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DETERMINATION OF THE MINIMUM PERCENTAGE OF DRY MATTER TO AUTHORIZE THE HARVEST OF HASS AVOCADO PEARS FOR EXPORT

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At present, Chile has approximately 28,500 ha planted with Hass avocados. Historically, our country has exported between 70 and 75 % of the production obtained in this area.
The Avocado Committee has considered as a priority ensuring that the fruits to be harvested have dry matter content allowing them to get in good conditions to their final destination and to have an adequate period of commercialization. In this way, the Avocado Committee established five seasons ago a minimum level of 23 % dry matter to authorise the harvest of the fruit.
That is how every sector of orchards to be harvested must be sampled according to the protocol established for these purposes. During the last four seasons, the work of sampling and laboratory analysis has been subcontracted with Faculty of Agronomy of PUCV.
Through the actions mentioned above, the objective of sending completely reliable fruits to our destination markets has been achieved.

Key words: dry matter, maturity, sampling.

DETERMINACIÓN DEL PORCENTAJE MÍNIMO DE MATERIA SECA PARA AUTORIZAR LA COSECHA DE PALTAS CV. HASS PARA SER EXPORTADAS.

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Actualmente, Chile posee aproximadamente 28.500 hás. de paltas cv. Hass. De la producción conseguida en esta superficie, nuestro país ha exportado históricamente entre un 70 y 75%.
Ha sido labor prioritaria del Comité de Paltas Hass, velar porque la fruta a cosechar tenga un contenido tal de materia seca, que permita que ésta llegue en buenas condiciones a su destino final y pueda tener un período de comercialización adecuado. Es así como el Comité de Paltas fijó ya hace cinco temporadas un tenor mínimo de 23% de materia seca para autorizar la cosecha de la fruta.
Es así como cada sector de los huertos a cosechar deben ser muestreados de acuerdo al protocolo establecido para estos efectos. En las últimas cuatro temporadas la labor de muestreo y análisis de laboratorio ha sido subcontratado con la Facultad de Agronomía de la PUCV.
Con lo anterior se ha pretendido y conseguido enviar a nuestros mercados de destino una fruta cuya calidad sea plenamente confiable.

Palabras clave: materia seca, madurez, muestreo

INTRODUCTION

Avocado Industry in Chile, is one of the most developed fruit heading in the last decade. At the present time, the surface planted with cv. Hass avocados (*Persea Americana* Mill.) reaches 28.500 hectares, occupying the third place, after the table grapes (52.300 h.) and the apple trees (36.095 h.)[1], representing a growth of 83.4% in the last 10 years.
In Chile, planted surface with commercial plantations is located between the IV th and the VI th region, and the V th region represents 67% of this surface.

Nowadays, Chile is the second producer and exporter of cv. Hass avocados in the whole world.

Table 1. Hass Avocado Volumes exported to different markets (in tons.)

Season	USA	Europa	Others	Total
2004/2005	121.000	11.500	1.670	134.170
2005/2006	85.500	18.000	1.716	105.216
2006/2007	118.000	42.000	5.000	165.000

Table 2. Total Hass Avocado Volumes produced in Chile (in tons.)

Season	Internal Market	Exportation	Total
2004/2005	52.000	134.170	186.170
2005/2006	40.000	105.216	145.216
2006/2007	60.000	165.000	225.000

DRY MATTER SAMPLING PROGRAM

During the last five seasons, Hass Avocado Committee, as the promoter of production and exporting of high quality Hass Avocado, is carrying out the **Sampling Program for measuring of Dry Matter** and its objective is to guarantee that the harvested fruit ripen homogeneously and then allow an adequate commercialization inside the destination markets.
From the beginning, the mentioned program has been developed by the Agronomy Faculty of the PUCV, and by means of a team of professionals, the work of sampling in the land and subsequent laboratory analysis are done.

