

RELATION OF MATURITY TO CERTAIN CHEMICAL AND PHYSICAL CHARACTERS IN FLORIDA AVOCADOS

Thurman T. Hatton, Jr., John Popenoe, Mortimer J. Soule, Jr.,¹ Paul L. Harding

U. S. Department of Agriculture, Agricultural Marketing Service,

Quality Maintenance and Improvement Section, Miami and Orlando, Florida

¹Associate Professor, Fruit Crops Department, University of Florida, Gainesville, Fla., formerly of this section.

The Florida avocado industry is interested in finding more accurate measures of avocado maturity. The objective of the present investigation was to obtain data on physical and chemical characters of Florida avocados which might indicate their maturity. Special consideration was given to the beginning picking dates and the minimum fruit weights specified in the Florida avocado marketing agreement. This work was a continuation of avocado maturity studies reported by Harding (4) and Soule and Harding (9).

MATERIALS AND METHODS

During the 1955-56 season, the following varieties were studied: Fuchs, Pollock, Simmonds, Petersen, Pinelli, Trapp, Waldin, Booth 8, Booth 7, Lula, Hickson, Monroe, Booth 1, and Taylor. Except for the fruit of the Taylor variety, which was obtained from Highlands County, all fruit came from Dade County.

Where possible the first fruit of each variety were picked 3 weeks in advance of the earliest picking date specified in the marketing agreement (2). Test fruit were obtained and analyzed weekly. Each weekly sample consisted of 60 fruit per variety, 30 of which weighed below the minimum set by the marketing agreement and 30 of which met or exceeded the minimum weight requirement. The sub-samples were equally divided, half being sent to Orlando and half being retained at Homestead. Fruit shipped to Orlando were allowed to soften in an 80°F. Storage chamber and tests were performed on soft fruit. The Homestead studies were conducted on hard fruit.

Tests for oil content of the fresh fruit were made by the standard California method (8) modified by Harkness (5). Tests for reducing sugars and phenolic compounds were made a few months later on portions of frozen samples of hard fruit which had been stored at -15° to -40° F. The method of determining phenolic compounds was that employed by Guadagni *et al.*, (3) and that for reducing sugars was one adopted by Sumner (11); both were colorimetric procedures.

In addition, the following tests and measurements were made on the fruit: weight, length, diameter, total soluble solids, firmness of flesh, days to soften at 80° F., loss in weight to ripening, amount of decay and flavor ratings. Flavor was rated by ten members of the Orlando staff on the basis of the characteristics described by Harding

(4). The 15 fruit from each group were blended for all chemical tests. Taste tests were made on the blend. No attempt was made to compare palatability ratings of different varieties.

RESULTS AND DISCUSSION

It was impossible to pick the first fruit of every variety 3 weeks in advance of the earliest picking date specified by the marketing agreement because fruit of some varieties large enough to make up the heavier of the two weight groups could not be found. For example, fruit of Fuchs and Trapp weighing 14 ounces, the minimum regulated weight for these varieties, could not be found in the Dade County area at the beginning picking date. At the beginning picking date it was difficult to find Waldin avocados that had reached the minimum specified weight. This difficulty was more prevalent with the summer or West Indian varieties than with the fall or winter ones.

Data for only the three most important commercial varieties, Lula, Booth 8 and Waldin, are presented in table 1. Results for these varieties were similar to those for other varieties. These data were taken before, on and after the beginning picking date in the regulations.

There was no change in the amount of total soluble solids in fruit picked before and after the picking date in the regulations. In some varieties, a statistical "t" test showed that fruit below the minimum weight had significantly less total soluble solids than those above the minimum weight. Although the Booth 8 variety had this significant difference in total soluble solids, no statistical correlation existed between taste and total soluble solids.

The percentage of phenolic compounds in the fruit also did not change consistently with the advance of the season. No statistical correlation existed between the percentage of phenolic compounds in the fruit and the flavor rating of the fruit.

No trend occurred in the percentage of reducing sugars with the advance of season for the approximately six weeks in which the fruit was sampled; however, Church and Chace (1), working with California avocados, and Stahl (10), working with Florida avocados, found that as the season advanced and the fruit became more mature, the percentage of total sugars decreased. No difference could be found in the percentage of reducing sugars in fruit below and above the minimum weight. There was no statistical correlation between the percentage of reducing sugars and the flavor rating of the fruit.

