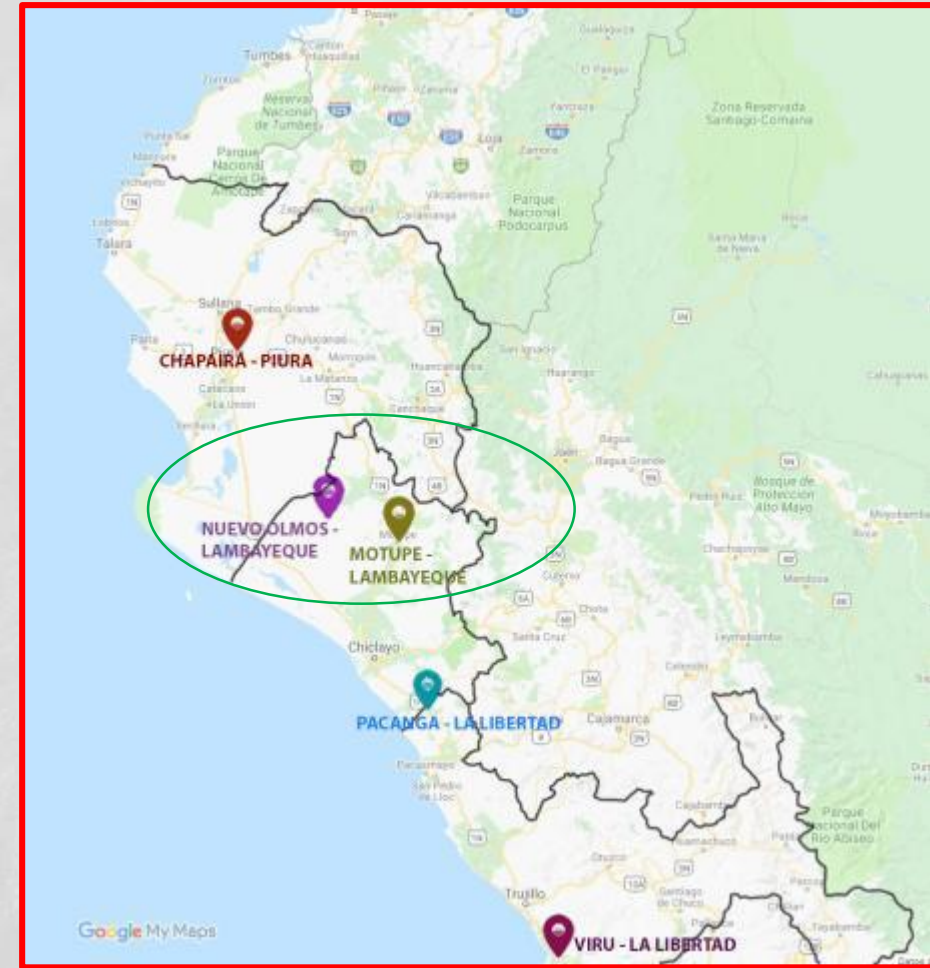
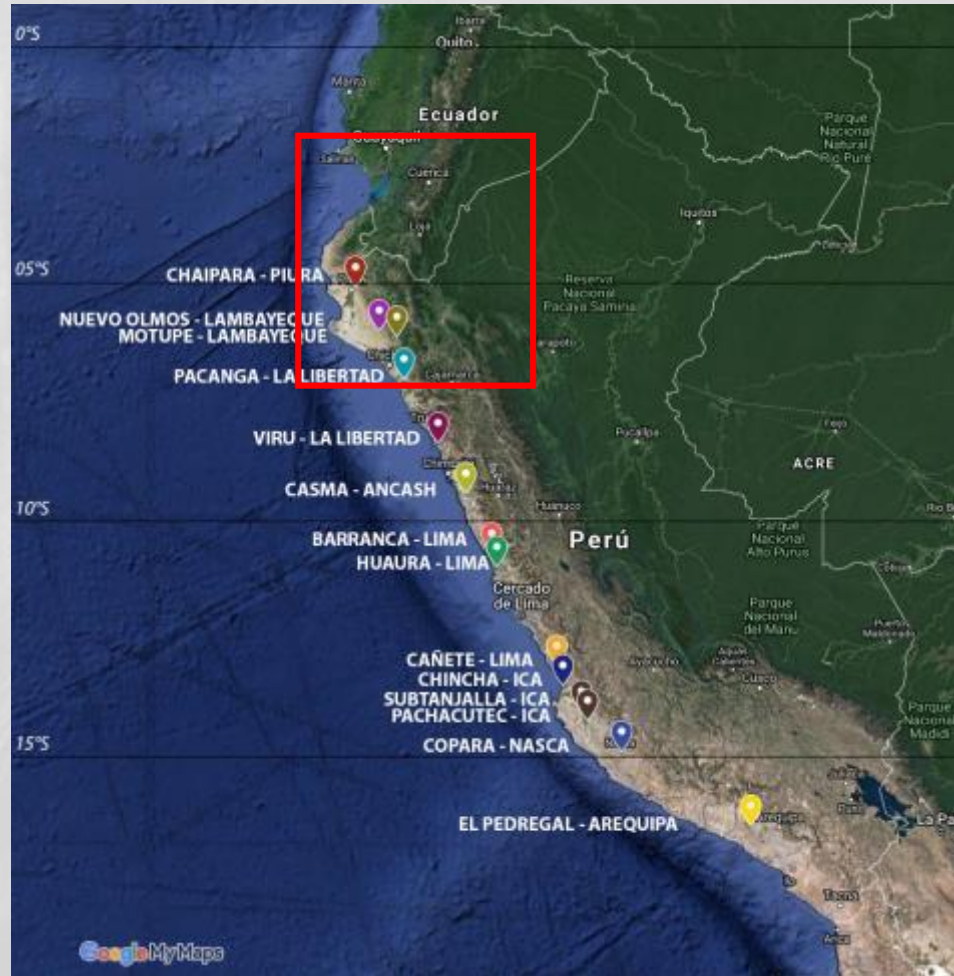