[1] ODEPA and CIREN (2005) and Chilean Hass Avocado Committee (2007)

Sampling Process

1.1. Plantation sampling

Sampling Process involves a sort of steps that will be described as follows and it begins when an Exporter, that is member of the Chilean Hass Avocado Committee, wants to harvest the fruit of a plantation for its exporting.

1st Sampling Request

The Exporter sends an e-mail to the post harvest laboratory, with the sampling request, specifying the name of the Producer, the area where the plantation is and the sections that will be sampled, with its surface itself.

2nd Sampling Program

According to the sampling requests, the laboratory decides and programs a calendar for them. In this calendar, it will be possible to describe the information of each sampling requested, the date of the sampling and the sampler selected in each case. Therefore, each day the samplers go to the ground with a representative of the exporter to take the required samples.

3rd Taking Samplings

When people arrive, the quarter or quarters are shown to the sampler.
This sample is referred to 10 fruits chosen at random, with a minimal weight of 180 grams each, mainly located on the southern side and inside the trees with a normal and high fruit charge that belong to a homogeneous block, and with no more than 10 hectares of surface. If the quarter has 14 hectares, 20 fruits will be taken (2 samplings), if it has 23 hectares, 30 fruits will be taken, and so on.

For taking samples, it's necessary to go through the block longitudinally.

When the sample is selected, this is put in a foliated paper envelope, which is sealed and put together with a file that allows the identification of the sample:

- ✓ Name of the Producer
- ✓ Name of the Plantation
- ✓ Name of the Exporter
- ✓ Name of the representative of the exporter
- ✓ Location of the Plantation
- ✓ Identification of the block
- ✓ Date
- ✓ Sampling time
- ✓ Name of the authorized sampler

When the day's journey is ending and before 12 hours, samples are given to the lab for its subsequent analysis.

4th Analysis

The analysis consists in determine the dry matter percentage of each fruit.

To specify the dry weight, each fruit must be weight; it's necessary to obtain a sample of this fruit itself, making a longitudinal section to it like a slice; then chopping it in little cubes and then it's carried out to the stove for a period of 24 hours with a temperature of 80 ° celsius (176 ° Fahrenheit). After that, the fruit is weighted and put in the oven again, but during 20 minutes. Afterwards, it's weighted again and if the weight is stable, the process is finished.

Therefore, if you have the initial weight data (wet) and the final weight (dry) , it's possible to obtain the percentage of dry matter,

$$Dry\ Matter\ \% = 1 - \left[\frac{\text{initial weight} - \text{final weight}}{\text{initial weight}}\right]$$

5th Results showing

Lab has a maximum period of time of 48 hours; since the moment the sample is obtained up to the results are given. These results are sent by E-mail to all the associated Exporters in a roll that shows all the data to identify the sample and the obtained dry matter percentages with its result.

The Chilean Hass Avocado Committee, has decided that to ACCEPT a sample, it must have a dry matter average[2] over 23 % and no facts bellow 21, 4 %. Any analysis that doesn't reach these requirements is REJECTED, and it must be re-sampled after a week if its average is less than 23 % but more than 19, 5 % or 15 days later if its average is less than 19, 5 %.

Finally, those sections and/or quarters where the analyses were approved are authorized from that very moment to begin the crop, not before that.

1.2. Packing sampling

The person in charge of sampling (sampler) goes to the different packing where fruit that is coming from quarters of plantation previously released, is going to be processed. These visits are unexpected and its frequency is related to the volumes to be processed in the different packing.

It's necessary to check 10% of each quarter that is available in the place, taking at random, 4 fruits, as well as in the process line as in the different quarters of bins.

[2] From ten measurements that are done, the highest and the lowest values are taken away.

Each sample is left in an envelope which involves the following roll:

- ✓ Name of the Producer
- ✓ Name of the Planting
- ✓ Name of the Exporter
- ✓ Name of the Packing
- ✓ Name of the Packing chief
- ✓ Location of the packing
- ✓ Quarter or block identification
- ✓ Size of the Plot (bins number)
- ✓ Date
- ✓ Sampling time
- ✓ Name of the authorized sampler.

