

## REPORT METALOSATE AVOCADO

### EVALUATION OF APPLICATION OF METALOSATES IN QUALITY AND CONDITION OF AVOCADO HASS



## 1. OBJECTIVES

- Evaluate the effect of a program of foliar applications of Metalosates in avocado Hass, after cold storage.
- Evaluate the effect of Metalosate in concentration of Bound Calcium, Magnesium and Boron in the fruit during development and harvest.
- Evaluate the effect of Metalosates on the level of Nutrients in the leaf.
- Evaluate the effect of Metalosate sprays in the fruit set.

## 2. METHODOLOGY

### 2.1. Features of the site experimental

The study carried out on avocado Hass plantation of 16 years renewed ago three seasons, currently in full production, set in the local of Santo Domingo, from to the Enterprise agricultural the Lilenes S.A. The study performed between October 2014 and January 2015 (Photo 1).

The orchard planted in ridges of 1.2 m of high by 1.5 m of width and presents free texture surface (0 - 50 cm). From 50 cm if you have a clay texture. It should be that ridge constructed considering the presence of a siliceous hardpan at 60 cm. of depth in the floor original.

The water of irrigation comes of the River Maipo, high via pump and applied to the ridges via micro sprinklers.

The quality chemical of the water is presents in the box 1.

**Picture 1. Quality chemical of the water of irrigation**

Parameter	Unit	Value
pH		7.1
Cond. Electric	dS/m	1.61
Nitrates	meq/l	28
Chloride	mg/l	8.3
Boron	mg/l	0.7
sodium	meq/l	3.2
calcium	meq/l	8.1
magnesium	meq/l	1.8
R.A.S.		1.37

Of agreement to these results, the water classified as moderately saline, be the level of chlorides high for avocado. The danger of sodium (RAS) is low. The level of Boron, suitable.

In how to the floor of the Ridge, be they collected samples composite of floor to three depth: 0-20, 20-40 and 40-60 cm. the results of the analysis of detailed on the box 2.

**Picture 2. Features of fertility chemical of the floor.**

Parameter	Unit	Prof. 0-20 cm	Prof. 20-40 cm	Prof. 40-60 cm
pH	Rel. 1: 2.5	7.9	7.5	7.2
C.Electrica	(extract) dS/m	1.4	1.7	1.7
N disp.	ppm	23	16	---
P disp.	ppm	42	31	-0.2
K int.	meq/100	0.21	0.23	9
Ca int.	g	8.2	9.8	9.6
Na int	meq/100	4.4	4.9	5.0
Mg int	g	2.3	2.8	3.0
Chlorides	meq/100	5.4	6.9	6.6
Boron	g	2.1	2.4	-2.
RAS	meq/100	1.9	2.0	0
	g meq/l			
	ppm			

The floor presents pH right, but conductivity something high for avocado in the underground, according to Mass and Hoffmam affect the performance potential on 10%. The N is low, the P is high and the K suitable to low. The Boron is to level high and concentrated in the subsoil. The calcium is also, product of the large contribution of the water of irrigation; the Magnesium is suitable. The level of chlorides is high for avocados, concentrated on the subsoil. The fact of that the conductivity electric and the chloride be

increase on the basement indicates bad practice irrigation. The sodium is in a level suitable.

## **2.2. Treatment and design experimental**

The test it was in the comparison of a program Metalosate that considered:

- 4 lt/ha of Metalosate Calcium
- 2 lt/ha of Metalosate Magnesium and
- 1 lt/ha of Metalosate Boron

The surface treated was to 0.55 ha, by which in every chance of applied: 2.22 lt/ha of Metalosate-Ca, 1.11 lt/ha of Metalosate-Mg and 0.55 lt/ha of Metalosate-B.

The applications was made mixing on the pond of the nebulizer the three products every time on the following dates and stages phenological:

- 21 November 2013: heart flower
- 6 December 2013: 20% bunches
- 26 December 2013: 60 - 80% bunches
- 09 January 2014: 100% bunches

The control had only water.

The treatment (control and Metalosate) was applied to three row complete of 60 trees every one. The area cover by the application of Metalosates was 5554 m<sup>2</sup> ((0.55 ha), the which meant apply 2.2 l of Metalosate of Calcium, 1.11 l of Metalosate Magnesium and 0.55 l of Metalosate of Boron to the sector test in each opportunity. The product be was dissolved, waving, in a volume of 1000 l of the nebulizer. The nozzles were regulated for uniformity of the application (photo 2). Of this way the row to assess (central) is well cover for both side by the application of round trip.

The row adjacent (photos 3 and 4). For avoid any possible derived of products, the treatment control was separate by 4 rows. To the long of the row and about every 8 to 10 trees be established five plots experimental composite of 5 trees every one. These plots (5) in every case were considered recurrences.

The sampling leaf and fruit pre harvest and to the harvest is made in base to these trees.

