Oil content of the commercial avocado varieties and the relationship with moisture and ripening pattern

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ABSTRACT

The relationship between moisture and oil content for different avocado varieties was determined as:

Fuerte:	% oil = 87.96 – 1.01% moisture
Hass:	% oil = 87.30 – 1.02% moisture
Pinkerton:	% oil = 82.70 – 0.94% moisture
Maluma:	% oil = 100.80 – 1.21% moisture
Carmen:	% oil = 66.00 – 0.77% moisture
Gem:	% oil = 86.09 – 0.96% moisture.

The regression for 'Carmen' is unexpected and need confirmation.
The ripening pattern for each of the varieties in relation with % oil is represented.

INTRODUCTION

Although moisture content as an indicator of avocado maturity is extensively used, it is not the most reliable criterion. The oil content of avocados is widely accepted as the most appropriate index for maturity (Hatton, Soule & Popenoe, 1957; Swarts, 1976; Gazit & Spodheim, 1969) without actual ripening of the fruit. The aims of the present study were:

1. Determine the relationship between oil, ripening pattern and moisture for the new avocado varieties where no such data exist.
2. Update the correlation data between oil and moisture for the established varieties.

The standard method to determine oil is by the Soxhlet extraction technique (Swarts, 1976; Holzapfel & Kuschke, 1971; Seung-Koo Leë, 1981; Horwitz, 1975) and is tedious and expensive. Cheaper alternatives exists, however each has its own disadvantages: The chemical (Halowax oil) is carcinogenic as used in the Halowax method (TOXNET, National Library of Medicine, 2001) while the rapid oil extraction method requires a very high capital outlay (Seung-Koo Leë, 1981) and is seldom used in reports where oil is measured.

MATERIALS AND METHODS

Avocado fruits were peeled and pip and seed coat removed. Using a potato peeler, the flesh was longitudinally sliced. A ca. 50 g sample of the slices was dried in an oven (100°C) equipped with a fan and the moisture content calculated from the mass between the initial and dried sample.

Oil content was determined by the Soxhlet method as described by Sweet (1955). Initially petroleum ether (B.P. 60°C) was used as solvent, after trials with hexane:butanol (10:1 ratio), the latter solvent system was employed.

The fresh fruit was stored at 25°C and days to ripen recorded between harvest and ready to eat date.

RESULTS

Comparison between petroleum ether and hexane/butanol

Hexane/butanol extracted 17.3% oil, significantly more (97% probability level) than ether (Table 1).

Prior to ether-hexane comparison, a minority of samples was extracted with ether. The oil content of these samples was increased with 17.3% to be re-

Table 1. t-Test: Paired two sample for means.

Parameter	Hexane	Ether
Mean oil content	13.88%	11.83%
Variance	14.02	10.99
Observations	7	7
Hypothesized mean difference	0	
df	6	
t Stat	2.43	
P(T<=t) one-tail	0.03	

lated with the hexane-butanol extracted samples.

Relationships between oil and moisture content and days to ripen

Data for the oil and moisture stretched over a wide range, from immature fruit to late season fruit (Table 2).

The range of maturity levels provided an opportunity to refine published data. For example, in the 1995 study in the Kiepersol/Hazyview area the oil content depending on the variety varied at onset of determination between 11 to 17% (Kruger *et al*., 1995; Kruger & Claassens, 1996).

The oil/moisture relationships of the present study are summarised in Table 3. In the new varieties, either the slope or intercept differ significantly from the established varieties, which warrant investigations in postharvest handling.

The intercepts for 'Fuerte' and 'Hass' do not differ signicantly from Swarts (1976) and Holzapfel (1977) figures.

Figure 1 provide a graphical representation of the relationship between oil and moisture content.

The correlation between oil and days to ripen is represented in Figures 2 to 4. In contrast with oil/moisture, the correlations for the new varieties were not significant on a 95% probability level. The graphs for these varieties should be interpreted with caution. Further investigation on the new varieties is required.

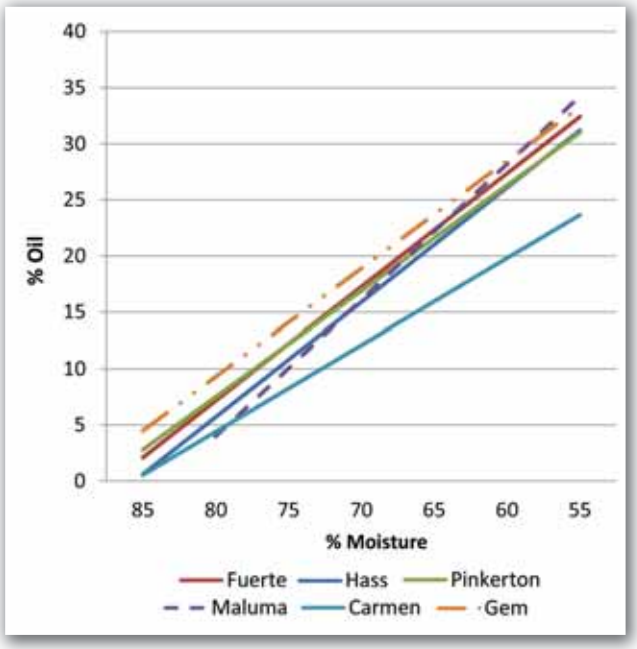

Figure 1. Oil content at different moisture contents.

Table 2. Minimum and maximum values of the recorded data.

