

Use of soil/root bio-stimulant Bioamino-L in Mandarin, Lemon, Orange and Avocado Crops.

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ABSTRACT.

Bioamino-L is a soil/root bio-stimulant derived from salmon. A field experiment was conducted to determine the effect of Bioamino-L on leaf components (leaf analysis), fruit production, size, fruit quality and root weight of four fruit species: Mandarins, Lemons, Oranges and Avocados. **Bioamino-L** did not modify significantly the foliar analysis of the evaluated species, except for a higher concentration of Ca, Mg and Cu for the orange tree; N, Ca, Na, and Cu for the avocado tree. The **Bioamino L** treatment did not modify significantly the quality parameters, except in avocado where the weight loss in post-harvest not only decreased, but also presented the highest percentage of healthy fruits, and did not present peduncle rot and black spot. In general, the most significant differences could be shown on the total yield (Kg/plant) and the average number of fruits, which were greater in the **Bioamino-L** treatments.

In the species wich roots were evaluated (all except the avocado trees), the **Bioamino L** treatment showed significant differences in root mass, which would explain the significant increase in yield and number of fruits.

Materials and methods.

For all species, the foliar analysis evaluation, fruit production and size, quality fruits and roots were considered. For all species, the control treatment (T0) was evaluated versus the **Bioamino L** treatment at a rate of 160 lt / ha (T1), except in lemon trees where a third treatment with the addition of nematicide was evaluated.

Three repetitions per treatment were considered. The collected information were subjected to a variance analysis with a significance level of 5%. The effect of the treatments on parametric variables were determined by comparing the means using the T-Student test, with 95% confidence intervals. For the statistical analysis the MiniTAB 17.0 software was used.

Due to the length of the study, some particular details of each species evaluated are shown below, and the results showed statistically significant differences, with their respective conclusions.

MANDARINS (*Citrus reticulata* Blanco) var. Murcott / Citrumelo.

Orchard established in the town of Panquehue, 2006, with a 5x2 m planting frame. The 160 lt / ha dose of **Bioamino-L** was applied in the fractional fertirrigation system, with an initial application of 20 lt / ha, one of 10 lt / ha, continuing with applications of 5 lt / ha weekly until the total was completed, all at as of October 4, 2017.

RESULTS.

Figure 1. Average number of frutis per plant. Bioamino-L in mandarins. Panquehue, 2018.

