

1 DRY MATTER AS A QUALITY INDEX FOR BRAZILIAN MANGOES

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11 INTRODUCTION

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13 Mango (*Mangifera indica* L.) is widely cultivated in more than 90 countries, reaching a
14 production of 30 million tons in 2010 (Tharanathan et al., 2006; FAOSTAT, 2013). The United
15 States represents the largest mango importer in the world, accounting for about 32% of imports
16 (Evans, 2008; FAOSTAT, 2013). The U.S. imports mango mostly from Mexico, Peru, Ecuador, and
17 Brazil, with Mexico representing about 60%. Over the last years, Brazil has become significant
18 exporter to the United States, competing with Mexico at the beginning and at the end of the season
19 (Evans, 2008).

20 Harvest of climacteric fruit, such as mango, must be accomplished after physiological
21 maturity is reached, but before the onset of the climacteric respiration rise to optimize the
22 postharvest life and eating quality. Delaying harvest allows carbohydrates to accumulate, which
23 increases fruit sensory attributes (Subedi et al., 2007). Previous studies have shown that quality
24 parameter such as soluble solids content and dry matter can be precisely determined final eating
25 quality of mangoes during ripening (Saranwong et al., 2004; Subedi et al., 2007). The objectives of
26 this study were to validate dry matter as an index to indicate final consumer quality and acceptance
27 of mango fruit from Brazil.

28 MATERIAL AND METHODS

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30 Mangoes cultivar Ataulfo and Tommy Atkins from Mexico and Brazil were obtained from a
31 commercial wholesale in San Francisco, CA, US. The fruit were transported to the Postharvest
32 Laboratory at University of California, Davis, CA, US. At the same day, fruit with external injury
33 were eliminated and the boxes were kept at 20°C and >85% of relative humidity (RH). When
34 mango fruit were ‘ready to eat’, fruit from Brazil and Mexico were separated and divided in ranges,
35 according to their dry matter content. For dry matter determination, slices with 18 mm were cut

36 from the longitudinal part of each mango, weighted and placed on the dehydrator (Dehydrator:
 37 Nesco/American Harvest Snackmaster® -Pro Food Dehydrator) and weighted again when the final
 38 weight were constant. The dry weight was calculated based on the difference between the fresh and
 39 dry weight and the results were given in percentage.

40 To evaluate consumer acceptance on mangoes from Mexico and Brazil, samples were
 41 prepared in the postharvest lab in Wickson Hall at University of California, Davis, and were
 42 transported to the store taking into full consideration the sample sequence number. The Consumers
 43 rated their overall impression for each mango sample, according to location and dry matter range
 44 and the responses were recorded using a 9 point hedonic scale and consumer acceptance was
 45 measured as degree of liking (1–9) (Lawless and Heymann, 2010). The experiment design
 46 (William’s design), the three digit code and presentation order for the consumer test were
 47 randomized using the Software Compusense 5 (Compusense, 1998).

48 49 RESULTS AND DICUSSION

50 According to data obtained for ‘Ataulfo’ mangoes produced in Mexico, the differences in
 51 dry matter content (DM) evaluated were not sufficient to affect the degree of liking, as well as the
 52 percentage of consumer acceptance and the percentage of consumers that ‘neither like nor dislike’
 53 the fruit (Table 1). Higher DM increased the percentage of consumers that disliked the fruit of
 54 ‘Ataulfo’ mangoes (Table 1). Data obtained for ‘Tommy Atkins’ mangoes produced in Mexico
 55 show that increasing fruit DM increased the degree of liking and consumer acceptance (Table 1).
 56 Increasing DM of ‘Tommy Atkins’ mangoes decrease the percentage of consumer that neither like
 57 or dislike and the percentage of people that dislike the fruit (Table 1).

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 Table 1. Degree of liking and percentage of consumer acceptance of Mexican ‘Ataulfo’ and
 ‘Tommy Atkins’ mangos by American consumers at different levels of Dry Matter (DM).

