Sensory Evaluation of 15 Mango Cultivars in South Florida

Noris Ledesma[1,3], Luzmila Andrea Nieto[2], and Luisa Pacheco[2]

[1]*Fairchild Tropical Botanic Garden, 10901 Old Cutler Rd, Coral Gables, FL 33156*

[2]*University of Magdalena, Santa Marta, Colombia*

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The mango industry in Colombia is primarily for domestic consumption. In addition to local cutlivars, Colombia produces mango cutlivars such as 'Tommy Atkins' and 'Keitt'. In this work, 15 mango cultivars were selected for characteristics and attributes that make them desirable for the mango industry (Ledesma, 2018). 'Ah Ping', 'Angie', 'Rosigold', 'Rosa', 'Cosghall', 'Duncan', 'Kensington Pride', 'Mallika', 'Nam Doc Mai', 'Espada', 'Rapoza', 'Valencia Pride', 'Young', 'Osteen', and 'Omer' were evaluated and compared with 'Tommy Atkins' through sensory analyses in different locations in South Florida. The survey was conducted from May to July 2018, during main mango season in South Florida. For the study, mature fruit from the genetics collection of Fairchild Tropical Botanic Garden in Coral Gables, FL, were used. The sensory evaluations were performed in public places following established protocols. Sensory attributes include appearance, aroma, taste, and texture. Ethnicity, age, and gender of the panelists was recorded. Results using 392 panelists per variety show that 'Rapoza', 'Mallika', and 'Rosa' are the favorite mangos in terms of general appearance, aroma, flavor, and texture. The study also shows differences in preference according ethnicity, but no significant differences based on age or gender.

Mango is one of the most important tropical fruits produced worldwide. Mango production in Colombia is mainly for fresh fruit consumption, which accounts for more than 95% of national production. In Colombia , the main variety is Hilacha or mango crioyo (native mango). Colombia introduced mango cultivars from South Florida in the 1980s: including 'Haden', 'Kent', 'Keitt', 'Ruby', 'Tommy Atkins', 'Van Dyke', 'Palmer', and 'Irwin'. New mango plantations were established in 2011 and 2012, but the fresh mango industry is still in its infancy. The mango industry in Colombia is interested in introducing new cultivars. (Ledesma et al, 2018).

The increase in mango production and consumption has generated a search for new varieties in different countries. Although Colombia currently has varieties with potential for the international market, they are not yet known outside of the country. For the industry to grow, it is necessary to introduce new cultivars with superior characteristics and high quality (Campbell and Ledesma, 2006, 2015). A sensory analysis is a first step in obtaining valuable information about consumer preferences and is a tool to determine the potential of new cultivars for commercialization.

Materials and Methods

This study was done using mature fruit from the Fairchild Tropical Botanic Garden mango collection from May to July 2018. The Fairchild mango collection is located near Homestead, FL, geographic coordinates: 25°32'12.91" N lat. and 80°25'55.17" W long.

The collection is composed of a single tree per cultivar. Each tree is averagre of 12 years-old.. Trees were been grafted onto 'Turpentine' rootstock and have been hand-pruned every year following harvest. Fertilization and disease control involve very few chemical inputs. No irrigation is applied.

The varieties selected for the study are: 'Ah Ping', 'Angie', 'Rosigold', 'Rosa', 'Cosghall', 'Duncan', 'Kensington Pride', 'Mallika', 'Nam Doc Mai', 'Espada', 'Rapoza', 'Valencia Pride', 'Young', 'Osteen', and 'Omer'.

Fruit preparation. The fruit was harvest at a physiologically mature state, stored at temperatures of 70 °F to 75 °F until reaching the ideal ripeness for tasting. For harvesting and postharvest processes, maturity was judged by the color of the flesh, firmness, and the shape of the shoulders of the fruit. The fruit was evaluated at physiological maturity before the survey. Brix degrees and a cut test were performed.

Survey. Color, flavor, and texture of fresh mango are critical factors to consumer acceptance and the success of fresh mango cultivars in the United States. In this research we examined desirable and undesirable quality attributes of the 15 different mangos cultivars compared with 'Tommy Atkins.' The survey included a chart designed to evaluate the preferences in overall appearance of the 15 mango varieties. Color, flavor, texture, quality of fresh-cut mango, and flavor preference were evaluated in different locations in South Florida.