### **2.3. Evaluations**

(a) Tracking of the gauge and weight cool and dry of the fruit.

East tracking is conducted in base to sampling of like fruit trees no marked, with the end of know the evolution of the growth average of the fruit in terms of size, weight and matter dry up harvest.

b) Tracking of the curdles.

For assess the set end, is marked three twigs by tree (total 15 twigs/treatment) in the positions North, South and East. Then be had in each as the number initial of fruit to the state of "curdles initial". In said state the fruit had a size average of head of match (photo 5). After of finished the second fall of fruit that happened the months of March and April (Photo 6), told the fruit finally solidified, that is to the number end of fruit to harvesting (photo 7).

(c) Sampling of fruit in development pre harvest.

In the following dates be found the gauge and weight dry of fruit similar in size:

9 of January, 6 of March, 28 of April and 21 August of the 2014.

In an aliquot of these samples, be determined: matter dry concentration Ca, Mg and B, separating the total, soluble and linked.

In way extra to the proposal be made an analysis additional the 21 of March of the 2014.

(d) Sampling of fruit to vintage and analysis chemical

With date, 3 of December 2014 and a time achieved the stuff dry for harvesting made the vintage of the test. This be led to out by staff of the company (Photo 8), following the guidelines of the harvest that the bottom (basically large gauges) to which the pedicel is cut (Photo 9).

Is they collected 30 fruit/plot, allocated 10 to assessment of quality to the harvest, whereas weight and gauge (photo 10) and analysis chemical. Twenty fruit they were to assessment condition post cold Chambers ad hoc. (Photos 11 and 12). The assessment of post vintage were made then of the out of cold in every fruit of each tray of 10 fruit (photos 13 and 14). For the evaluation, the fruit were removed of the cold and analyzed in two periods, one to the 32

days of stocking in camera of cold (10 fruit) and a second (10 fruit) to the 53 days of stocking in cold Chamber. In both cases, after of the period of cold, the fruit be held in condition "counter" or "shelf life", to 20 °C by a period variable of time, to the fruit acquired the color black (photo 15 a and 15 b).

e) Sampling and analysis leaf

With date 9 of January, 6 of March and 28 of April, made sampling leaf whereas leaves adult of the outbreak spring without fruit and without growth of summer.

f) Assessment post-harvest

The assessment condition post stocking in cold (5 ° C) is carried out then of out the fruit of the camera and expose it to the status shelf life (20 ° C). For the first period is (32 days in camera of cold), the fruit is evaluated after of 3 to 8 days in the status shelf life, to measurement that the fruit was taking color. For the second period of guard (53 days in cold camera), the fruit is evaluated within of 2 to 4 days in the condition shelf life.

The assessment considered:

- (a) Firmness by pressing in the faces opposite of each one of the 10 fruit of every replay (photos 16 and 17).
- (b) Browning of do vascular in base to scale hedonic of 1 to 5, in use in laboratory Post harvest of INIA (photo 18)).
- (c) Browning of pulp in base to scale hedonic of 1 to 5 in use of the laboratory Post vintage of INIA (Photo 18).
- (d) Leaf sampling  
Made in base to leaf of 7 months of the cycle of spring, without fruit and without growth of summer. In each replay be they collected 50 leaves, for analysis chemical from: N, P, K Ca, Mg, Mn, Zn, Cu and B.

### 3. RESULTS OBTAINED

#### 3.1. COMPOSITION OF Ca, Mg AND B IN FRUITS IN DEVELOPMENT.

Results they say relationship with the analyzed fruits in the following dates:  
9 January 2014 (4 repeats), 6 of March 2014 (5 reps), 28 of April 2014 (5 reps) and  
a sampling additional not referred to in the proposal, the day 21 of August 2014.

An overview of the results obtained for fruit in development, in how to the level of  
calcium be presents on the box 3a. The detail by Repeat is in the annex 1a to 1 c.

**Picture 3a. Effect of the program Metalosates in level of Calcium total soluble and linked  
in fruit Hass in development (data in mg / 100 g of weight cool)**

Date	Treatment	CA <sub>t</sub>	CA <sub>s</sub>	CA <sub>l</sub>	Caliber (mm)
09/01/14	E	54.1	5.1	48.9	12
	T	51.0	5.0	46,0	13
	Value t Ca	4,010	0,980	3,965	0.001
	value tab. Significance	2,447 <b>S.1%</b>	2,447 N.S.	2.44 <b>S.1%</b>	2,447 N.S.
06/03/14	E	22.9	5.1	17.9	42
	T	22.4	4.9	17.4	41
	Value t Ca	0,0557	0,218	0,508	0.653
	value tab. Significance	2,306 N.S.	2,306 N.S.	2,306 N.S.	2,306 N.S.
28/04/14	E	22.6	4.0	18.6	54
	T	19.4	4.2	15.2	56
	Value t Ca	2,855	0.356	3,388	1,363
	value tab. Significance	2,306 <b>S.5%</b>	2,306 N.S.	2,306 <b>S.1%</b>	2,306 N.S.
21/08/14	E	19.5	2.8	16.6	64
	T	17.9	3.0	14.9	63
	Value t Ca	0.942	0.250	2,820	0,270
	value tab. Significance	2,776 N.S.	2,776 N.S.	2,776 <b>S.5%</b>	2,776 N.S.