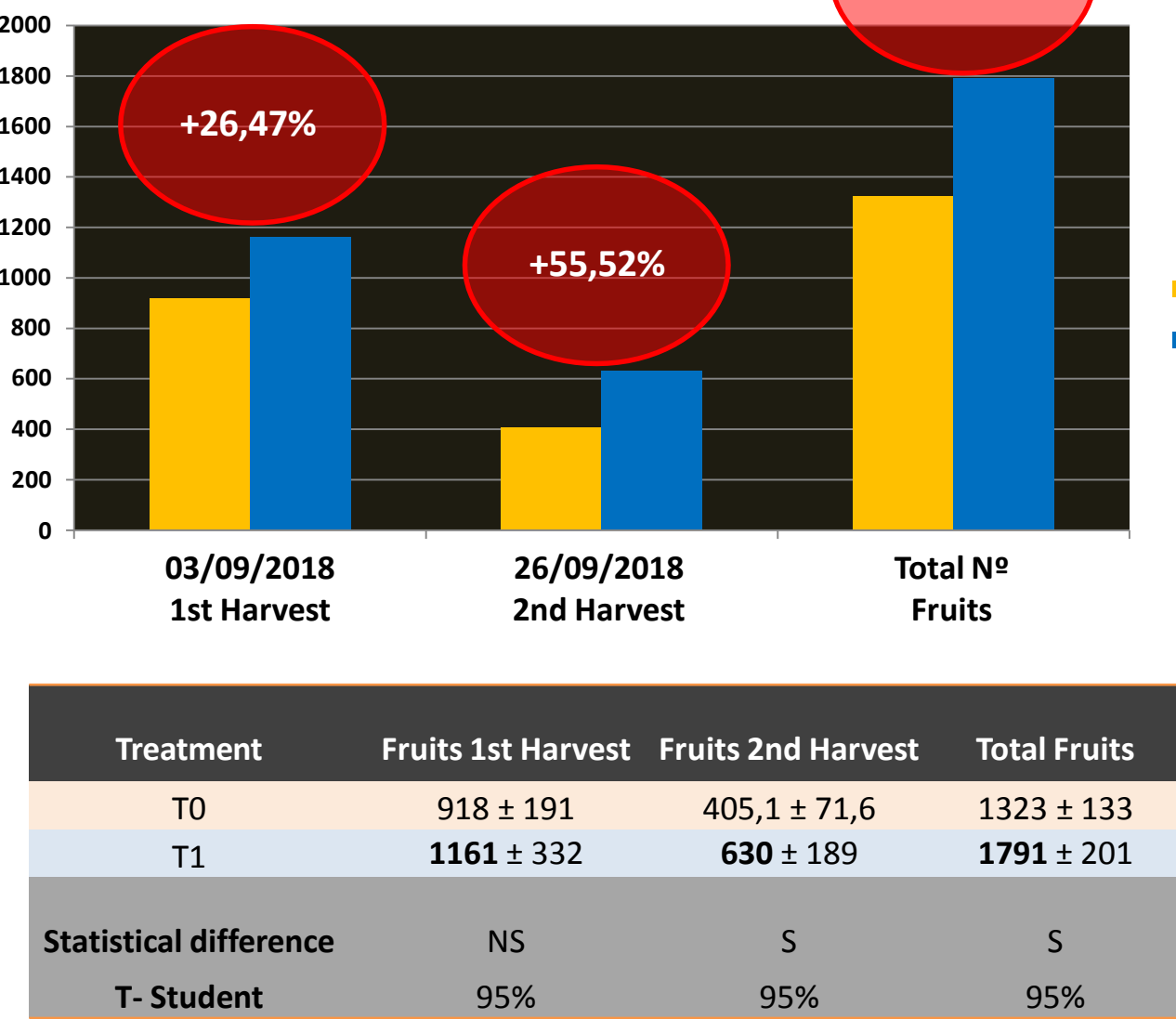


Figure 3. Average number of frutis per plant. Bioamino-L in mandarins. Panquehue, 2018.

