

*Quality assessment of
avocados by means of
dry matter content*



Ministry of Agriculture and Rural Development
Plant Protection and Inspection Services (PPIS)

STATE OF ISRAEL

Presented by: Brett Hickson

June 2006

SLOVAK REPUBLIC, Mojmirovce (ITC)

- The degree of the ripeness of the avocado is determined by the dry matter content in the fruit.

- The development of the avocados should have reached a physiological stage which will ensure a continuation of the ripening process to completion.

- The dry matter content in the fruit will determine not only the harvesting date of the fruit but also ultimately the final eating quality of the fruit.



OECD quality brochure- avocados




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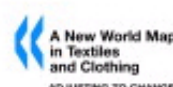
[OECD to join Arab states in launching "Good Governance for Development" programme](#)
02-Feb-2005
OECD Secretary General Donald J. Johnston and ministers and senior officials from OECD countries will join heads of government and ministers from Arab states at a conference in Jordan on 6-7 February 2005 for the launch of a major programme to promote good governance for development in the region.

[Economic Survey of Australia](#)
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**International Standardisation
of Fruit and Vegetables**

AVOCADOS

**Normalisation internationale
des fruits et légumes**

AVOCATS

**Normalización internacional
de frutas y hortalizas**

AGUACATES (PALTAS)

AGRICULTURE



OECD 



ANNEX

METHOD OF DETERMINATION OF THE DRY EXTRACT IN AVOCADO USING DESICCATION PROCESS IN A MICROWAVE OVEN

In order to determine the maturity index of Mexican and Guatemalan varieties of avocados and their hybrids, the oil or fat content appears to be the determining factor.

In California, the Hallowax method was developed and was applied for a certain number of years to determine the oil content.

The research conducted in California concluded that the total of the fat content and of the moisture, of the oil and water, is a constant for each variety so that to each minimum oil content required to obtain the appropriate organoleptic characteristics for consumption corresponds a maximum moisture content.

The moisture being the difference between 100 and the dry matter content and vice versa, it was thought preferable to set a minimum dry matter content for each variety, thus enabling to guarantee a post-harvest development of the avocado satisfactory for consumption.

Therefore the Hallowax method was replaced by the determination of the content of dry matter. In various producing and exporting countries of avocados the determination in a microwave oven is used, a method which has its merits due to its speed, simplicity, low cost, and repeatability.

1. Application

This method allows to determine the loss of mass during the process of desiccation of the avocado.

2. Materials and instruments

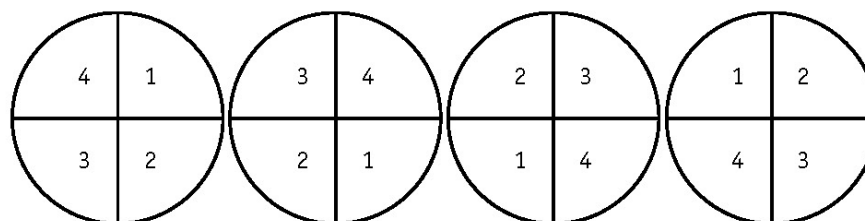
- 2.1. Analytical scale with gradation of 0.010 mg
- 2.2. Microwave oven, capable of reaching a power of 800 W
- 2.3. Glass slides 8 cm in diameter
- 2.4. Pocket knife or knife
- 2.5. Slicer

3. Procedure

Each time that samples are weighed, they must be controlled until the nearest centigram.

- 3.1. Weigh each glass slide and take note of the weight (P_0)
- 3.2. Cut the fruit longitudinally in two parts, eliminating the seed and the seminal tegument.
- 3.3. From one of the parts of the fruit, four 1.5 mm-thick slices must be cut with the help of the slicer.

