

Hass Maturity Project

New Project: Year 1 of 1

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Benefit to the Industry

The market place for California ‘Hass’ avocado is changing as off-shore fruit imports are increasing in volume. As fruit from different places compete with California produced fruit, the consumer is likely to become more discerning about fruit quality. An important determining factor of ripe fruit quality is maturity. Immature avocado fruit are more prone to uneven ripening, shriveling and storage related physiological disorders and are often watery rather than creamy in texture. The current ‘Hass’ minimum maturity standard, is 20.8% dry matter. This project re-examines the relationship of fruit maturity (as measured by dry matter) and ripe fruit quality, in particular, fruit acceptability and may help the industry in re-examining its current maturity standards.

Objective

To determine the acceptance for ‘Hass’ avocados at a range of maturities as quantified by dry weight values.

Summary

The purpose of this project is to continue our studies comparing the relationship between dry weight, as a measurement of fruit maturity, and acceptability. This project is a follow-up to our project “Lamb Hass Maturity Project” and was requested by the Avocado Inspection Committee.

We identified 3 cooperators in Ventura County (Somis, Moorpark and Santa Paula/Fillmore) as a source of ‘Hass’ fruit. Commencing in November 2002 we sampled ‘Hass’ fruit at regular intervals (Table 1) for a total of 14 harvests. The fruit was taken to the UC Kearney Agricultural Center for evaluation. We used size 48 fruit and we discarded any fruit that were severely scarred or blemished. Thirty fruit per grower lot were sampled for dry matter content using equatorial cores. After sampling the fruit were treated with ethylene and allowed to ripen. Once ripe, fruit were presented to the UC-KAC volunteer sensory panel using the protocols we established in the Lamb Hass Maturity Project. The panel rated the fruit on a 1 to 9 Hedonic scale where 1 is equal to “Dislike extremely,” 5 is equal to “Neither like nor dislike” and 9 is equal to “Like extremely.” A second set of 15 fruit were kept as controls that were not cored but ripened using the same protocol as the cored fruit. This allowed us to monitor any impact of the coring treatment on fruit ripening which may not be desirable. We have completed the fruit harvests for this season and the results have been summarized and submitted for statistical analysis.

We used varying amounts of ethylene to trigger uniform ripening as noted in Table 1 for several reasons. First, since we were dealing with very immature fruit in November 2002, we were not completely sure how much ethylene was needed to trigger the ripening process; thus the varying time for the initial harvests. Secondly, at various dates we have also wanted to avoid fruit ripening on holidays or weekends since our panelists are not available on these times.

In general and in agreement with our results from the Lamb Hass Maturity Project, the cored fruit tended to lose slightly more weight during ripening and tend to ripen slightly faster than the control fruit (Tables 2 and 3). We feel confident based on these results, as well as the results of the ‘Lamb Hass Maturity Project’ that our methodology provides a reliable approach for determining the relationship between dry matter and sensory evaluation.

Due to the unpredictability of avocado ripening it was difficult to have a uniform number of fruit to use for sensory evaluation for each harvest. We were able to evaluate 27 to 55 fruit per harvest (Table 4) for a total of 621 fruit during the course of the study. The average dry weight and sensory score for each location and harvest date is presented in Table 4. This data shows size 48 fruit are not necessarily at 20.8% dry matter at the time of normal release of this size in December. In this study only 1 of the 3 sites (Fillmore/Santa Paula) had an average equal or exceeding the current minimum standard of 20.8% at the time of the release date for size 48 ‘Hass’ fruit (December 12). Additionally, the data presented here is “averages”. This means that for any given date, there will be fruit that are judged by the panel to be both higher and lower in eating quality. A more insightful way to examine the data, therefore, is to view the data set as a scatter plot and perform a multiple regression analysis to predict the point at which the fruit will be judged at a specific sensory score. Figure 1 illustrates our results (through the final harvest on July 14, 2003) for the relationship between dry matter content and hedonic rating graphed in this manner. Each point on the graph represents the average hedonic rating for an individual fruit. There are 621 data points (individual fruit) presented in Figure 1. Each fruit was evaluated by 4 to 8 panelists and the point on the graph represents the average of all panelists who evaluated the individual fruit. The preliminary trend line shows that as dry matter increases, so does the acceptability of the fruit. The percent dry matter for a score of 6 or “like slightly” is approximately 23%. Interesting, this is the approximate dry matter equivalent suggested by previous research examining the relationship between ‘Hass’ fruit maturity and acceptability. The results of this study (although at this point incomplete since data analysis is still underway) suggests that a formal re-evaluation of the minimum maturity index of 20.8% dry matter for California ‘Hass’ is warranted.