Note: E = essay T = witness. CA<sub>t</sub> = Calcium total; CA<sub>s</sub> = Calcium soluble; CA<sub>l</sub> = Calcium linked

In general be notes effect positive of the treatment Metalosates on the rise of the Ca total (2 of 4 dates) ), and in special of calcium linked in 3 of 4 dates, the which indicates that the treatment has affected positive the concentration of calcium on the fruit in development. The effect is more consistent to the compare the calcium linked . In the box 3b be presents the situation of the Mg.

**Picture 3b. Effect of the program Metalosates in level of Mg total, soluble and linked in fruit Hass in development (data in mg / 100 g of weight cool)**

Date	Treatment	Mg <sub>t</sub>	Mg <sub>s</sub>	Mg <sub>l</sub>
09/01/14	E	22.2		
	T	22.9		
	Value t Ca	0,705		
	value tab. Significance	2,447 N.S.		
06/03/14	E	16.3	8.3	8.0
	T	16.5	9.5	7.0
	Value t Ca	0,319	1,938	2,651
	value tab. Significance	2,306 N.S.	2,306 N.S.	2,306 <b>S.5%</b>
28/04/14	E	17.4	4.0	13.4
	T	17.2	4.4	12.8
	Value t Ca	0,598	0,755	1,625
	value tab. Significance	2,306 N.S.	2,306 N.S.	2,306 N.S.
21/08/14	E	20.6	5.7	15.4
	T	20.3	3.9	16.0
	Value t Ca	0,352	2,710	1,690
	value tab. Significance	2,776 N.S.	2,776 N.S.	2,776 N.S.

Note: E = essay T = witness. Mg<sub>t</sub> = Magnesium total; Mg<sub>s</sub> = Magnesium soluble;  
Mg<sub>l</sub> = Magnesium linked

Not are you look higher differences in how to levels of Magnesium, except Magnesium linked , the which is more when the fruit reach the 4 cm of diameter (06/03/14), but that be diluted later.

In picture 3 c be presents the summary for the case of the boron.



**Picture 3 c. Effect of the program Metalosates in level of Boron total soluble and linked in fruit Hass at development (data in mg / 100g of weight cool)**

Date	Treatment	B <sub>t</sub>	B <sub>s</sub>	B <sub>l</sub>
09/01/14	E	1.72	-	-
	T	1.75	-	-
	Value t Ca	0,590	-	-
	value tab.	2,447	-	-
	Significance	N.S.	-	-
06/03/14	E	1.27	-	-
	T	1.19	-	-
	Value t Ca	0,921	-	-
	value tab.	2,447	-	-
	Significance	N.S.	-	-
28/04/14	E	1.59	0.58	1.02
	T	1.56	0.56	1.00
	Value t Ca	0,725	0,223	1,291
	value tab.	2,306	2,306	2,306
	Significance	N.S.	N.S.	N.S.
21/08/14	E	1.92		
	T	1.86		
	Value t calc.	0,380		
	Value tab.	2,776		
	Significance	N.S.		

Note: E = essay T = witness. B<sub>t</sub> = Boron total; B<sub>s</sub> = B soluble; B<sub>l</sub> = B- linked

To the State of fruit in development to the 28/04/14, not is they look effects in how to the content of Boron total or fractions. Nor is you look increases in Boron total in the other dates.

### 3.2. COMPOSITION OF Ca, Mg AND TOTAL B IN FRUIT TO HARVEST

In the box 3d is have the values of Calcium, Magnesium and Boron total to the time of harvest. The detail repeat be presents in the annex 2.

**Picture 3d. Concentration of Calcium, Magnesium and Boron total in fruit to vintage (data in mg / 100 g of fresh weight)**

Date	Treatment	Calcium	Magnesium	Boron
03/12/14	E	11.94	21.2	2.21
	T	10.82	22.7	2.15
	Value t calc.	1,886	1,735	0.014
	Value t tab. 5%	2,306	2,306	2,306
	value t tab.10%	1,860	1,860	1,860
	Significance	S.10%	N.S.	N.S.

The results State a trend to more Calcium total in the fruit low treatment with Metalosate (S.10%). Unfortunately, the data of more relevance (calcium linked) not can be obtained with the methodology employee on the case of avocados, because to the emulsion that causes the centrifugation. Not be affect by the treatment the total Magnesium and total Boron.