- 3.4. Slices must be divided into four portions, cutting the diameters from largest to smallest. Then, deposit the four portions of the 4 slices without overlap, on four numbered glass-slides, according to the following schema of the slices divided in four and the number of the glass-slide where you are setting each quarter :



- 3.5. Weigh each glass-slide which contains the sample and record the weight (P_1).
- 3.6. Put the glass-slides into the microwave oven. It must be checked beforehand, for this thickness of the sample slice, that the desiccation is constant and that no brown coloration due to burning will appear. Establish a power of 800 W and after 4 minutes, weigh the sample directly, without allowing it to cool in the desiccator. Return the sample into the microwave for 1 minute and weigh it again. Repeat the process until the weight is constant or the difference of the mass between two consecutive weighings is not greater than 0.5 mg. The total time of desiccation ranges between 4 and 7 minutes. The final weight will be P_2 .
- 3.7. Calculate the dried extract as following :

$$\% \text{ Dried extract} = \frac{P_2 - P_0}{P_1 - P_0} \times 100$$

Advantages/Disadvantages



Microwave	Oven
•Quick (+-15 minutes)	•Slower process (4 hours)
•Non specific temperature (very high temp.)	•Specific temperature (105°C)
•Frequency varies between different microwaves	•Equal frequencies
•Cannot be calibrated	•Can be calibrated

Equipment needed to determine the dry matter content of the fruit (oven method):

- Oven with air flow of 105°C
- Scales accurate to 0.01g
- Vegetable peeler
- Petri dish
- Calculator
- Correlation tables



The Equation:

$$\frac{C-A}{B-A} \times 100 = \frac{\text{Dry flesh weight}}{\text{Fresh flesh weight}} \times 100 = \% \text{ dry matter}$$

A – weight of Petri dish

B - weight of the flesh (& Petri dish) prior to drying

C - weight of the matter (& Petri dish) after drying

Procedure:

Weigh the fruit; list the fruit weights in a table



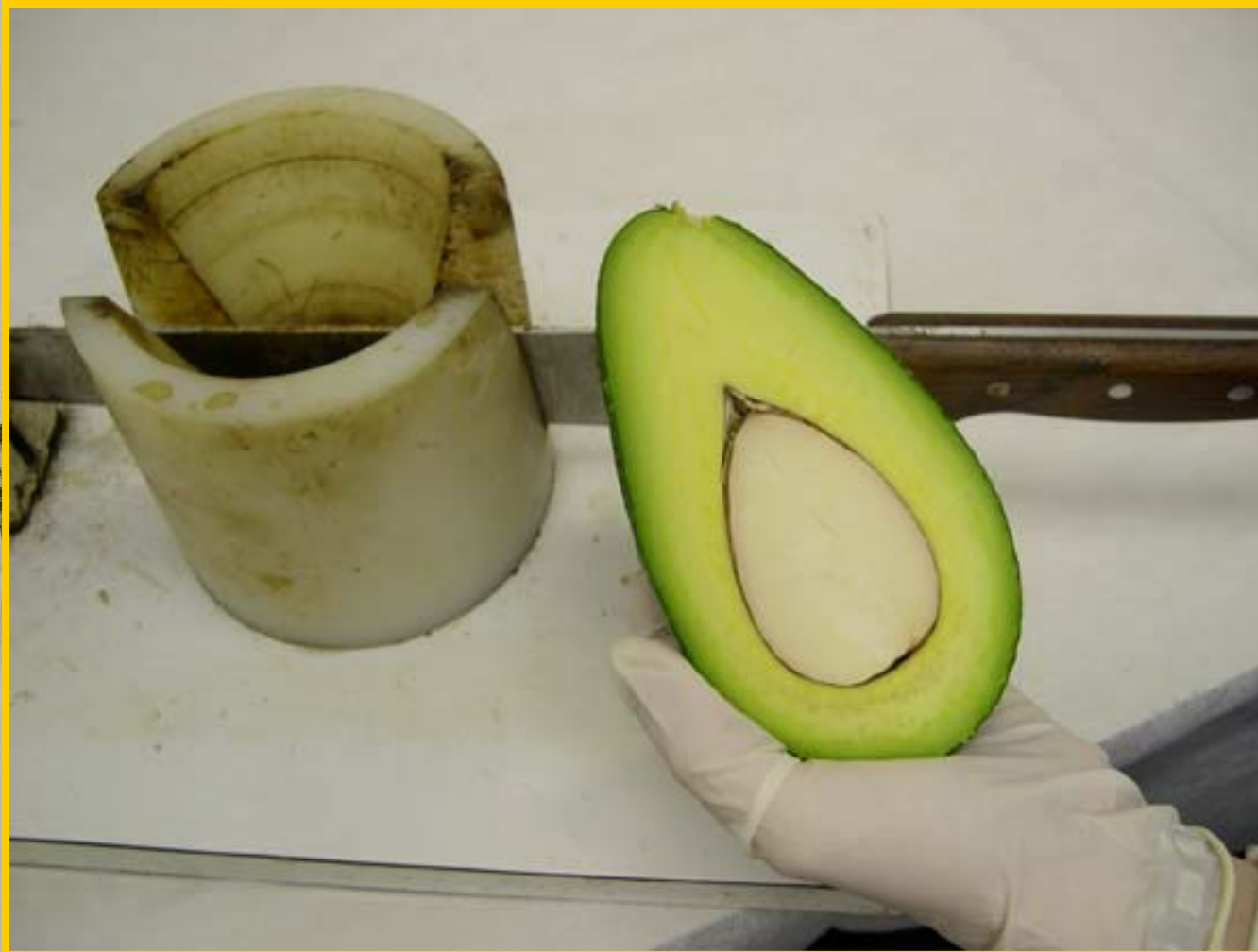
Procedure:

