Mango Dry Matter Measurement Protocol
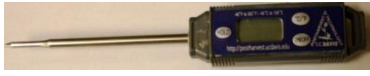
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Dry Matter (DM) content is considered an important criterion of mango fruit maturity and/or consumer quality. DM increases as fruit approaches maturity, and may vary with cultivars. Therefore, cultivar specific percentage dry matter needs to be determined to precisely estimate fruit maturity and potential consumer acceptability. This brochure provides methodology for determining dry matter content for which you will need the following materials:

#	Items	Picture	Model/comments
1	Food Dehydrator		Nesco/American Harvest Snackmaster® Encore Food Dehydrator Model FD-61 or similar http://www.nesco.com/products/Dehydrators/Dehydrators/
2	Electronic Top Loading Balance		Capacity of 200g Readability of 0.01g
3	Multi Slicer		Prepworks multi slicer or similar http://progressiveintl.com/products/multi-slicer
4	Six-inch Chef's Knife		Any brand, needs to be sharp
5	Cutting Board		Any brand, nonslip

6	Thermometer		0-110°C (32°F-230°F) Preferably non-glass
7	Weighing Paper		http://www.fishersci.com/categories 09-898-12A 3x3 inches
8	Notebook or Data sheet (Appendix-I)		

Before you start:

1. Be sure that the electronic balance is completely leveled and the dehydration process is done in a secure clean area.

2. Label the food dehydrator trays. Each tray can be labeled, from A (Top) to D (Bottom), and from 1-12 (clockwise) within the each tray (Fig. 1-left). Thus, four trays with 12 samples each can accommodate 48 possible samples respectively.

3. Set dehydrator at 130°F (54°C). Turn it on to warm up. Check the temperature a few times with a standard probe thermometer (Fig. 1-Right); adjust settings (if needed) to achieve the desired temperature.

Fig.1: Left: Labeled food dehydrator tray; Right: Checking temperature with a probe thermometer.

4. Make sure you choose the thin slicer blade for preparing mango slices. Often it is written on the side as shown in picture

Procedure

a. Select a representative sample of mango fruits (defect free) like the ones you intend to harvest, from different trees. Label fruit with proper ID (block, cultivar, harvest date, etc.) and record on your data sheet or note book.

b. Mango slices preparation (Fig. 2). For each fruit, record the sample ID (description) in column-1 on your data sheet (Appendix-I). Cut one slab parallel (Fig.2-1&2) to the seed and then cut the slab in half longitudinally (Fig.2-3). Turn the half cut slab such that the cut side is placed flat on the slicer with the stem end oriented towards the blade (Fig.2-4&5). Slice off (thin slice plate) a ~5mm thick slice (Fig.2-6).
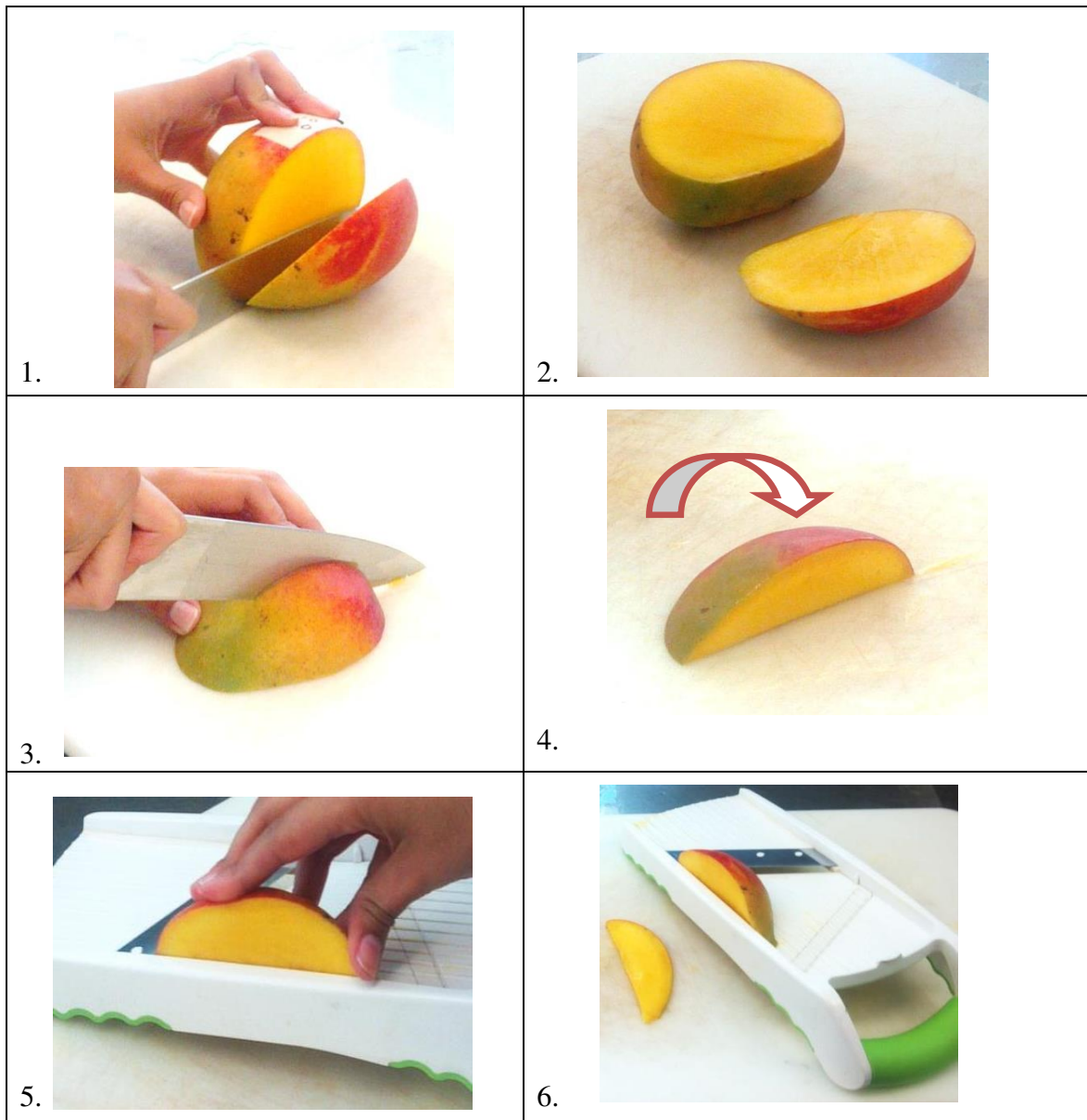