### 3.3. EFFECT IN PARAMETERS OF QUALITY TO THE HARVEST.

The effect the treatment in some parameters of quality to the vintage be presents in picture 4. Detail by repeat, in the annex 3.

**Picture 4. Effect of treatment in the diameter, weight and % of field dry of the fruit to the harvest**

Date	Treatment	Diameter (mm)	Weight cool (g)	M.Seca (%)
03/12/14	E	69	238	22.7
	T	68	233	22.7
	Value t calc.	0,486	0,277	0.018
	Value t tab. 5%	2,306	2,306	2,306
	value t tab.10%	1,860	1,860	1,860
	Significance	N.S.	N.S.	N.S.

Not are you look differences of the treatment on the aspects of quality evaluated to the harvest. Be highlight that the comparison not has much value, and that the harvest, of agreement to the instructions of the estate to the growers, was led to a segment of the fruit (caliber bigger).

### 3.4. EFFECTS IN THE FINAL CONFIGURATION.

In base to three twigs marked by tree (total 15 twigs / treatment) be had the number initial of fruit joined (bunches initial), to mid of December. Then and then of ended the second fall of fruits is made a new count for to the fruit that persists up harvest. The results Average by tree in both assessments and the curdles percentage is state in box 5.

**Picture 5. Effect of treatment on fruit set.**

Treatment	Repetition	No. of fruit set initial *	No. of fruit set end*	% Setting
<b>E</b>	1	109	12	11.0
	2	102	14	13.7
	3	58	13	22.4
	4	67	8	11.9
	5	81	23	28.4
<b>Average E</b>		83.4	14	<b>17.5</b>
<b>T</b>	1	102	10	9.8
	2	83	9	10.8
	3	155	10	6.5
	4	98	5	5.1
	5	88	6	6.8
<b>Average T</b>		105	8.0	<b>7.8</b>

\* Each value is the average of the three twigs marked of the tree.

Value t calc. = 2.402

Value t tab. 5% = 2,306

Significance = **5.5%**

Is notes that the treatment Metalosates has led more curdles end. This effect be should to the action combined of Calcium - Boron on the period bloom - curdles.

### 3.5. LEAF ANALYSIS

In the box 6 be presents the results of the analysis of the treatment in various times.

**Picture 6. Effect of treatments in the results analysis of leaf at different times**

Date	Tr.	N	P	K	CA	Mg	Faith	MN	Zn	CU	B	CL
		(%)					(ppm)					(%)
09/01/14	E	2.86	0.26	1.26	1.25	0.31	122	216	45	10	74	
	T	2.77	0.27	1.30	1.24	0.34	116	192	50	11	69	
06/03/14	E	2.98	0.23	1.12	2.03	0.43	172	281	40	9	50	
	T	2.60	0.18	0.76	1.74	0.42	133	274	35	7	38	
28/04/14	E	2.48	0.21	0.95	2.08	0.40	181	321	40	8	49	0.74
	T	2.16	0.22	0.86	1.92	0.41	161	290	36	8	48	0.74
Significance		N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Note: Tr. = treatment E = test T = witness.

Not are you look differences of the treatment on the results of the leaf analysis.

### 3.6. EVALUATION OF FIRM AND STATUS OF AVOCADOS. 1RA. EVALUATION

Assessments carried to out the days 8, 9 and 11 January 2015, to the 35 days after of the stock in cold. The avocado be were evaluating to measurement that the fruit were reaching color black, to the living in condition *shelf life*.

The results summarized of firm is have in the box 7. The detail be presents in annex 4a.

**Picture 7. Effect of treatments in firm and status then of 35 days of stock in cold to 4 C and Post period *shelf life* to 20 ° C.**

Treatment	Repetition	Firmness
Trial	1	1.07
	2	1.05
	3	0.82
	4	0.82
	5	0.96
Prom. Test		0.94
Witness	1	1.11
	2	1.04
	3	1.23
	4	0.96
	5	1.00
Prom. Witness		1.07

Value t Calc. : 1,491

Value t tab. : 2,306 value

significance : N.S.

No effects observed in firmness in the 1st. evaluation.

Given that at this date not be noted effects in Browning vascular and Browning of pulp, not be have the results (photo 19)

### 3.7. EVALUATION OF FIRMNESS AND STATUS OF AVOCADOS. 2ND EVALUATION.

The 2nd. Assessment be led to out the 28 and 30 of January, Vale say, 53 days post-harvest. Avocados you were assessing as that fruit were reaching the color black, to be in status *shelf life*. (photo 10). The results summary are in the box 8 and the detail in the annex 4b.

**Picture 8. Effect of treatment in firmness after of 55 days of stock in cold to 4 C and post period *shelf life* to 20 °C.**

Treatment	Repetition	Firmness
Trial	1	1.01
	2	0.85
	3	1.09
	4	0.93
	5	1.06
Prom. Test		0.99
Witness	1	1.18
	2	0.92
	3	0.74
	4	0.98
	5	0.97
Prom. Witness		0.96

Value t calc. : 0,291

Value t tab. : 2,306 value

significance : N.S.