Gibberellin and cytokinin effect on fruit size and yield of 'Hass' avocado in the north of Peru

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PERU





**2 years 8 months trees – commercial orchard.
Olmos project**



**Min ave. T° 16 C.
Max ave. T° 28 C.
Ave. humidity 78%.**

North of Peru – Lambayeque region

OLMOS PROJECT:

- 5,000 hectares planted – 5 to 6 years older plantations.
- Projection: 8,000 – 10,000 hectares.

MOTUPE:

- Older plantations.
- Still some areas to plant.

SERIOUS PROBLEM: Small fruit size

METHODOLOGY

- 2 orchards in **Motupe** and 1 in **Olmos**.
- **GIBBERELLINS** applied in **cauliflower** stage and **CITOKININS** in **full bloom** (1 month difference).
- For **each** orchard: **120 trees**.
- **6 treatments**: 20 trees per trt / 4 reps of 5 trees per treatment.



62.5 ppm of GA



40 ppm of kinetin
40 ppm of TDZ

METHODOLOGY - ASSESSMENTS

- In **2** orchards (**1** in **Olmos** and **1** in **Motupe**), **4** **indeterminate inflorescences** were marked per tree:
 - Development of set fruit.
- In all the **3 orchards**:
 - **Total yield** (at harvest).
 - **Fruit size** distribution.