Dry matter range	n	Degree of Liking (1-9) ¹	Acceptance (%)	Neither Like nor Dislike (%)	Dislike (%)
‘Ataulfo’					
DM 16.9-20.0	90	7.0a*	82.2	10.0	7.8
DM 20.1-22.0	114	6.9 a	84.2	6.1	9.6
DM 22.0-25.3	60	6.5 a	76.7	8.3	15.0
HSD		0.63			
p- value		0.21			
‘Tommy Atkins’					
DM 11.6-14.5	126	5.8 c	64.3	11.9	23.8
DM 14.6-17.0	126	6.4 b	73.8	7.9	18.3
DM 17.1-21.8	108	7.1 a	84.3	3.7	12.0
HSD		0.56			
p- value		8.01 x 10 ⁻⁸			

61 ¹ Degree of liking: 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5 = neither
 62 like nor dislike, 6 = like slightly, 7 = like moderately, 8 = like very much, 9 = like extremely. * Same letters within the
 63 same column indicate no significant difference between means according to Tukey Test (5%).

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65 The data obtained for 'Ataulfo' and 'Tommy Atkins' mangos produced in Brazil show that
 66 increasing DM content tends to increase the degree of liking as well as the percentage of consumer
 67 acceptance (Table 2).

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69 Table 2. Degree of liking and percentage of consumer acceptance of Brazilian 'Ataulfo' and
 70 'Tommy Atkins' mangos by American consumers at different levels of Dry Matter (DM).

Dry matter range	n	Degree of Liking (1-9) ¹	Acceptance (%)	Neither Like nor Dislike (%)	Dislike (%)
'Ataulfo'					
DM 14.6-16.4	101	5.9 b*	65.3	9.9	24.8
DM 16.5-17.5	143	6.7 a	79.0	8.4	12.6
DM 17.6-19.3	114	6.9 a	82.5	8.8	8.8
LSD		0.54			
p- value		8.10 ⁻⁴			
'Tommy Atkins'					
DM 10.1-11.5	118	4.7 b	38.1	16.9	44.9
DM 11.6-12.5	125	5.2 b	51.2	11.2	37.6
DM 12.5-14.0	114	5.4 a	56.1	11.4	32.5
LSD		0.57			
p- value		0.01			

71 ¹ Degree of liking: 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5 = neither
 72 like nor dislike, 6 = like slightly, 7 = like moderately, 8 = like very much, 9 = like extremely. * Same letters within the
 73 same column indicate no significant difference between means according to Tukey Test (5%).
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75 Fruit of both cultivars with the lowest DM content showed the highest percentage of people
 76 that neither like nor dislike the fruit and the percentage of people that dislike the fruit decreased by
 77 increasing DM content (Table 2). High DM content at harvest results in higher sugar content,
 78 increasing the degree of liking and consumer acceptance of mango fruit at the ripe stage. 'Ataulfo'
 79 mangoes produced in Mexico and in Brazil with DM contents higher than 16.9 and 16.5%,
 80 respectively, showed no difference in the degree of linking, indicating that higher DM contents have
 81 no effect on consumer perception for this cultivar.

82 The average DM content in 'Ataulfo' mangoes produced in Mexico and Brazil were 21.1%
 83 and 16.9%, respectively. The average DM content in 'Tommy Atkins' mangoes produced in Mexico
 84 and Brazil were 16.7% and 12.0%, respectively. These results show that the average DM of
 85 Brazilian mangoes is lower than Mexican mangoes, which has negative effects on consumer
 86 sensory attribute. Lower DM content of Brazilian mangoes is possibly the result of early harvest
 87 accomplished to extend the postharvest life required for shipping and commercialization in the U.S.,
 88 compared to mangos produced in Mexico. Therefore, new technologies have to be used to extend
 89 the postharvest life of Brazilian mangoes, allowing later harvest and higher carbohydrate
 90 accumulation in the fruit. This will improve the eating quality and incentivate the consumption of
 91 Brazilian mango.

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CONCLUSION

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The increase in DM content had no effect on degree of liking in ‘Ataulfo’ mangoes, but increased the degree of liking in ‘Tommy Atkins’ mangoes from Mexico. An increase in DM content increased the degree of liking and the percentage of consumer acceptance for ‘Ataulfo’ and ‘Tommy Atkins’ mangoes from Brazil.

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Lower dry matter content of Brazilian mangoes is possibly the result of early harvest accomplished to extend the postharvest life required for shipping and commercialization. New technologies have to be used to extend the postharvest life of Brazilian mangoes, allowing later harvest and higher carbohydrate accumulation in the fruit. This will improve the eating quality and encourage the consumption of Brazilian mango.

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