Figure 1. The relationship between harvest dry matter (%) and hedonic rating for 'Hass' avocado – Preliminary Results. Fruit were harvested from 3 groves in Ventura county, CA from November 2002 through July 2003. Dry matter determined within 24 hours of harvest, fruit ripened at 68°F then presented to panelists and rated. Fruit rated on a 1-9 hedonic scale where 1 = dislike extremely; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly and 9 = like extremely.

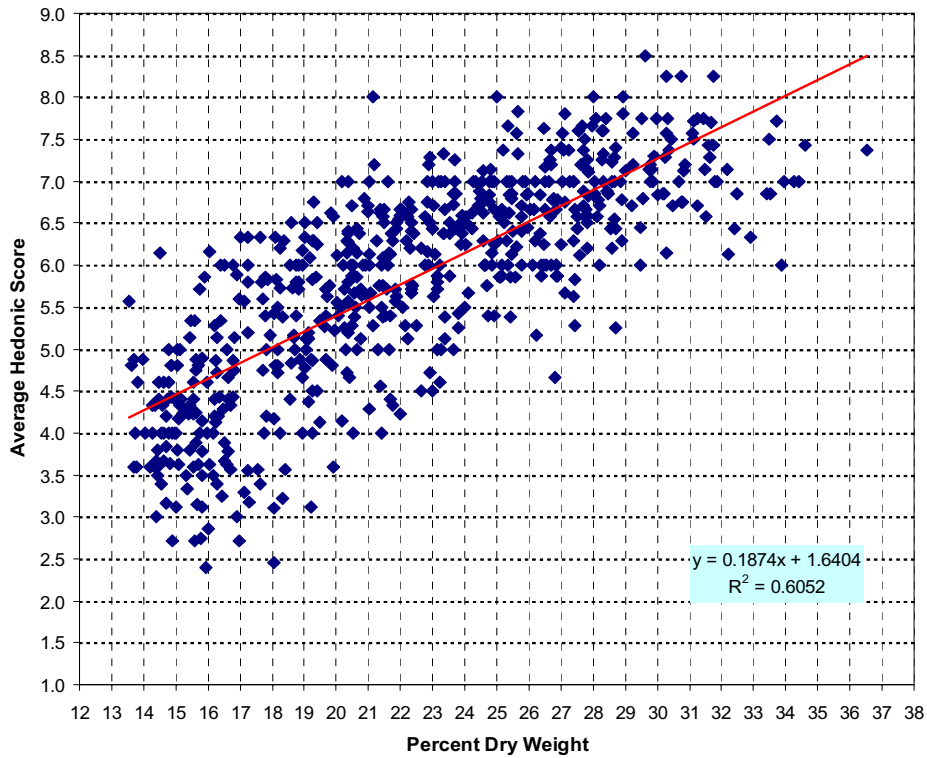


Table 1. Harvest dates for each location and hours of ethylene treatment at 68°F.

Harvest date	Ethylene treatment (hrs)
11-Nov-02	72
18-Nov-02	144
25-Nov-02	96
2-Dec-02	120
9-Dec-02	72
6-Jan-03	72
27-Jan-03	48
6-Mar-03	24
17-Mar-03	48
21-Apr-03	24
7-May-03	24
20-May-03	24
23-Jun-03	24
14-Jul-03	24

Table 2. Comparison by location between control and cored fruit for weight loss (%) during ripening.