The ethnicity and age range were included in the study to evaluate the preference among U.S. consumers. Age range was divided in 4 groups: (10- to 15-year-old); (15 to 25-year-old),

*Corresponding author. Email: norisledesma.mango@gmail.com

(25- to 45-year-old), and older than 45-years-old. Ethnicity was grouped as: Asian; Hispanic/Latino; White/Caucasian; Black/African American; American Indian/Alaska Native; Native Hawaiian/Pacific islander; and other. At least two hundred (200) people sampled each cultivar.

The form was designed to consider consumer characteristics including gender, ethnicity and age. The test has two interval scales: The first scale is graphical (facial hedonic) and evaluates the appearance and aroma of three varieties of mango compared with 'Tommy Atkins'. The faces correspond to a numerical scale: 1 = "I like it very much", 2 = "I like it", 3 = "I do not dislike it", 4 = "I don't like it", and 5 = "I do not like it at all." The second scale was linear, to determine the intensity of aroma (low, moderate, and very aromatic) and fiber content (a of lot fiber, moderate fiber, and no fiber).

Following the methodology used by Reis et al., 2006 for the preparation of samples, each group of panelists only evaluated four samples (1, 2, 3, and T), with T being the 'Tommy Atkins' cultivar used as a control since it is widely known. The survey was measured using the central tendency to define differences.

Results

Results using 392 panelists per cultivar show that the highest score and acceptability per characteristic evaluated were:

Appearance = 'Ah Ping', 'Rapoza', 'Osteen' and 'Omer'
Flavor = 'Rapoza', 'Rosa', 'Angie', 'Young', 'Mallika'
Aroma = 'Mallika', 'Rosa', 'Rapoza'

Texture = 'Rosa' and 'Espada', (cultivars with more fiber). Latin ethnic group chose fiber as a positive quality in a mango.

Among the 15 mango cultivars selected for the study, the highest score based on flavor and appearance among all cultivars evaluated taken across all ethnicities, genders, and ages were: 'Rapoza' (3.57); 'Mallika' (3.54); 'Rosa' (3.46); 'Osteen' (3.23); and 'Espada' (3.21). The margin of error was 0.102, with a 95% confidence interval. (Table 1, Fig. 1).

Preferences by Ethnicity, Age, and Gender

The study also showed differences in preference based on ethnicity (Table 2), age (Table 3), and gender (Table 3).

There were significant differences for acceptability based on age or gender. For a small percentage of the evaluations, participants did not mark their gender and it was difficult to identify them based on their name so they were not included.

In general all participants, based on gender, considered the cultivar selected as a control, 'Tommy Atkins' as having a pleasant appearance, but it was not the favorite based on taste; it was also the cultivar with the highest amount of fiber.

Discussion and Conclusions

Sensory analyses showed that several new mango cultivars have potential for commercialization in South Florida: 'Rapoza', 'Mallika', 'Osteen', 'Rosa', and 'Espada'. These cultivars were characterized by consumers as having an attractive color and shape, a pleasant aroma and texture, which means little fiber. Other cultivars, such as Omer, Ah Ping, Angie, Rosigold, and
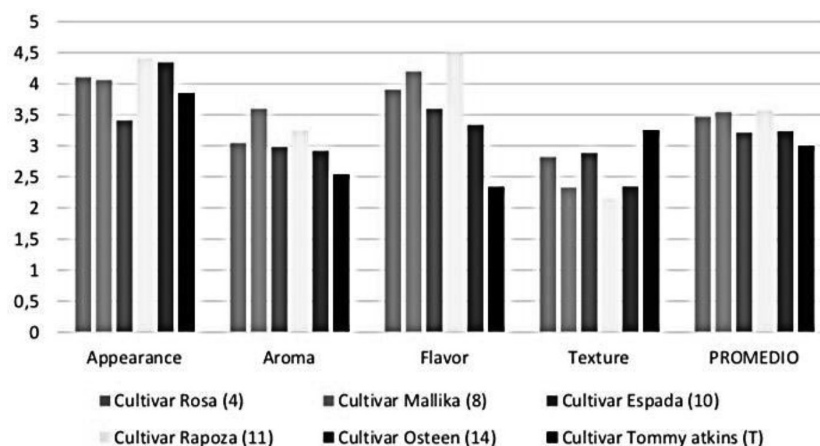

Fig 1. The top cultivars in the survey

Table 1. Average acceptability[z] of the top five cultivars across ethnicity, gender and age.