There were few changes in percentage of oil from week to week and no significant difference in the percentage of oil in fruit picked before the beginning picking date and those picked after the beginning picking date for the period in which this study was undertaken. However, it has long been known that as avocado fruit attain greater maturity they increase in percentage of oil (1, 10). Hatton *et al.*, (6) showed that selecting Florida avocados for a specific percentage of oil was not practical because of the wide variation in percentages of oil in individual fruit at any given time. In this study there was also no significant difference in the oil content of fruit below the minimum fruit weight and above it. The data indicate that there is no statistical correlation between the percentage of oil and flavor rating of Florida avocados during the first few weeks of the

harvest season. However, Hodgkin (7) found a direct relation between percentage of oil and flavor of California avocados.

Table 1.--Soluble solids, phenolic compounds, reducing sugars, oil and flavor of some Florida avocados^{1/} above and below the minimum weight^{2/} and before, on and after picking dates as specified in the regulations, 1955.

Variety and picking date	Total solids in fruit		Phenolic compounds in fruit		Reducing sugars in fruit		Oil in fruit		Flavor rating ^{3/} of fruit		
	Below minimum	Above minimum	Below minimum	Above minimum	Below minimum	Above minimum	Below minimum	Above minimum	Below minimum	Above minimum	
	%	%	%	%	%	%	%	%	%	%	
Waldin:											
Aug. 1 ^{4/}	9.3	9.4	4.7	4.5	3.5	3.3	4.9	5.3	65	73	
8	9.0	8.9	5.8	5.3	3.5	3.4	4.9	4.6	70	78	
15	9.2	9.2	5.7	5.8	3.7	3.7	3.3	3.6	75	85	
22	9.1	9.9	4.5	4.7	3.9	4.0	3.3	3.3	70	72	
29	9.7	9.7	5.7	4.5	4.2	3.3	4.2	4.2	78	85	
Sept. 6	9.7	9.8	4.5	4.5	3.3	3.8	3.9	3.9	81	86	
Booth 8:											
Aug. 29	8.3	8.3	8.5	7.7	3.2	3.4	4.2	4.2	60	68	
Sept. 6	8.0	8.4	5.0	4.5	2.7	1.5	5.4	5.4	71	78	
12	7.9	8.2	6.3	5.8	2.8	3.2	4.6	4.6	74	79	
19 ^{4/}	7.7	8.4	7.3	6.5	3.0	2.9	4.9	4.9	76	80	
26	8.2	8.4	8.7	8.7	2.8	2.9	4.7	5.3	75	76	
1/4 Oct. 3	8.1	8.6	8.5	7.0	2.8	3.1	5.2	5.2	78	77	
Lula:											
Sept. 26	9.5	9.9	6.3	6.5	4.1	4.4	4.3	5.3	76	74	
Oct. 3	9.7	9.9	7.7	7.0	4.1	4.4	5.7	6.9	73	75	
10	9.9	9.9	7.0	7.0	4.5	4.5	6.5	5.1	75	77	
17 ^{4/}	10.9	10.9	7.8	7.3	5.0	4.8	4.8	5.6	72	75	
24	9.9	10.2	7.0	7.0	4.8	4.5	5.1	6.0	76	76	
31	8.2	8.7	7.7	8.5	5.0	4.4	5.2	6.4	74	76	

^{1/} Flavor ratings were made on a blend of 15 soft avocados and other determinations on a blend of 15 hard ones.
^{2/} Values in the "below minimum" columns represent samples selected below the minimum fruit weight in the regulations; values in the "above minimum" columns represent samples selected above the minimum fruit weight in the regulations.

^{3/} Ratings below 70 indicate fruit that failed to pass the flavor test, 70-79 palatable fruit, and 80-100 excellent fruit.

^{4/} On or about the official beginning-picking date on the basis of the 1955-56 regulations. The special early weight and date for the Lula variety in the 1955-57 regulations were not used in this study.

Fruit above the minimum weight in the regulations had a higher flavor rating than those below it, but correlation of weight and flavor has already been shown by Soule and Harding (9).

In all of the tests described, there were no significant differences between soft and hard fruit. Other physical tests are not shown herein since they agree with previous findings (4, 5, 10).

With data accumulated to date, the present maturity regulations of beginning picking dates and minimum picking weights or diameters are the most satisfactory indices for Florida avocados.

SUMMARY

Samples of 14 varieties of avocados were selected below and above the minimum fruit weight and picking date on the basis of the 1955-56 Florida avocado maturity regulations. Analyses for oil content, reducing sugars, total soluble solids and phenolic compounds showed no appreciable changes for the period in which the samples were studied. The findings indicate that present maturity regulations are still the most satisfactory for Florida avocados.

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