Weigh the Petri dish (“A”)

<p style="text-align: center;">A</p> <p style="text-align: center;">(weight of Petri dish)</p>	<p style="text-align: center;">B</p> <p style="text-align: center;">(weight of the flesh (& Petri dish) prior to drying)</p>	<p style="text-align: center;">C</p> <p style="text-align: center;">(weight of the matter (& Petri dish) after drying)</p>
<p style="font-size: 2em;">52.46</p>		



Cut the fruit longitudinally in two parts



Eliminate the stone and seminal tegument



Peel the fruit (remove the skin)



Remove thin slices of flesh from all around the cut.



Take a sample of 10 grams of flesh from each fruit using the peeler.



Place the slices in the Petri dish and cut the slices into smaller pieces



Weigh the avocado flesh with the Petri dish.

(Note this weight in the table “B”)

Weigh immediately in order to avoid loss of water.

A (weight of Petri dish)	B (weight of the flesh (& Petri dish) prior to drying)	C (weight of the matter (& Petri dish) after drying)
52.46	62.46	



The oven should be warmed to the required temperature (105°C) before placing the samples inside the oven



An accurate thermometer placed in a cup filled with oil can be placed inside the oven to achieve the most accurate temperature readings



Place the samples in the oven

Dry the samples in the oven for 4 hours at 105°C.



Oven is opened after 4 hours.



RE-Weigh the samples

Note the total weight of the dry sample + Petri dish.
(Note this weight in the table “C ”)

A (weight of Petri dish)	B (weight of the flesh (& Petri dish) prior to drying)	C (weight of the matter (& Petri dish) after drying)
52.46	62.46	54.95



The Equation:

C-A	x 100	=	Dry flesh weight	x 100	=	% dry matter
B-A			Fresh flesh weight			

54.95-52.46	x 100	=	2.49	x 100	=	24.9%
62.46-52.46			10			

A – weight of Petri dish

B - weight of the flesh (& Petri dish) prior to drying

C - weight of the matter (& Petri dish) after drying

Compare this percentage to the table

Correlation table



Variety	% Dry Material
Ettinger	20
Fuerte	20
Reed	20
Nable	19
Hass	21
Pinkerton	20

Avocado maturity in Israel is checked at different stages:

- 1. Before harvesting in the orchard**
- 2. Once the fruit arrive in the packinghouse**
- 3. After packaging at the sea port inspection station**



Avocado maturity in Israel is checked at different stages:



1. Before harvesting in the orchard:

- Sample 10 fruits randomly with a minimum fruit size of 265 grams.
- The fruits should be taken at 1.5 meters to 2 meters height, from all sides of the tree, at least 5 trees per plot.

Avocado maturity in Israel is checked at different stages:



2. Once the fruit arrive in the packinghouse:

- Sample 10 fruits randomly with a minimum fruit size of 265 grams.
- The fruit can be collected from the bins or the packing line.