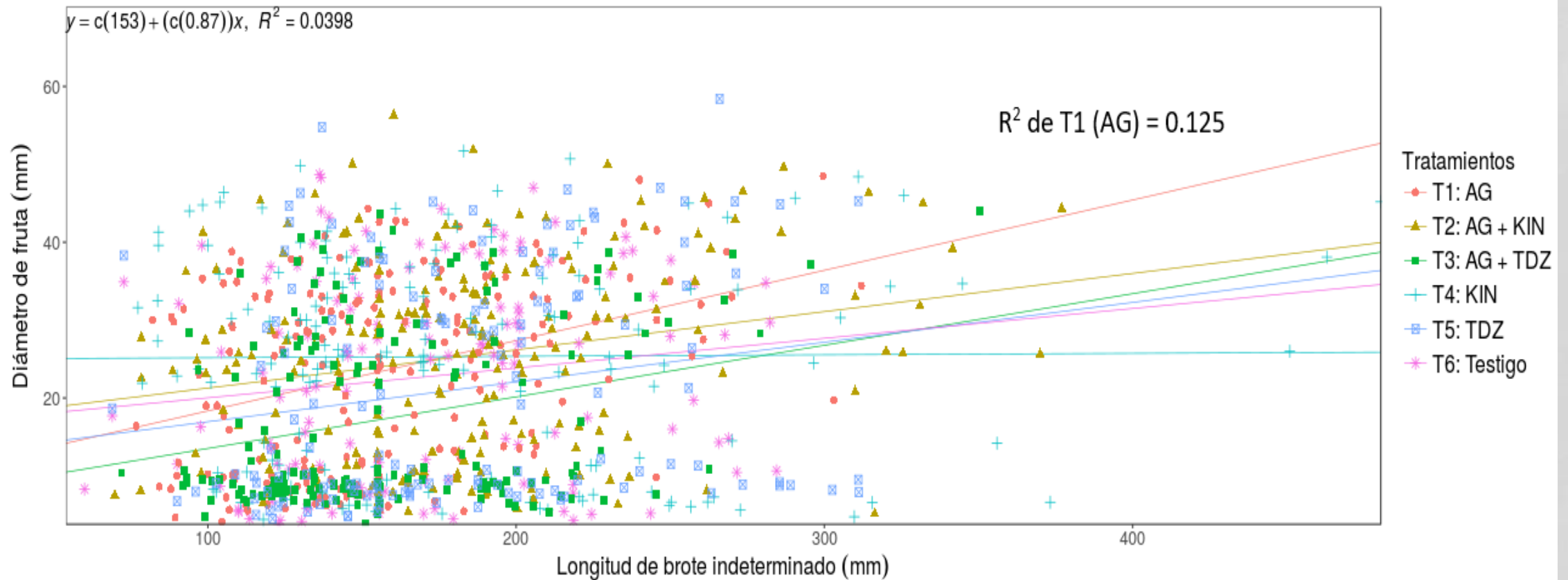
TREATMENTS

<u>Treatment</u>	<u>Active ingredient (i.a)</u>	<u>Abbreviation</u>	<u>Doses</u>
T1	<u>Gibberellic acid</u>	GA	62.5 ppm
T2	<u>Gibberellic acid</u> <u>Kinetin</u>	GA + KIN	62.5 ppm 40 ppm
T3	<u>Gibberellic acid</u> <u>Thidiazuron</u>	GA + TDZ	62.5 ppm 40 ppm
T4	<u>Kinetin</u>	KIN	40 ppm
T5	<u>Thidiazuron</u>	TDZ	40 ppm
T6	Control: no <u>applications</u>	Control	-

**Kinetin product has also nutrients content and algae*

RESULTS

Correlation between fruit diameter and shoot length (mm)



Average fruit diameter (mm) set in indeterminate inflorescences by treatment, evaluated on October, November, January and February

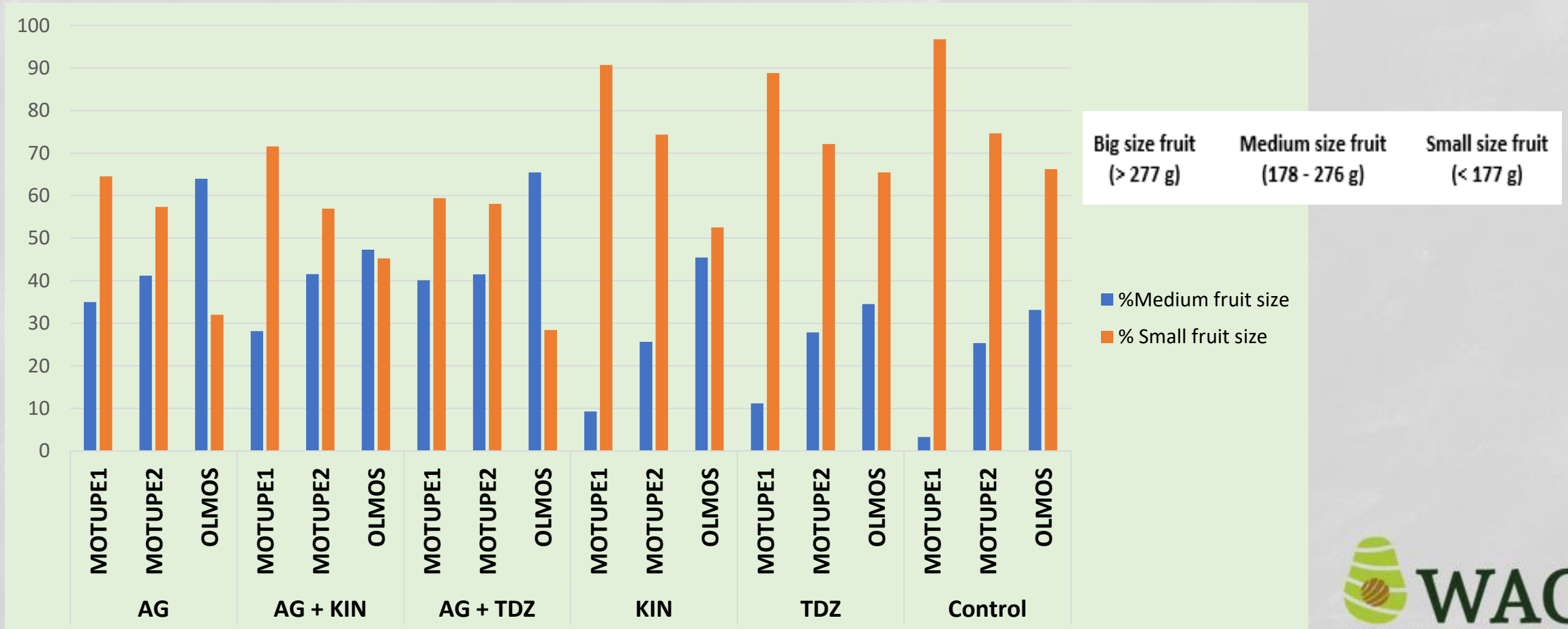
Zone	Treatment	Set fruit diameter (mm)			
		October	November	January	February
MOTUPE	AG	22.7 a	36.4 b	51.9 b	53.4 b
	AG + KIN	21.1 a	36.4 b	51.7 b	53.5 b
	AG + TDZ	16.2 b	35.3 b	50.4 b	52.5 b
	KIN	22.8 a	38.2 b	52.7 b	54.8 b
	TDZ	21.0 a	43.0 a	57.2 a	59.0 a
	Control	20.9 a	37.0 b	51.4 b	53.2 b
	CV	40.88	18.75	9.06	8.49
OLMOS	AG	9.3 b	30.6 c	48.8 a	50.7 a
	AG + KIN	12.2 a	34.0 ab	51.3 ab	53.0 ab
	AG + TDZ	8.8 b	31.5 bc	50.5 ab	53.3 a
	KIN	8.4 b	31.4 bc	49.4 b	-
	TDZ	9.8 b	35.6 a	50.3 ab	-
	Control	9.4 b	33.5 abc	53.0 a	-
	CV	45.59	16.52	8.47	7.52