Characteristics	Cultivar					
	Rosa	Mallika	Espada	Rapoza	Osteen	Tommy Atkins (T)
Appearance	4.11	4.06	3.41	4.41	4.34	3.85
Aroma	3.05	3.60	2.98	3.25	2.92	2.54
Flavor	3.91	4.2	3.59	4.48	3.34	2.34
Texture	2.82	2.33	2.88	2.15	2.34	3.25
Average	3.47	3.55	3.22	3.58	3.23	2.99

[z]Ratings based on a 1–5 scale with 1 = not acceptable and 5 = highly desirable.

Table 2. Average mango cultivar ratings [z] for flavor and appearance by different ethnic groups.

Ethnicity	Flavor	Appearance
Asian		
	Mallika (4.6)	Osteen (4.75)
	Nam Doc Mai (4.3)	Mallika (4.375)
	Osteen (4.25)	Omer, Rapoza, Rosa (4)
	Tommy Atkins (2.48)	Tommy Atkins (3.55)
White/Caucasian		
	Rapoza (4.46)	Omer (4.56)
	Angie (4.27)	Rapoza (4.38)
	Nam Doc Mai (4.09)	Ah Ping (4.35)
	Ah Ping, Cosghall (4)	Osteen (4.31)
	Tommy Atkins (2.39)	Rosa (4.26)
		Tommy Atkins (3.9)
Hispanic/Latino		
	Rapoza (4.68)	Ah ping (4.65)
	Mallika (4.48)	Rapoza (4.57
	Angie (4.28)	Osteen (4.2)
	Nam Doc Mai (4.23)	Mallika (4.16)
	Cosghall (4.15	Valencia Pride (4.13)
	Tommy Atkins (2.21)	Tommy Atkins (3.78)
Black/Afrian American		
	Rapoza (5)	Mallika (4.66)
	Mallika (4.66)	Rapoza, Valencia Pride, Osteen (4.5)
	Angie (4.66)	Rosa (4.33)
	Nam Doc Mai, Rosa (4)	Tommy Atkins (3.64)
	Tommy Atkins (1.82)	
Native Hawaiian/Pacific Islands		
	Ah Ping, Rapoza (5)	Ah ping, Rapoza (5)
	Young (4.5)	Duncan, Valencia Pride (4)
	Tommy Atkins (2.66)	Tommy Atkins (4)

[z]Ratings based on a 1–5 scale with 1 = not acceptable and 5= highly desirable.

Table 3. Preference ratings[z] for appearance, flavor and most aromatic by age group and gender.

	Appearance	Flavor	Aroma
Age			
10–15	Omer (4.8)	Mallika (4.8)	Rosa (4.1)
16–25	Cosghall (4.6)	Rapoza (4.6)	Mallika (4.5)
26–45	Rapoza (4.5)	Mallika (4.5)	Mallika (3.7)
			Angie (2.2)
45+	Ah Ping (4.5)	Rapoza (4.2)	Mallika (3.4)
Gender			
Women	Ah Ping (4.4)	Rapoza (4.4)	Mallika (3.5)
Men	Rapoza (4.4)	Mallika (4.4)	Mallika (4.4)

[z]Ratings based on a 1–5 scale with 1 = not acceptable and 5 = highly desirable.

Cosghall, also stood out for certain qualities. 'Rapoza' and 'Mallika' stood out for their organoleptic qualities.

The control 'Tommy Atkins' was not a favorite. It was characterized as having a higher fiber content than the other cultivars.

The different ethnic groups present in South Florida described (Gómez, 1994), that the consumption of mango in the United States has been increasing due to ethnic populations, which have contributed to the expansion of the market. Likewise, a study carried out by the National Mango Board (2008–14) where they learned that the demand for mango in the United States depends on the consumer, with ethnicity being the main factor driving the market. New mango varieties can open new possibilities for the mango market in the United States.

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