To the like that for the first date, not is note differences in firm on the second lot of fruit.

The Browning vascular is present and the values average obtained in every replay is indicated in box 9, in base to scale hedonic of 1 = without to 5 = Severe. The detail is indicates on the annex 5a.

**Picture 9. Effect of treatment in Browning Vascular after of 55 days of stock in cold to 4 C and post period *shelf life* to 20 ° C.**

Treatment	Repetition	Browning vascular
Trial	1	2.2
	2	1.9
	3	2.4
	4	1.7
	5	2.9
Prom. Test		<b>2.24</b>
Witness	1	2.5
	2	3.0
	3	2.5
	4	3.5
	5	2.7
Prom. Witness		<b>2.84</b>

Value t calc. : 1,880  
 Value t tab. 5% : 2,310  
 Value t tab. 10%: 1,860  
 Value Significance: **S. 10%**

The results state a trend to minor Browning of do vascular treatment Metalosates with a value close to 2 (Photo 20) vs. control with a value close to 3 (photo 21).

About the Browning of pulp, the values presented in the box 10, and details on the annex 5b. The numbers account the average obtained of a scale hedonic believes 1 = to 5 = severe Browning .

**Picture 10. Effect of treatment in Browning of pulp then of 55 days of storage in cold to 4 C and post period *shelf life* to 20 ° C.**

Treatment	Repetition	Browning of pulp
Trial	1	1.1
	2	1.0
	3	1.5
	4	1.3
	5	1.1
Prom. Test		1.20
Witness	1	1.0
	2	1.2
	3	1.4
	4	2.7
	5	1.0
Prom. Witness		1.46

Value t calc. : 0,655

Value t tab. : 2,310

Significance : N.S.

Is notes that in numbers absolute the Browning of pulp was of lower intensity that the Browning vascular and the difference to favor of the treatment Metalosate not it turned out significant.



## CONCLUSIONS

1. The program Metalosate managed increase the level of calcium and bound calcium.
2. The firmness increase observed after of 35 or 55 days of cold storage (+shelf life) was not statistically significant.
3. Vascular browning after 55 days in cold storage was significantly decreased by Metalosate treatment. The reduction of internal browning observed was not statistically significant.
4. The Metalosate program, increased significantly the fruit set.

**ANNEX****Annex 1a. Concentration of calcium and fractions in fruit in development**

Date	Treatment	Repetition	CA <sub>t</sub>	CA <sub>s</sub>	CA <sub>l</sub>
09.01.14	E	1	55.7	6.5	49.2
	E	2	54.2	4.3	49.9
	E	3	52.8	5.8	47,0
	E	4	53.5	3.9	49.6
	<b>PROM. E</b>		<b>54.1</b>	<b>5.1</b>	<b>48.9</b>
	T	1	50.2	4.8	45.4
	T	2	51.9	6.4	45.5
	T	3	50.2	3.9	46.3
06.03.14	T	4	51.6	4.8	46.8
	<b>PROM. T</b>		<b>51.0</b>	<b>5.0</b>	<b>46,0</b>
	E	1	24.7	4.6	20.1
	E	2	22.9	4.7	18.2
	E	3	22.5	4.8	17.7
	E	4	19.9	4.1	15.8
	E	5	24.7	7.1	17.6
	<b>PROM. E</b>		<b>22.9</b>	<b>5.1</b>	<b>17.9</b>
23.04.14	T	1	21.7	4.7	17.0
	T	2	23.1	4.3	18.8
	T	3	23.0	5.6	17.4
	T	4	21.9	4.7	17.2
	T	5	22.1	5.3	16.8
	<b>PROM. T</b>		<b>22.4</b>	<b>4.9</b>	<b>17.4</b>
	E	1	23.2	3.8	19.4
	E	2	24.6	3.6	21.0
21.08.14	E	3	21.4	4.7	16.7
	E	4	22.1	3.0	19.1
	E	5	21.7	4.7	17.0
	<b>PROM. E</b>		<b>22.6</b>	<b>4.0</b>	<b>18.6</b>
	T	1	21.2	6.2	15.0
	T	2	18.8	3.9	14.9
	T	3	20.7	4.2	16.5
	T	4	16.7	2.7	14.0
09.01.14	T	5	19.8	4.1	15.7
	<b>PROM. T</b>		<b>19.4</b>	<b>4.2</b>	<b>15.2</b>
	E	1	19.5	3.0	16.5
	E	2	20.9	3.2	17.7
	E	3	18.0	2.8	15.7
	<b>PROM. E</b>		<b>19.5</b>	<b>2.8</b>	<b>16.6</b>
	T	1	17.1	2.4	14.7
	T	2	17.9	2.6	15.3
21.08.14	T	3	18.6	3.9	14.7
	<b>PROM. T</b>		<b>17.9</b>	<b>3.0</b>	<b>14.9</b>