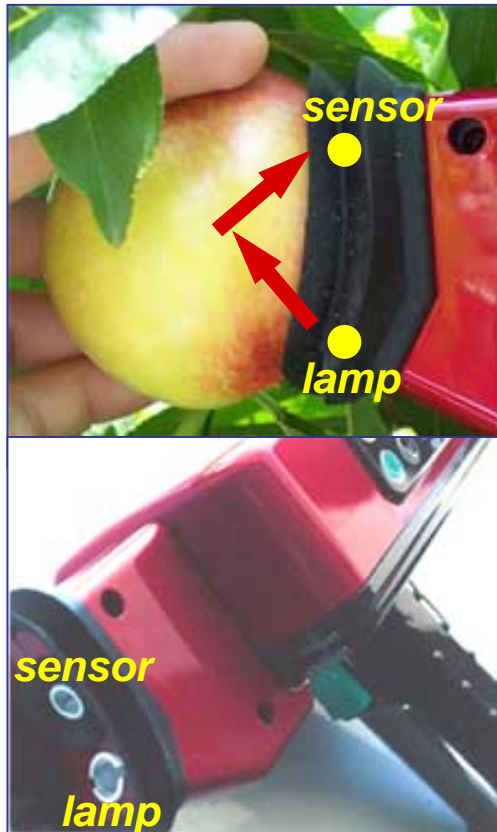
Avocado maturity in Israel is checked at different stages:

3. After packaging at the sea port inspection station:

- Consignment size might be 30 pallets/truck load.
- If pallets are all the same size code we will sample 10 fruit randomly for every 5 pallets (60 fruit/consignment)
- If consignment consists of more than 1 size code we will sample 10 fruit randomly from each size code.
- Frequency of sampling is high at the beginning of the season but is relaxed as season progresses.

Non Destructive Objective Tests for Internal Quality

Technical specifications:



brix, acidity, ripeness
internal breakdown (on testing)

analysis time : 1 second

the **NIR GUN** *system*



Applications:

✓ Of basic importance for determining the due time for harvesting

✓ Useful in the inspection during collection of fruit from the growers

✓ Useful in the inspection in the supermarket



Total Solutions for the Fresh Produce Business

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Registered trademarks

How it Works

The Sinclair IQ™ system measures the electrical response from a sensor mounted in Sinclair's patented below delivery system at four separate locations on the fruit. From these measures, the system predicts, for every fruit on the line, its elastic property, which reflects the ripeness level of that fruit.

Operation

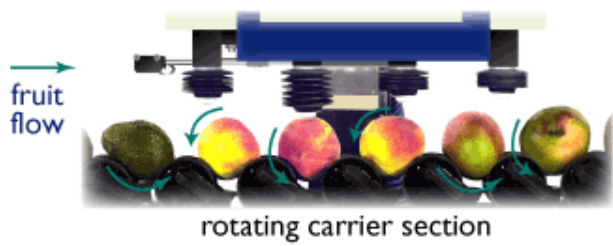
How it Works

Benefits

Technical Service

Video Clip

Data Capture



innovation • machines • service

Measures
electrical
response from
sensor which
predict the
fruit's elastic
property
↓
Ripeness
level



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Operation

- The Sinclair iQ™ firmness tester works on-line over a rotating carrier section. It measures every fruit at high speed - integrating with all major sizer models. The system is designed for fast installation and easy operation by existing packhouse staff.

- Operation
- How it Works
- Benefits
- Technical Service
- Video Clip
- Data Capture