The sampler also makes a weighing control and that's way he weighs the packages that are being used, first, and also the trays, if these are being used; so that he weighs then, already packed boxes from different kind of packing (11.2 kgs. net weight to USA and 4 kg. net weights to Europe).

RESULTS

1. Samples volume at national level

It has been checked approximately, 196.647 avocados up to now, since the 2003/2004 season, when the sampling program began for dry matter measuring.
It is possible to show a season detail in the following table:

Number of avocados	Plantation	Packing	Total
Season 2003/04	33.975	8.344	42.319
Season 2004/05	38.033	9.506	47.528
Season 2005/06	45.090	12.596	57.686
Season 2006/07	37.510	11.604	49.114
Total	154.597	42.050	196.647

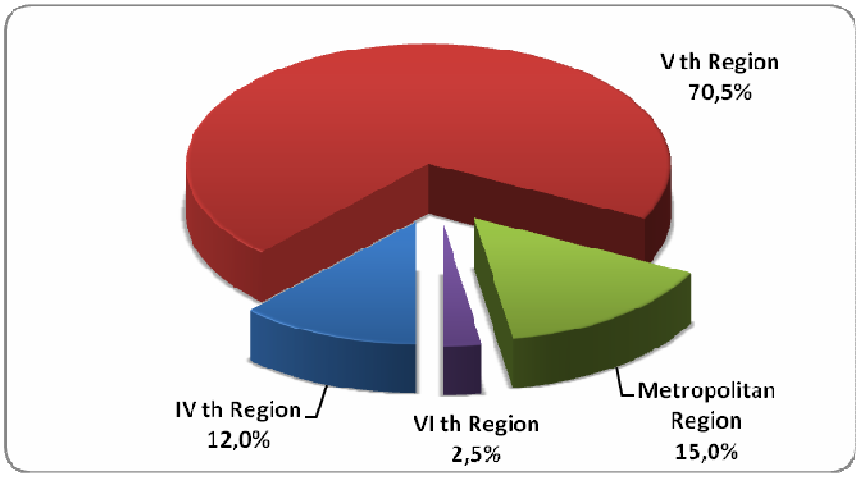
2. Geographical distribution of the samples

The number of samples that are taken in each season is directly related to the distribution of the avocado tree in the national territory. Therefore, four zones were defined for the Sample Program of dry matter:

a) IV Region
b) V Region (coast and Mountain Range)
c) Metropolitan Region
d) VI region

The following sample distribution was observed during the 2005/2006 and 2006/2007 seasons:

Graphic 1. Distribution of the average volume of a sort of taken samples during the seasons 2005/2006 and 2006/2007

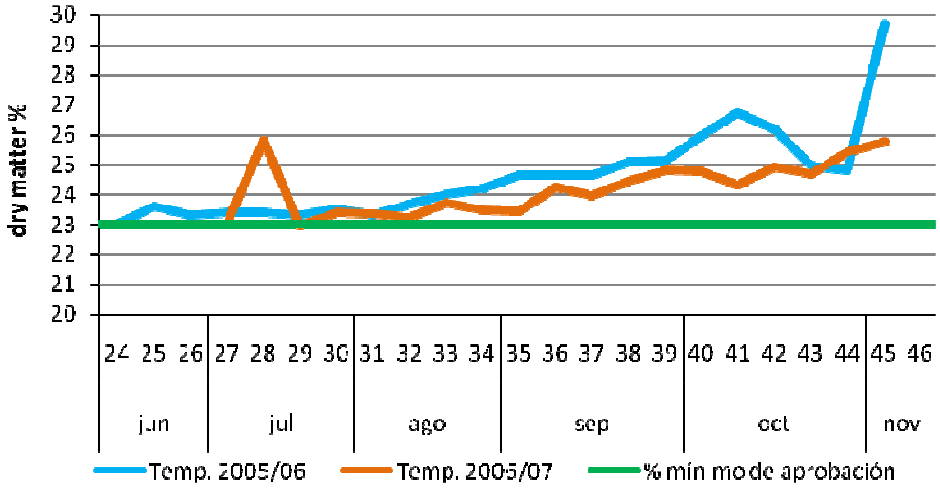


This distribution has been kept on between both seasons. The V Region is still the most important area, contributing with about 70 % of the samplings taken each year.