Harvest Date	Location					
	Moorpark		Somis		Santa Paula	
	Control	<i>Cored</i>	Control	<i>Cored</i>	Control	<i>Cored</i>
11-Nov	7.20	9.40	9.10	9.50	8.20	8.60
18-Nov	5.10	6.00	5.90	6.40	5.30	4.20
25-Nov	5.20	4.00	4.40	5.30	3.70	5.60
2-Dec	5.20	5.30	4.10	4.00	4.70	5.40
9-Dec	5.00	5.40	4.20	4.80	-	5.60
6-Jan	6.00	5.50	4.60	4.50	4.50	6.60
27-Jan	4.20	5.90	4.80	4.50	5.50	4.90
6-Mar	6.10	7.00	6.40	6.70	6.20	6.50
17-Mar	5.30	4.90	4.30	4.40	4.60	5.60
21-Apr	6.11	5.45	5.90	4.98	5.45	4.96
7-May	5.52	5.49	3.10	4.51	5.17	5.24
20-May	4.71	3.71	2.83	2.95	3.07	2.40
23-Jun	3.28	4.08	2.63	3.85	2.53	3.12
14-Jul	2.78	3.19	2.50	2.86	2.30	2.87
Average	5.12	5.38	4.63	4.95	4.71	5.11

Table 3. Comparison by location between control and cored fruit for the average number of days to ripen to an average firmness ≤ 1.5 lbf.

Harvest Date	Location					
	Moorpark		Somis		Santa Paula	
	Control	Cored	Control	Cored	Control	Cored
11-Nov	12.70	14.70	10.40	14.50	14.80	10.40
18-Nov	6.60	6.70	6.20	7.00	6.90	6.10
25-Nov	6.20	7.10	6.10	6.00	6.20	5.80
2-Dec	7.00	6.90	6.40	7.00	7.00	6.50
9-Dec	7.10	7.80	6.70	6.60	6.40	6.80
6-Jan	8.10	7.30	8.10	7.10	6.60	8.20
27-Jan	9.40	7.70	7.80	10.00	9.80	8.40
6-Mar	16.10	14.00	14.20	11.90	13.30	13.70
17-Mar	9.20	8.60	10.20	7.70	7.60	10.40
21-Apr	14.05	11.20	14.50	8.77	12.05	9.43
7-May	12.90	12.00	7.00	6.40	11.05	9.70
20-May	8.80	7.77	5.25	5.27	5.80	6.03
23-Jun	8.40	8.70	5.75	6.00	5.95	6.60
14-Jul	7.35	6.63	6.00	5.97	5.85	6.03
Average	9.56	9.08	8.19	7.87	8.52	8.15

Table 4. The average dry weight, sensory score and number of ‘Hass’ fruit evaluated from November 2002 through July 2003. Size 48 fruit harvested from 3 locations in Ventura county, CA.

Harvest Date	Location								
	Moorpark			Somis			Santa Paula		
	% Dry Weight	Sensory Score	n	% Dry Weight	Sensory Score	n	% Dry Weight	Sensory Score	n
11-Nov	16.9	3.7	17	15.6	3.2	5	16.7	3.4	5
18-Nov	15.0	4.2	14	15.0	3.9	15	15.3	4.3	15
25-Nov	15.3	4.2	17	14.5	4.1	9	18.8	5.3	18
2-Dec	15.7	4.9	20	18.3	4.7	16	20.9	5.3	16
9-Dec	17.5	5.1	18	18.9	5.5	16	21.0	6.1	20
6-Jan	19.4	4.7	16	19.5	5.2	20	22.3	5.7	19
27-Jan	20.1	6.1	18	21.1	6.0	21	24.7	6.7	13
6-Mar	21.8	5.7	13	21.3	5.0	4	26.4	5.9	15
17-Mar	22.3	6.2	22	22.3	6.5	15	25.3	6.4	14
21-Apr	25.3	6.8	16	24.4	6.4	5	27.0	6.6	25
7-May	26.3	6.8	15	25.9	6.3	7	27.7	6.9	18
20-May	25.7	7.0	16	25.8	6.8	18	27.2	7.0	12
23-Jun	29.7	7.2	12	28.4	6.7	12	31.2	7.3	10
14-Jul	29.3	7.5	4	29.5	7.1	27	32.5	7.3	13