Variety	% Moisture (maximum / minimum)	% Oil (minimum / maximum)
Fuerte	78.1/59.2	8.7/29.9
Pinkerton	79.5/70.1	7.9/17.5
Hass	85.7/63.3	0.6/24.1
Maluma	79.6/66.3	3.8/21.9
Carmen	84.0/72.9	2.2/12.5
Gem	72.5/61.8	15.6/27.9

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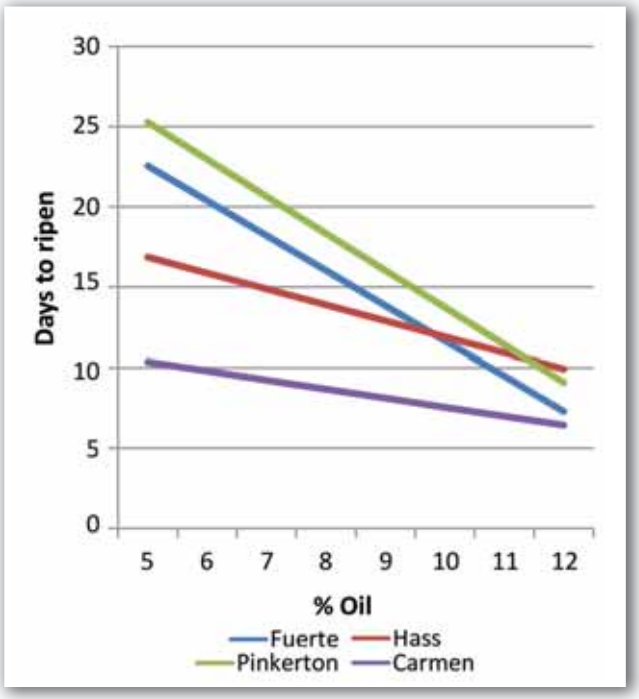

Figure 2. Relationship between % oil and days to ripen.

Table 3. The intercept and slope of the relationship between %Oil and %Moisture in the equation %Oil = Intercept + Slope x Moisture.

Variety	Intercept / SE	Slope / SE	n	F-value	Significance level (%)
Fuerte	87.96/8.25	-1.01/0.12	18	73.71	> 99
Pinkerton	82.70/9.22	-0.94/0.12	12	59.56	> 99
Hass	87.30/6.32	-1.02/0.09	53	139.50	> 99
Carmen	66.00/10.37	-0.77/0.12	18	33.82	> 99
Maluma	100.80/10.91	-1.21/0.15	25	54.85	> 99
Gem	86.09/14.59	-0.96/0.22	12	20.12	> 99

SE = Standard error, n = Number of observations.

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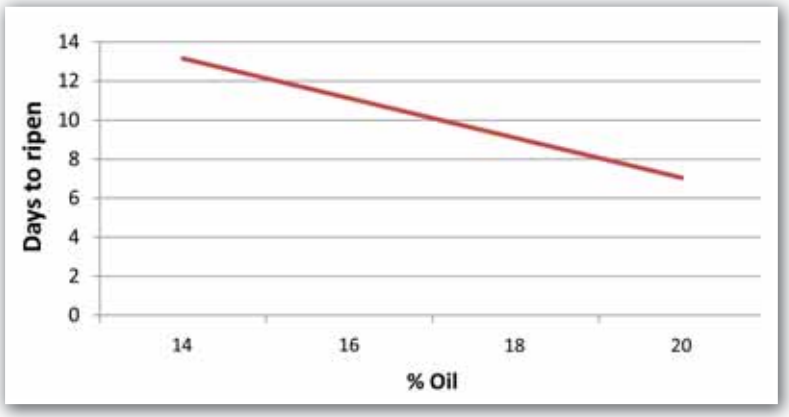

Figure 3. Relationship between % oil and days to ripen for 'Maluma'.

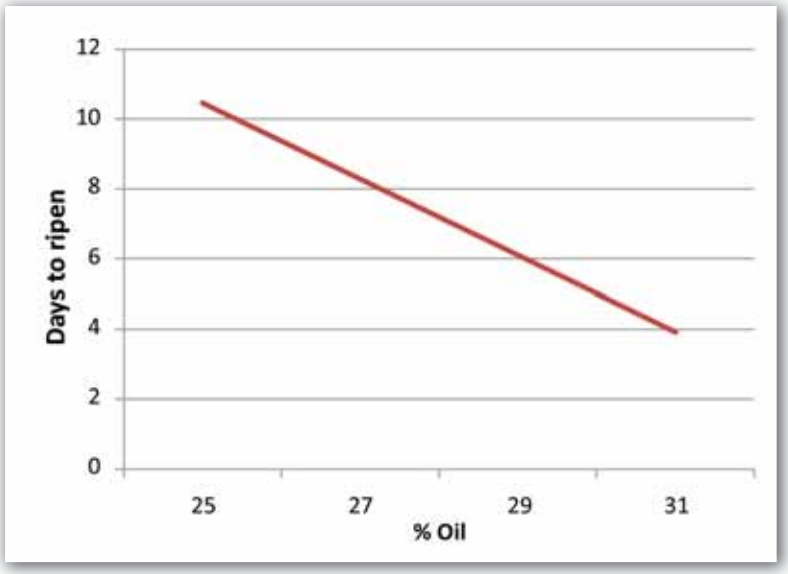

Figure 4. Relationship between % oil and days to ripen for 'Gem'.