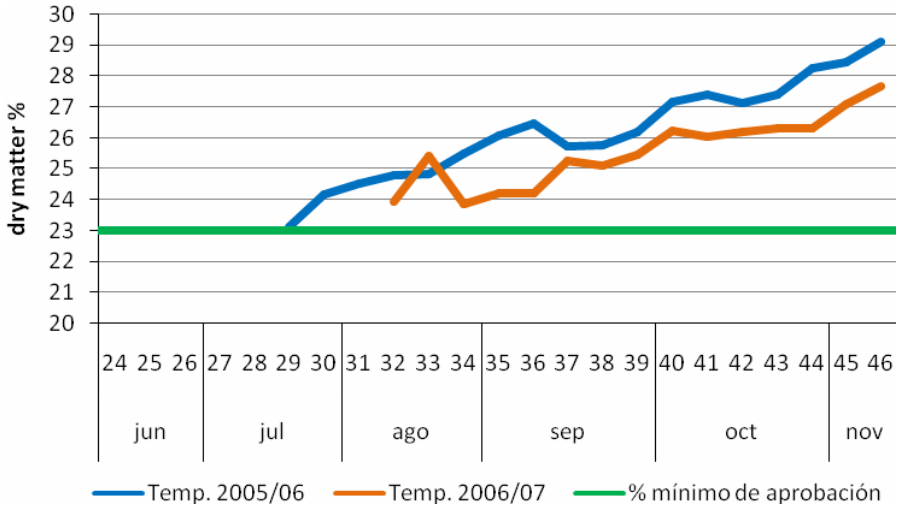
3. Evolution of the average percentage of dry matter.

Next, it's possible to appreciate the evolution of the average percentage of dry matter, measured as well in plantations as in packing, for the seasons 2005/2006 and 2006/2007

Graphic 2. Evolution of the average percentages of dry matter measured in plantation during the seasons 2005/2006 and 2006/2007.



Graphic 3. Evolution of the average percentages of dry matter measured in packing during the seasons 2005/2006 and 2006/2007.

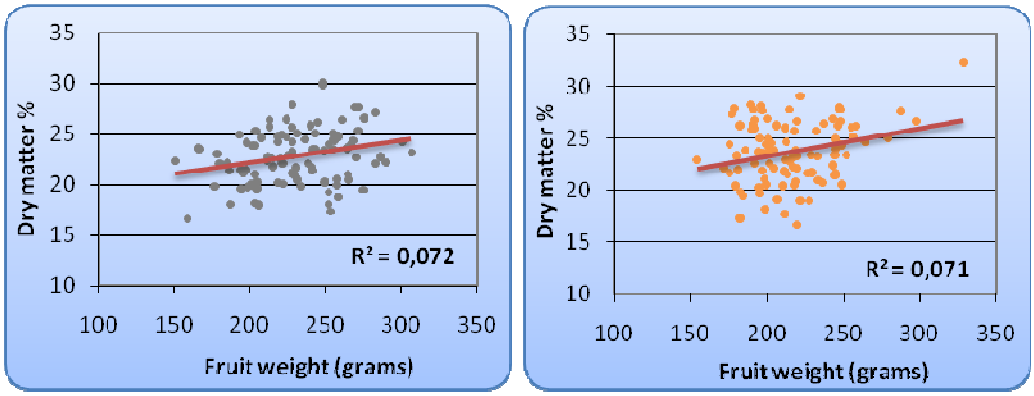


The analysis of the former graphics allows us to conclude that in both seasons, 2005/2006 and 2006/2007, the average values of dry matter obtained, always succeeded the minimum percentage that is required so that fruit be accepted (23 %).