Fig. 2 Stepwise procedure showing preparation of mango slices.

c. Take a piece of weighing paper and write tray position on one corner, weight it, record its weight in column 5 (paper weight). Now gently place the fresh mango sample slice on the weighing paper and weigh them together (paper+ slice), initial weight in grams, to the nearest hundredths (two decimal places) and record it on the data sheet in column 6.

Now take a dehydrator tray, record it's ID in column 3. Place slices along with paper in the tray in their respective positions e.g. 7 and 8, as shown in picture.

Before starting to weigh a new slice, make sure that the electronic balance is at zero or tare it again prior to weighing the paper.

d. When all of the sample slices have been placed in the tray, place it in the dehydrator set at 130°F (54°C) cover and leave to dry for approximately 24 hours. Complete column 2 (date and time).

e. After 24 hours, weigh each slice along with paper as shown in picture, and record its weight (paper +slice) under "Dry Slice Weight-1" column 7. The samples should be measured one tray at a time keeping the others in the dehydrator to prevent the slices from reabsorbing moisture.

f. After weighing, place the slices back in the same positions in the dehydrator.

g. Run the dehydrator for another hour or two with the mango slices and then reweigh, record the weights under "Dry Slice Weight-2" in column 8. Compare the two Dry Slice Weight measurements (column 7 and 8). If the weight has not changed for each sample more than one hundredth of a gram (.01), the dehydration process has ended, and that weight (column 8) is taken as the final reading (final dry weight). Be sure that burning does not occur anytime during the dehydration process.

h. Calculate net fresh slice weight by subtracting the paper weight (column 5) from the initial slice weight (column 6) and record it in column 9.

i. Now calculate net final dry weight of slices by subtracting paper weight (column 5) from final dry weight (column 8) and record it in column 10.

g. Finally, calculate the Dry Matter as the ratio of the final Net Dry Slice Weight (column 10) to the Net Fresh Slice Weight (initial weight (column 9) and expressed as a percentage.

$$Dry\ Matter\ (\%) = \frac{Final\ Net\ Dry\ Slice\ Weight\ (g)}{Initial\ Net\ Fresh\ Slice\ Weight\ (g)} * 100\%$$

References

González-Moscoso, S. 2014. Proposing minimum quality indices and improving ripening protocol for imported mangos (*Mangifera indica* L.) to the United States for the improvement of consumer quality. Univ. of Calif., Davis. MS Thesis.

Makani, O. 2013. A mango quality survey and sensory evaluation of mango (*Mangifera indica* L.) cultivars. Univ. of Calif., Davis. MS Thesis.

Table-1: Proposed dry matter (DM) minimum quality index (MQI)

Cultivar	Country of Origin	Proposed MQI (%DM)
'Ataulfo'	Nayarit, Mexico	≤16.9
	Brazil	14.4
'Francis'	Haiti	≤16.7
'Haden'	Sinaloa, Mexico	12.3
'Kent'	Peru	12.0
	Sinaloa, Mexico	≤15.0
'Tommy Atkins'	Nayarit, Mexico	13.0
	Guatemala	13.0
	Ecuador	11.0

González-Moscoso (2014)

Appendix-I: Sample Data Sheet

(1) Sample ID	(2) Date & Time	(3) Tray ID	(4) Position in Tray	(5) Weighing paper weight (g)	(6) Fresh Slice Weight (Initial weight) with paper (g)	(7) Dry Slice Weight with paper-I (After 24 hr) (g)	(8) Dry Slice Weight with paper-II (Final weight) (g)	(9) Initial Net Fresh Slice weight (column 6-column 5) (g)	(10) Final Net Dry Slice weight (column 8-column 5) (g)	(11) Dry Matter (%) [column 10/ column 9]*100
			1							
			2							
			3							
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