## Annex 1b. Concentration of Magnesium and fractions in fruit in development

Date	Treatment	Repetition	Mg <sub>t</sub>	Mg <sub>s</sub>	Mg <sub>l</sub>
09.01.14	E	1	21.9		
	E	2	22.4		
	E	3	22.2		
	E	4	22.3		
	<b>PROM. E</b>		<b>22.2</b>		
	T	1	22.5		
	T	2	22.5		
	T	3	23.4		
06.03.14	T	4	23.1		
	<b>PROM. T</b>		<b>22.9</b>		
	E	1	16.8	9.2	7.6
	E	2	15.0	7.3	7.7
	E	3	16.7	7.6	9.1
	E	4	16.4	8.2	8.2
	E	5	16.7	9.2	7.5
	<b>PROM. E</b>		<b>16.3</b>	<b>8.3</b>	<b>8.0</b>
	T	1	16.6	10.2	6.4
	T	2	16.0	8.7	7.3
	T	3	17.5	10.3	7.2
	T	4	15.8	8.5	7.3
T	5	16.5	9.7	6.8	
<b>PROM. T</b>		<b>16.5</b>	<b>9.5</b>	<b>7.0</b>	
28.04.14	E	1	17.7	4.4	13.3
	E	2	17.8	3.9	13.9
	E	3	17.6	4.6	13.0
	E	4	17.2	3.1	14.1
	E	5	16.8	4.0	12.8
	<b>PROM. E</b>		<b>17.4</b>	<b>4.0</b>	<b>13.4</b>
	T	1	15.9	3.32	12.6
	T	2	17.0	4.6	15.4
	T	3	17.5	4.8	12.7
	T	4	17.6	3.9	13.7
	T	5	17.8	5.2	12.6
	<b>PROM. T</b>		<b>17.2</b>	<b>4.4</b>	<b>12.8</b>
21.08.14	E	1	20.5	5.7	14.8
	E	2	20.6	5.0	15.7
	E	3	20.7	4.8	15.6
	<b>PROM. E</b>		<b>20.6</b>	<b>5.2</b>	<b>15.4</b>
	T	1	20.9	4.6	16.3
	T	2	19.7	3.3	15.4
	T	3	20.2	3.8	16.4
	<b>PROM. T</b>		<b>20.3</b>	<b>3.9</b>	<b>16.0</b>

## Annex 1c. Concentration of BORO and fractions fruit in development

Date	Treatment	Repetition	B <sub>t</sub>	B <sub>s</sub>	B <sub>l</sub>
09.01.14	E	1	1.69		
	E	2	1.71		
	E	3	1.75		
	E	4	1.72		
	<b>PROM. E</b>		<b>1.72</b>		
	T	1	1.78		
	T	2	1.77		
	T	3	1.70		
06.03.14	E	1	1.13		
	E	2	1.44		
	E	3	1.12		
	E	4	1.23		
	E	5	1.45		
	<b>PROM. E</b>		<b>1.27</b>		
	T	1	1.11		
	T	2	1.22		
28.04.14	E	1	1.56	0.55	1.01
	E	2	1.57	0.55	1.02
	E	3	1.52	0.51	1.01
	E	4	1.57	0.56	1.01
	E	5	1.75	0.72	1.03
	<b>PROM. E</b>		<b>1.59</b>	<b>0.58</b>	<b>1.02</b>
	T	1	1.54	0.56	0.98
	T	2	1.67	0.58	1.09
21.08.14	E	1	1.93		
	E	2	1.73		
	E	3	2.10		
	<b>PROM. E</b>		<b>1.91</b>		
	T	1	1.87		
	T	2	1.63		
	T	3	2.07		
	<b>PROM. T</b>		<b>1.86</b>		

**Annex 2. Composition of Ca, Mg, and B TOTAL in fruit pulp to harvest  
(data in mg / 100 g of fruit fresh)**

Treatment	Repetition	CA	Mg	B
<b>E</b>	1	11.6	21.1	2.34
	2	11.0	20.9	2.40
	3	12.5	21.5	2.15
	4	12.1	20.2	1.89
	5	12.5	22.2	2.29
<b>Prom E</b>		<b>11.94</b>	21.2	2.21
<b>T</b>	1	10.5	21.1	2.31
	2	11.3	23.2	2.11
	3	11.5	24.2	2.26
	4	9.3	21.2	2.17
	5	11.5	23.6	1.92
<b>Prom. T</b>		<b>10.82</b>	22.7	2.15
<b>Value t calc.</b>		1,886	1,743	0,540
<b>Value t tab.</b>		1,860		
<b>10% significance</b>		<b>S.10%</b>	N.S.	N.S.