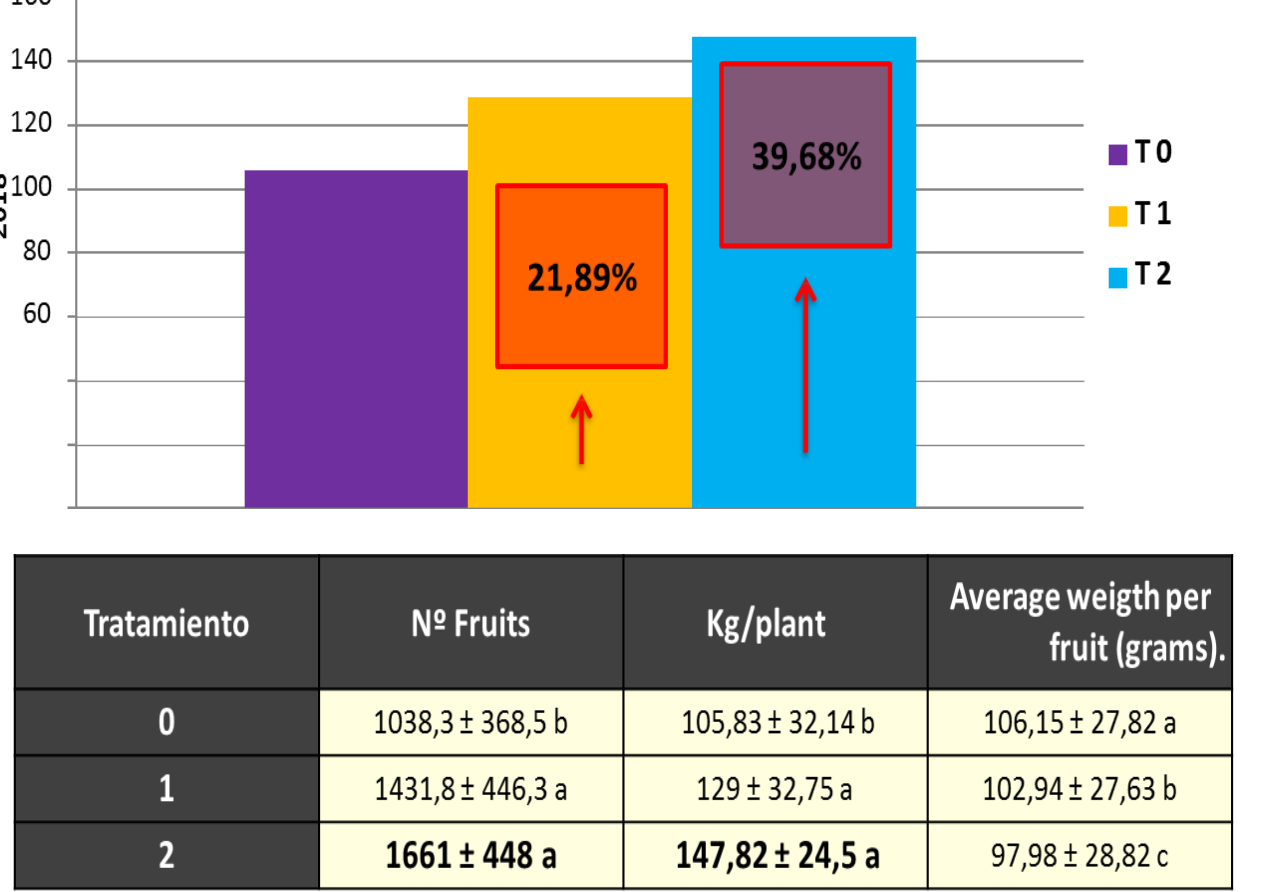
Treatment	Average roots weight (g)
T 0	0,904
T 1	2,8
St. Dif.	S
T- Student	90%

LEMONS (*Citrus limon* L. Burm; var. Fino 49 / Macrophylla).

Established in 2006 in the town of San Francisco-Panquehue, Chile. 6x2 m planting frame. Due to the high infestation of nematodes and severe damage to the roots and plants, an additional nematicide treatment was incorporated, in order to evaluate the effect of **Bioamino-L** applied only and in combination with nematicide. The treatments were as follows: T0: Control without application; T1: **Bioamino-L** 160 lt / ha + Rugby 200 CS (Cadusafos 20% w / v) 15 lt / ha; T2: **Bioamino-L** 160 lt / ha.

The 160 lt of **Bioamino-L** were applied in the fractional fertirrigation system, with an initial application of 20 lt / ha, one of 10 lt / ha and then continued with weekly applications of 5 lt / ha, until the total dose was completed until October 4, 2017. For T1 the nematicide application was carried out according to the product label during root growth.

Figure 4. Average yield (kg/plant) of Bioamino-L in Lemons. San Francisco, Panquehue, 2018.



CONCLUSIONS.

Bioamino-L increased significantly the average of fruit number per plant and the average yield per plant for more than **21%** applied in combination with nematicide and **39%** applied alone. However, the average weight per fruit decreased due to the high number of fruit per plant. **Bioamino-L** increased significantly the root weight for more than **106%** applied alone and more tan **421%** with nematicide combination. Foliar analysys and fruit quality parameters were not significantly modified by the use of **Bioamino-L**, with or whitout nematicide application.

ORANGE (*Citrus cinensis* L. Osbeck; var. Lane Late / Citrumelo).

Orchard established in 2000 in the town of Rautén, province of Quillota, Chile. The planting frame was of 5m x 2.5m which was equivalent to 800 plants per hectare. The evaluated treatments were **control** (T0) and **Bioamino-L** at a dose of 160 liters / ha. The product was applied by the fertirrigation system and was spited into an initial application of 20 lt / ha, one of 10 lt / ha and continued with applications of 5 lt / ha per week until the total were completed, starting from October 11th 2017.

RESULTS.