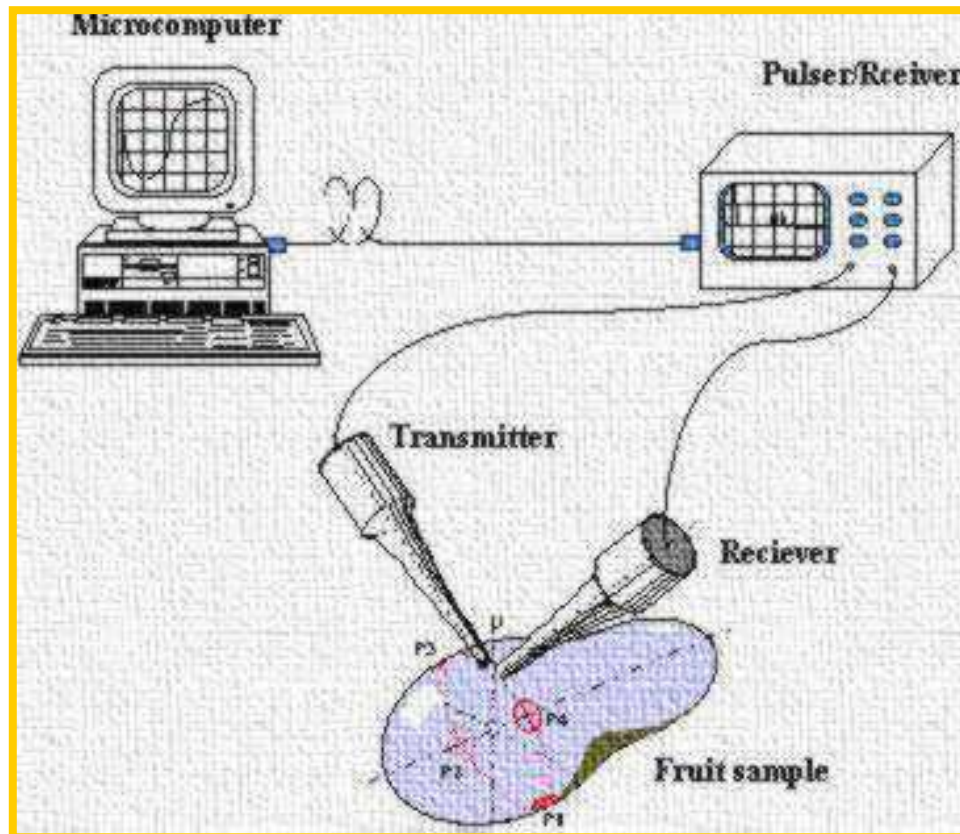


Mounts to most sizer models

innovation • machines • service

Ultrasonic devices:

- Show a lot of potential
- Still to be checked on a mass-production scale



Calibration Procedure for Avocado Maturity Laboratories:

1. Calibration will be carried out simultaneously with the laboratories of the Plant Protection and Inspection Services (PPIS).
2. Each laboratory will transfer an approval of oven and scale calibration – as required by the manufacturer.
3. Calibration tests will be carried out a week before expected harvesting date.

Calibration Procedure for Avocado Maturity Laboratories:

4. Sampling procedure:

- a. Harvesting will be done at noon a day before the testing will be carried out.
- b. 10 fruits (within two different size codes) are required for each test.
- c. Sampled fruit must be at least 220g.
- d. Fruit must be harvested at 1.5 meter to 2 meter height, from all sides of the tree, at least 5 trees per plot.

Calibration Procedure for Avocado Maturity Laboratories:



- e. The calibration form must include the following details:
 - Name of property
 - Name of plots
 - Sampling date
 - Samplers name
- f. Each fruit is numbered on both sides with the same serial number (from 1-10) with clear, non-removable marking.

Calibration Procedure for Avocado Maturity Laboratories:



- g. Fruit are weighed on the same day they were sampled and then cut and prepared for testing. Remove the stone and enclose every half fruit with plastic wrap.
- h. One set of half fruit is placed in the fridge of the packinghouse (4-5°C). The second set is placed in a cooler bag with ice and is transferred to PPIS.

Calibration Procedure for Avocado Maturity Laboratories:



- i. The following morning the tests at PPIS and packinghouse will be done simultaneously.

Important: The drying period in the oven will take 4 hours.

The weighing of the dry material will be done 5 minutes after being removed from the oven.

Calibration Procedure for Avocado Maturity Laboratories:



- j. After the results are obtained by the packinghouse, these results will be transferred to the laboratory at PPIS. The results will include the following details:
- Name of packing house
 - Serial number
 - Fruit weight (before cutting)
 - Dry matter results of each half fruit
- k. The results from the PPIS laboratory will be transferred to the packinghouse.

...THE END
Thanks for your patience