**Annex 3. Effect the treatment in diameter, weight cool and % of matter dry to the vintage**

<b>Treatment</b>	<b>Repetition</b>	<b>Diameter (mm)</b>	<b>Weight Cool (g)</b>	<b>Matter dry (%)</b>
<b>E</b>	1	67	215	21.0
	2	75	279	24.0
	3	67	222	22.6
	4	69	233	24.7
	5	68	239	21.2
<b>Prom E</b>		69	238	22.7
<b>T</b>	1	69	248	22.5
	2	65	209	21.3
	3	66	223	21.6
	4	70	238	24.3
	5	71	249	23.7
<b>Prom. T</b>		68	233	22.7
<b>Value t calc.</b>		0,486	0,277	0.018
<b>Value t tab. 5</b>		2,306	2,306	2,306
<b>% significance</b>		N.S.	N.S.	N.S.

## Annex 4a. Assessment of firmness on the 1st. Assessment (35 days of storage)

Treatment	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5	Prom.
<b>Trial</b>	0.68	0.73	0.85	0.88	0.93	
	0.75	0.73	0.70	0.83	0.75	
	1.05	0.55	0.75	0.93	0.63	
	0.85	0.53	0.70	0.83	1.28	
	0.90	0.75	1.03	0.88	1.40	
	0.63	2.13	0.73	0.95	0.70	
	1.63	1.73	0.70	0.65	0.93	
	1.63	1.33	0.93	0.75	1.00	
	1.43	1.00	0.90	0.85	0.93	
	1.13		0.90	0.63	1.00	
<b>Prom. E</b>	1.07	1.05	0.82	0.82	0.96	<b>0.94</b>
<b>Witness</b>	0.63	0.65	1.08	0.70	1.03	
	1.50	0.83	0.73	1.10	1.18	
	1.00	0.73	1.13	0.93	1.80	
	1.25	0.85	0.60	0.85	1.13	
	1.05	1.08	1.50	0.73	0.90	
	1.11	1.15	1.63	1.03	1.18	
	1.00	1.08	1.50	0.98	0.95	
	1.38	1.00	0.65	1.28	0.88	
		1.40	1.60	0.90	0.80	
		1.63	1.35	1.08	1.08	
<b>Prom T</b>	1.11	1.04	1.23	0.96	1.00	<b>1.07</b>
<b>Value t calc.</b>	1,491					N.S.
<b>Value t tab</b>	2,306					
<b>5%</b>						

## Annex 4b. Assessment of firmness in the 2nd. Assessment (55 days of storage)

Treatment	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5	Prom.
<b>Trial (E)</b>	1.35	1.00	1.73	0.88	1.43	
	0.75	0.82	0.98	1.13	1.15	
	1.48	0.65	0.85	1.20	1.05	
	0.60	0.78	1.00	1.00	0.95	
	0.78	0.70	1.18	0.83	1.13	
	0.80	0.90	1.23	0.68	1.13	
	0.98	0.93	0.88	0.90	1.33	
	1.38	0.78	1.50	0.90	0.55	
	1.10	1.10	1.10	0.88	0.78	
	0.88		0.50		0.68	
<b>Prom. E</b>	1.01	0.85	1.09	0.93	1.06	<b>0.99</b>
<b>Witness (T)</b>	1.15	1.20	1.13	1.06	1.50	
	1.53	1.15	0.78	1.05	0.58	
	1.08	1.13	0.63	1.08	0.97	
	1.20	1.00	0.63	1.30	0.98	
	1.08	1.13	0.68	0.78	0.75	
	1.22	1.25	0.58	0.83	1.00	
	0.98	1.28	0.63	1.08	1.15	
	1.18	0.85	0.40	0.88	0.78	
	1.23	0.85	0.88	0.78	01.03	
	1.18	0.90		0.95	0.97	
<b>Prom T</b>	1.18	0.92	0.74	0.98	0.97	<b>0.96</b>
<b>Value t calc.</b>	0,291					<b>N.S.</b>
<b>Value t tab</b>	2,306					
<b>5%</b>						



## Annex 5a. Browning Vascular after of the 2nd. period of storage (55 days)

Treatment	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5	
<b>Trial</b>	3 3 3 3 3 1 1 1 2 2	1 3 2 1 2 2 2 2 2	3 3 2 3 2 2 1 2 3 3	2 2 1 1 3 1 1 1 1	3 1 3 3 3 3 3 4 3	
<b>Prom. E</b>	2.2	1.9	2.4	1.7	2.9	<b>2.22</b>
<b>Witness</b>	2 2 2 2 2 2 3 3 3 4	2 2 3 4 3 4 2 3 3 4	4 3 2 2 2 3 2 4 1	4 4 3 3 4 4 4 3 3 3	2 4 3 2 2 3 3 2 3	
<b>Prom T</b>	2.5	3.0	2.5	3.5	2.7	<b>2.84</b>
<b>Value t calc.</b>	<b>1,893</b>					<b>S.10%</b>
<b>Value t tab</b>	<b>1,860</b>					
<b>10%</b>						