Figure 5. Average weighth per fruit. Bioamino-L in orange. Rautén, 2018.

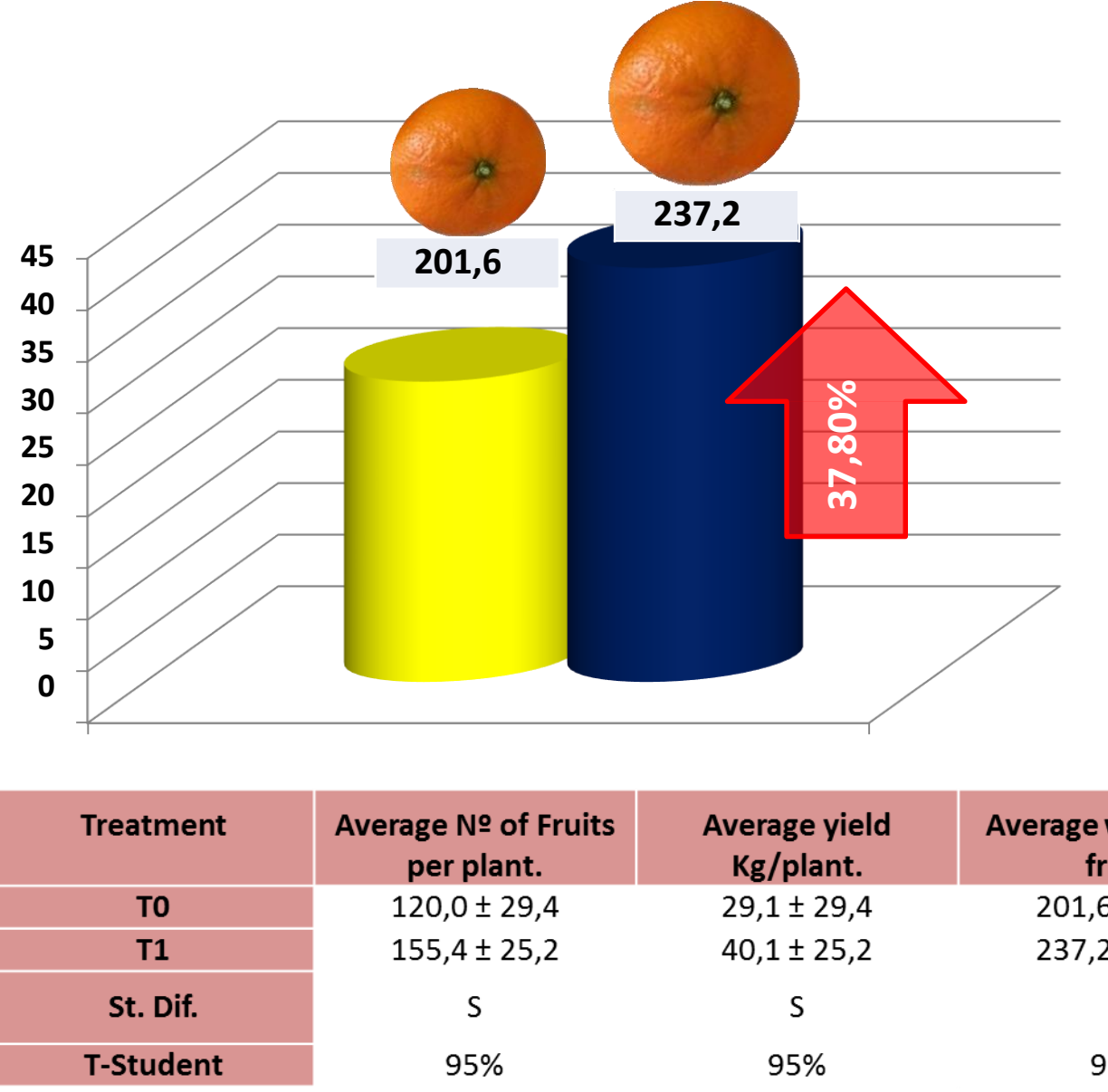
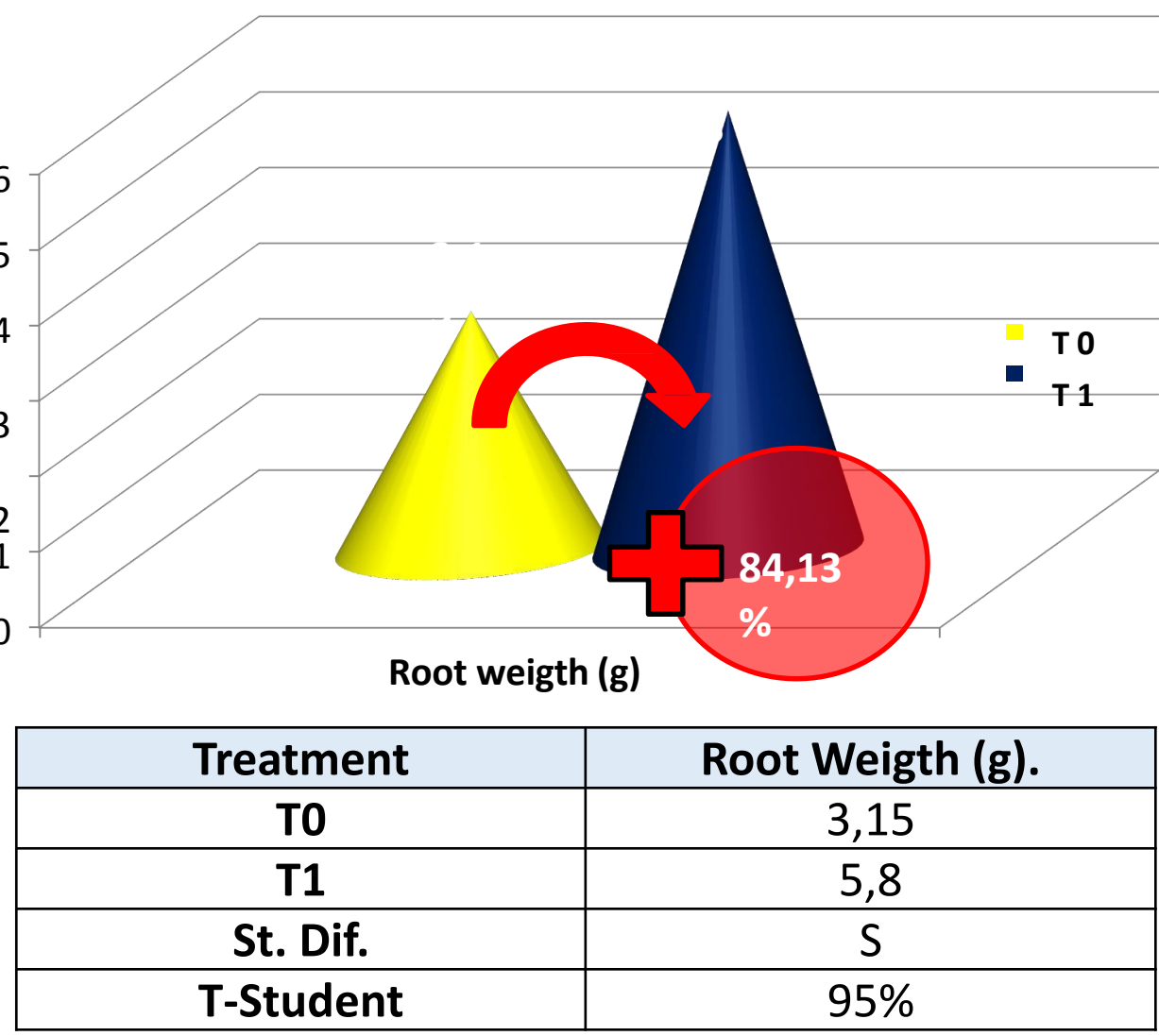