Duncan's new multiple range test (MRT) ($\alpha = 0.05$) was used.

Number of inflorescences by treatment which set at least one (01) fruit, evaluated in October, November, January and February. For Motupe orchard.

Treatment	Number of inflorescences that set at least ONE fruit			
	<i>October</i>	<i>November</i>	<i>January</i>	<i>February</i>
GA	50	49	39	34
GA + KIN	68	55	45	40
GA + TDZ	53	26	18	17
KIN	60	49	33	28
TDZ	42	23	15	14
Control	34	34	30	29

Percentage of medium and small size fruit harvested in the three orchards



Orchard Zone	Treatment	Big size fruit (> 277 g)	Mid size fruit (178 - 276 g)	Small size fruit (< 177 g)	Average weight per tree (Kg)	Average weight per hectare (Kg)
		Percentage (%)				
MOTUPE1	GA	0.5	35.0	64.5	22.3	10,718
	GA + KIN	0.2	28.2	71.6	17.4	8,328
	GA + TDZ	0.5	40.1	59.4	20.1	9,634
	KIN	0.0	9.3	90.7	22.1	10,622
	TDZ	0.0	11.2	88.8	19.5	9,341
	Control	0.0	3.3	96.7	22.8	10,940
MOTUPE2	GA	1.5	41.2	57.4	35.4	23,586
	GA + KIN	1.5	41.5	56.9	21.7	14,457
	GA + TDZ	0.4	41.5	58.1	22.9	15,236
	KIN	0.0	25.6	74.4	32.1	21,394
	TDZ	0.0	27.9	72.1	38.5	25,643
	Control	0.0	25.3	74.7	20.4	13,574
OLMOS IRRIGATION PROJECT	GA	4.0	64.0	32.0	11.1	5,316
	GA + KIN	7.4	47.3	45.3	15.2	7,276
	GA + TDZ	6.1	65.5	28.4	12.0	5,772
	KIN	2.0	45.5	52.5	9.2	4,440
	TDZ	0.0	34.5	65.5	11.7	5,638
	Control	0.6	33.1	66.2	18.7	8,999

Distribution of sizes by treatment for each zone, and average weight per tree and per hectare.

TREES PER HECTARE

Motupe 1: 480

Motupe 2: 668

Olmos: 480.



CONCLUSIONS

- Treatments with GA increased harvest fruit size.
- Fruit size was increased with gibberellins applications, but no total yield.
- Contrast with the wide use of triazoles (pbz and uni), which inhibit the action of plant endogenous gibberellins.
- TDZ increase diameter on early fruit growth but not fruit size (g) at harvest. In addition, present less inflorescences with set fruit.
- PGRs tested, even though increased final fruit size on stressed orchards, they impacted negatively on the yield. PGRs applications under stress conditions should be avoided.

FURTHER RESEARCH

- Trial for 2019 – 2020 season:
 - GA
 - 6BA
 - 3,5,6-TPA
- The goal of these trials is to have alternative tools to increase fruit size and also YIELD in the North part of Peru, from the ones already used in the Peruvian avocado industry.

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Jorge Escobedo Alvarez
UNALM Professor



iii Gracias!!!