## Annex 5b. Browning of pulp after of the 2nd period of storage (55 days)

Treatment	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5	
<b>Trial</b>	2 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 2 2 4	1 1 3 2 1 1 1 1 1	1 2 1 1 1 1 1 1 2	
<b>Prom. E</b>	1.1	1.0	1.15	1.3		<b>1.20</b>
<b>Witness</b>	1 1 1 1 1 1 1 1 1	1 1 4 2 1 1 1 1	1 1 4 2 1 1 1 1	4 4 4 4 3 3 2 1 1	1 1 1 1 1 1 1 1	
<b>Prom T</b>	1.0	1.2	1.4	2.7	1.0	<b>1.46</b>
<b>Value t calc.</b>	0,655					N.S.
<b>Value t tab</b>	2,306					
<b>5%</b>						

**PHOTOS:**

**1- Headquarters Tiltiles where you led to out the experiment**



**2. Regulating nozzles nebulizer**



**3. Applying Metalosates . Ida.**



**4. Applying Metalosates. Back.**



**5. Fruit just joined (bunches initial)**



**6. Fruit second fall.**



**7. Size of fruit persists in the tree after of 2nd fall.**



**8. Vintage by staff of the field.**



9. Cutting the peduncle.



10. Avocados for evaluation quality to harvest.



**11. Avocados to assess in the post-harvest.**



**12. Fruit in the cameras.**





13. Tray test to output of cold.



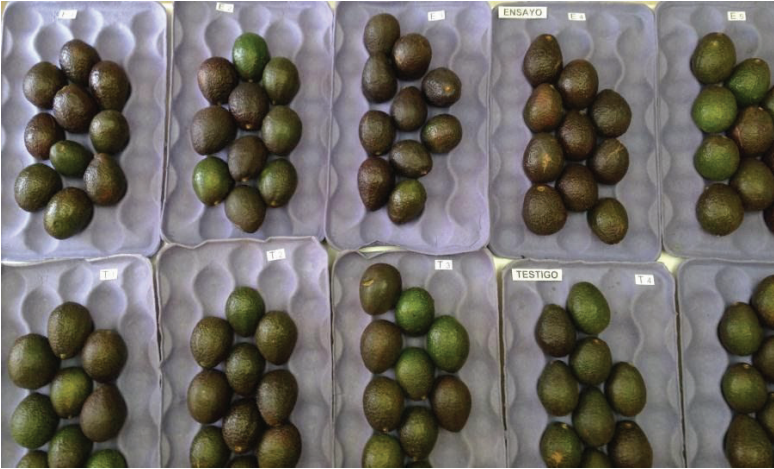
14. Tray control to output of cold.



15a. Fruit to the camera output to the 35 days.



15b. Fruit to the camera output to the 35 days + shelf life



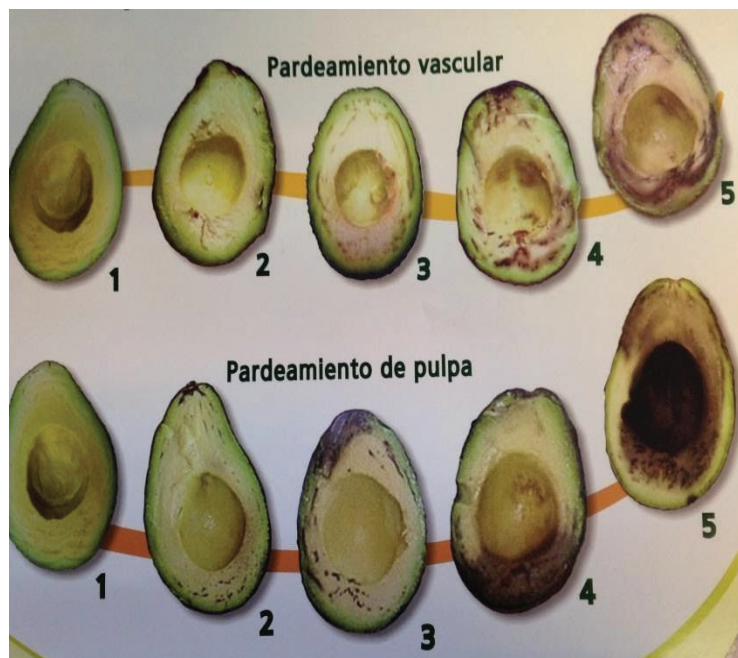
16. Determination of firmness using “presionometro”.



17. Measuring firmness.



18. Guideline Browning vascular and of pulp.



19. Absence of Browning of stem or pulp to 35 days.



20. Browning vascular test after 55 dias cold (value = 2, 24)



21. Browning vascular witness after 55 days cold (value = 2, 84)