Figure 6. Average root weighth. Bioamino-L in orange. Rautén, 2018.



CONCLUSIONS.

Bioamino-L increased significantly the average number of fruit and average yield per plant by more than **37%**. Unlike lemons and mandarins, in oranges Bioamino-L increases significantly the average weighth per fruit almost **17%**. **Bioamino-L** increased significantly the root weighth for more than **84%**. Foliar analysys and fruit quality parameters were not modified significantly by the use of **Bioamino-L**.

AVOCADOS (*Persea americana*, var. Hass / Mexícola).

Orchard established in 2004 in the town of La Ensenada Panquehue, Chile. The planting frame was 3.5m x 3.5m, which was equivalent to 816 plants per hectare. The evaluated treatments were **control** (T0) and **Bioamino-L** at the dose of 160 liters / ha. The product was applied by the fertirrigation system and was splitted into an initial application of 20 liters / ha, one of 10 liters / ha and continued with applications of 5 liters / ha per week until the total were completed, starting from September 28th 2017.

RESULTS.

Figure 7. Average number of fruits per plants, average yield per plant and average weight per fruit. Bioamino-L in avocados. La Ensenada, 2018.

Treatment	Fruits/plant (Average)	Kg/plant (Average)	Average weight per fruits (g)
0	95.4 ± 81.9	17.2 ± 13.8	177.8 ± 44.9
1	140.9 ± 73.5	23.6 ± 12	166.2 ± 39.3
St. Dif.	S	S	S
T-Student	90	89	95

Figure 8. Weigth differences at cold chamber outlet (SC), weighth differences color an days to RTE (Ready To Eat).

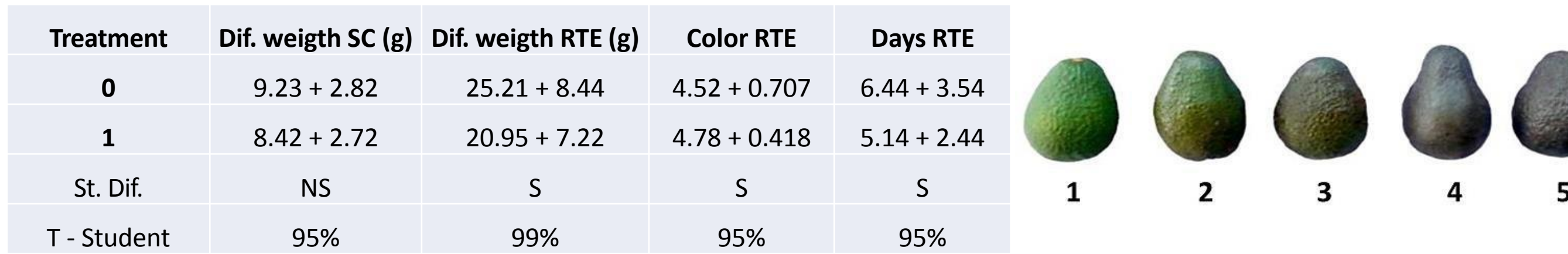


Figure 8. Incidence (5) of fruits with peduncle rot (SER) and Blac Spot. Bioamino-L in avocados, Panquehue 2018.

Treatment	% Incidence SER	% Incidence Black Spot
0	2	14
1	0	0

For both evaluated parametres , the best results were obtained with **Bioamino-L**. The treated fruit simply had no peduncle rot or Black Spot.

CONCLUSIONS.

Bioamino-L increased significantly the average number of fruits per plant by more than 47% and average yield (kg/plant) by more than 37%. Due to these results, the average weight of the fruits decreased. **Bioamino-L** improved some quality parameters. The weight loss in post-harvest decreased, presented the highest percentage of healthy fruits, and did not present peduncle rot and black spot.

Note: although the roots were not evaluated in avocados trees, treatments with Bioamino-L showed an important increase in the root activity of the plants. Some pictures are shown below.



GENERAL CONCLUSIONS.

- In all evaluated crops, the most significant differences could be seen in the total yield (Kg/plant) and the average number of fruits, which were greater in the treatments with **Bioamino-L**.
- The treatment with **Bioamino-L** did not significantly modified the quality parameters, except in avocado where the weight loss in post-harvest decreased and presented the highest percentage of healthy fruits.
- In the species where roots were evaluated (all except the avocado), the treatment with **Bioamino-L** showed significant differences in root mass which could explain the significant increase in yield and number of fruits.