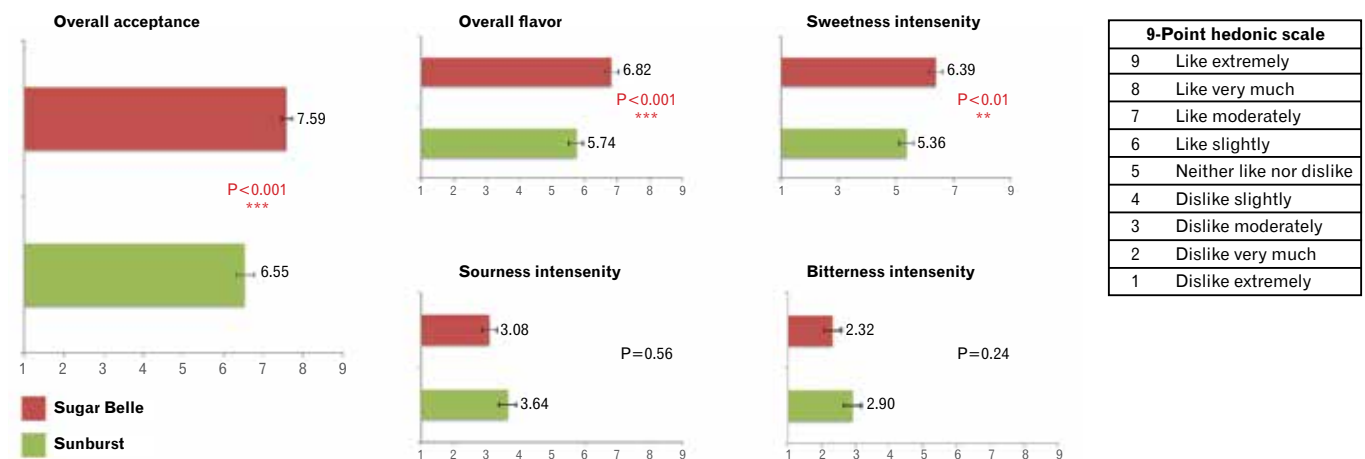


Figure 1. Sugar Belle vs. Sunburst

feature preferences.

CREC sensory test panelists are presented juice as well as peeled fruit. Some sensory tests may compare two different varieties, whereas other tests may compare three or four. Panelists are volunteers who proceed at their own pace in a designated sensory room consisting of individual booths for privacy and dim lighting to keep color from influencing the panelists' opinions. In addition to the citrus varieties, panelists are provided water and unsalted crackers to cleanse their palates between samples. Directions are given both verbally before entering the sensory room and again as written instructions on the ballot provided to record opinions. During 2015, sensory tests performed at the CREC provided useful data for orange, mandarin and grapefruit varieties.

SUGAR BELLE VS. SUNBURST

One such test used a nine-point scale to compare attributes of two mandarin varieties, Sugar Belle and Sunburst. The sensory results indicated that Sugar Belle had a much higher overall acceptance score than Sunburst. The overall flavor and sweetness intensities for Sugar Belle were significantly higher, with no differences for sourness or bitterness when the two varieties were compared (see Figure 1, page 20).

711 VS. ORRI

A similar nine-point rating system was also used for the comparison of two mandarin varieties, 711 and Orri. However, for this sensory test, panelists were also asked to implement an open-nose versus closed-nose technique to compare the effects of aroma on overall flavor and taste attributes. The overall acceptance of 711 was greater than that of Orri using the nine-point scale. 711 rated higher than Orri regardless of aroma influences. 711 was also rated more intense for sweetness, but with no significant difference for bitterness or sourness when compared to Orri (see Figure 2).

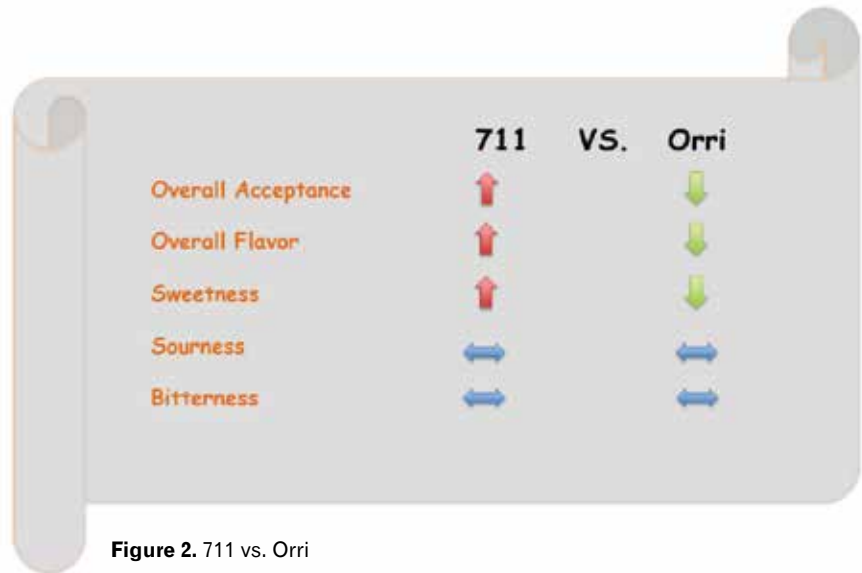


Figure 2. 711 vs. Orri

UF914 VS. RAY RUBY

In an effort to increase the consumer profile for grapefruit in the market, sensory tests were conducted with a new and an existing variety. Using criteria similar to that used for the mandarins, these results indicated grapefruit hybrid variety UF914 had greater overall acceptance than Ray Ruby. The sweetness intensity of UF914 was greater than Ray Ruby. However, there was no statistical difference in any of the other attributes for these two grapefruit varieties.

DATA AND DEMOGRAPHICS

Data collected in previous years has led to an interest in collecting additional and more personal information about panelists, leading to the design of a new ballot that asks some demographic-based questions. Examples of these newly added questions include the panelist's age, gender, education level, eating history, ethnicity, genetics and attitudes toward certain foods. The original rating of taste attributes as well as overall appearance, texture and flavor are also included. For example, association between age and grapefruit preference indicated older people preferred UF914, whereas younger people

typically either liked or extremely disliked it.

CONCLUSION

The goal for utilizing more extensive data collected from panelists is to create a comprehensive database for all citrus varieties, and also pre- and post-harvest practices, which will be easily accessible to both industry and researchers. This information will provide citrus growers with comparable information about consumer perceptions of, and preferences for citrus fruits (oranges, mandarins, grapefruits, etc.), as well as consumer use and knowledge of, and attitudes and beliefs about, citrus fruit. These outcomes will help implement and expedite varietal selection, guide breeding programs, and assess effectiveness of pre- and post-harvest practices in order to optimize the sensory quality of the fruits and in turn, increase consumer acceptance that leads to increased purchases of Florida-grown fresh citrus fruit. 🍊

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