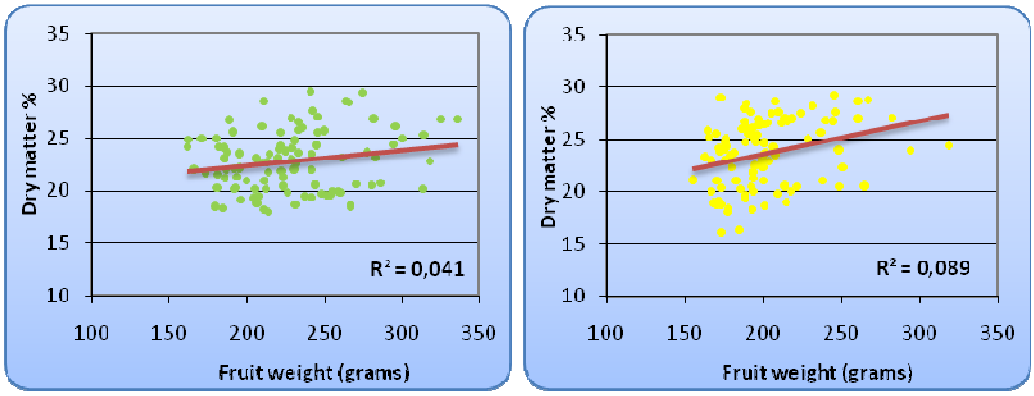
4. Relationship between size and dry matter

If we compare the resulting from the measuring of dry matter for fruits of different size in different plantations, in different regions, we can realize that there is no direct relation between size and dry matter percentage measured for the same moment.

Graphic 4. Relation between fruit size and content of dry matter in a plantation of the IV (left) and the V (right) region of Chile, season 2006/2007.



Graphic 5. Relation between fruit size and dry matter content in a plantation of the Metropolitan Region (left) and the VI region (right) of Chile , season 2006/2007.



The dry matter values measured; don't allow asserting that there is a direct relationship between size and dry matter, such as everybody think. That is way a small fruit does not have less dry matter than a bigger one, necessarily. These results agree with those obtained by Jaque (2006), Muñoz (2004), Pak (2001), Saavedra (1995) and Coggins (1984).

5. Zoning of the maturity

The analysis of an important number of data, allows us to state that there is no direct relationship among the production zone and the fruit maturity. Therefore, we can conclude that in Chile, the maturity of the avocado cv. Hass doesn't produce itself from north to south, necessarily.
This way, we can find fruits that were harvested en the VI region and they reach the minimal maturity required before other fruits that were harvested in the V region; and also others that were reaped en the V region that do mature before others that were reaped in the IV region.
The observations made during the last three seasons, allow us to conclude that the fruit maturity is rather related to the altitude where the plantations are than the geographical location of each other (north/south).

FINAL COMMENTS

The maturity control system established by the Chilean Hass Avocado Committee five seasons ago, has allowed that the fruit appointed to the different markets, be well recognized as a **"secure fruit"** by the receivers today, since during their marketing period, fruits will reach an homogeneous maturity, so it is easier and safer to sell themselves. This advantage is transferred to the final consumer because he will be able to count on a 100% profitable product.

On the other side, the producers have realized the importance of doing it, because it allows to them a safer sale since they are sending a more homogeneous product with a higher quality.

Nowadays, Chilean Hass Avocado Committee represents more than 80% of the total exportable volume of cv. Hass Avocado and the introduction of this already described method, allowed the use of a member sticker that has been used during the last two seasons in every box that has been sent to destiny markets. Then, there is a clear difference between this fruit and the ones without this control. The previous thing is fully recognized by the traders of the different markets where our avocado arrives.

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