Boron in olive trees

Study #1 details

Research institution: Juan Vilar, Agronomic Research (MSc. Isabel Raya Garcia)
Date: 2023/24 and 2024/2025
Location: Jaén, Baeza, Spain
Soil: Clayey
Fertilizers: *Granubor*® and *Solubor*®
Trial design: Randomized complete block with three repetitions in a traditional irrigated olive plantation, with an area of 7.98 hectares.

Soil test

Determinación	0-30 CM	30-60 CM	Unidades	Método
pH en agua 1:2.5	8,7	8,7	uds. de pH	Potenciometría
Conductividad eléctrica del extracto de saturación	0,75	0,87	$dS.m^{-1}$	Potenciometría
Nitrógeno Total	0,06	0,04	%	Dumas
Fósforo	0,93	0,15	mg/Kg	Olsen
Materia Orgánica Oxidable	0,82	0,41	%	Dicromato Potásico
Capacidad de Intercambio Catiónico	13,26	17,93	Cmolc/Kg suelo	Acetato sódico
Na cambiable	1,12	0,84	Cmolc/Kg suelo	Acetato Amónico
Ca cambiable	Saturación	Saturación	Cmolc/Kg suelo	Acetato Amónico
K cambiable	1,3	1,0	Cmolc/Kg suelo	Acetato Amónico
Mg cambiable	3,4	3,1	Cmolc/Kg suelo	Acetato Amónico
Mn disponible	1,65	1,85	mg/Kg	DTPA
Cu disponible	4,44	4,06	mg/Kg	DTPA
Zn disponible	0,14	0,18	mg/Kg	DTPA
Fe disponible	1,16	1,23	mg/Kg	DTPA
B disponible	0,20	0,21	mg/Kg	DTPA
Sulfatos	0,17	0,16	meq/100g	Cromatografía Aniónica
Fosfatos	No se detectan	No se detectan	meq/100g	Cromatografía Aniónica
Cloruros	0,11	0,19	meq/100g	Cromatografía Aniónica
Nitratos	0,03	0,06	meq/100g	Cromatografía Aniónica
Nitritos	No se detectan	No se detectan	meq/100g	Cromatografía Aniónica
Carbonatos	53,89	31,35	%	Calcímetro de Bernard
Gravas	2,07	2,93	%	Tamizado
Arenas	15,65	13,45	%	Pipeta Robinson/Barahona
Limos	37,67	41,54	%	Pipeta Robinson/Barahona
Arcillas	46,67	45,01	%	Pipeta Robinson/Barahona
Textura	ARCILLOSA	ARCILLOSA LIMOSA		Pipeta Robinson/Barahona
Caliza Activa	0,39	0,33	%	Calcímetro de Bernard
C / N	7,89	5,72		Cálculo
Porcentaje de Sodio Intercambiable (PSI)	8,47	4,66	%	Cálculo

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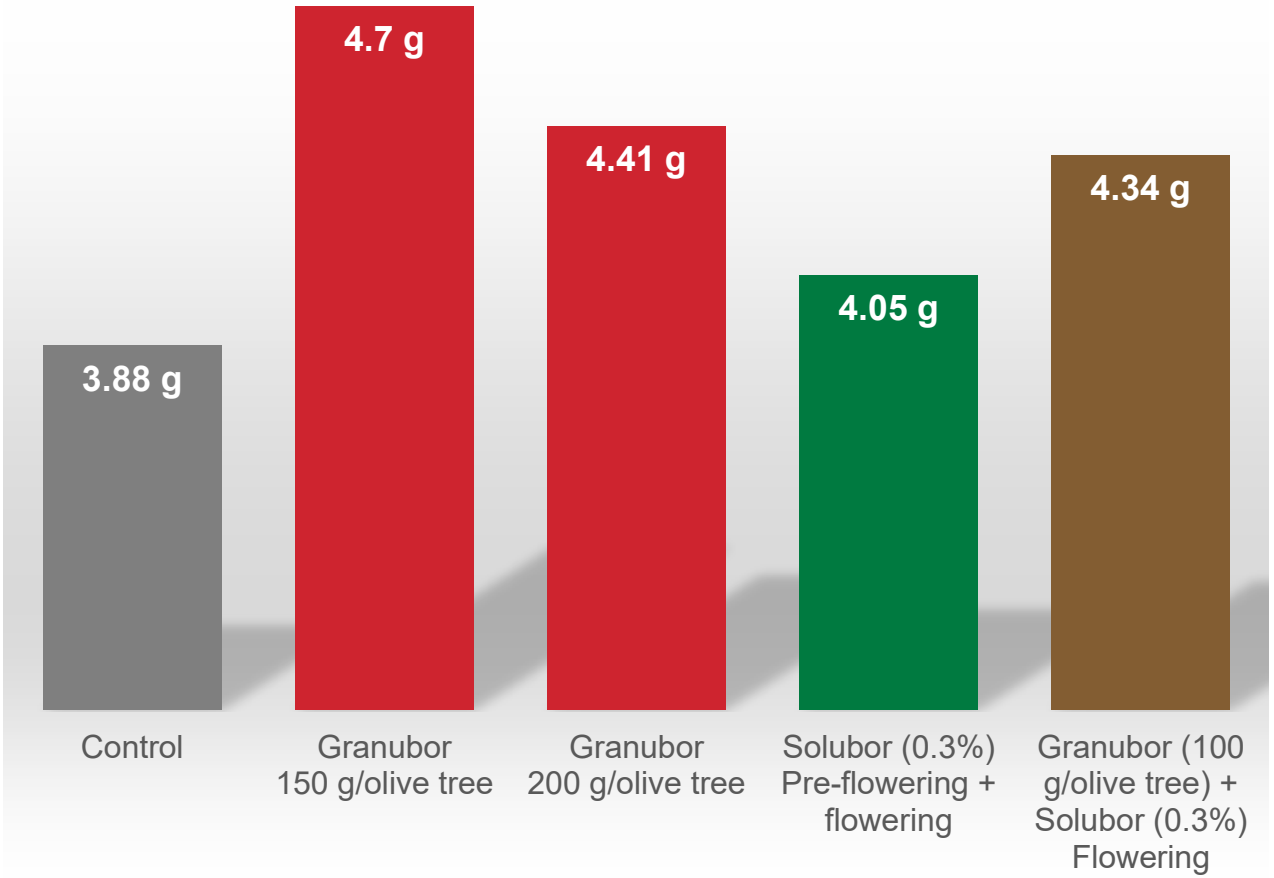
GRANUBOR®

SOLUBOR®

Boron fertilizer treatments

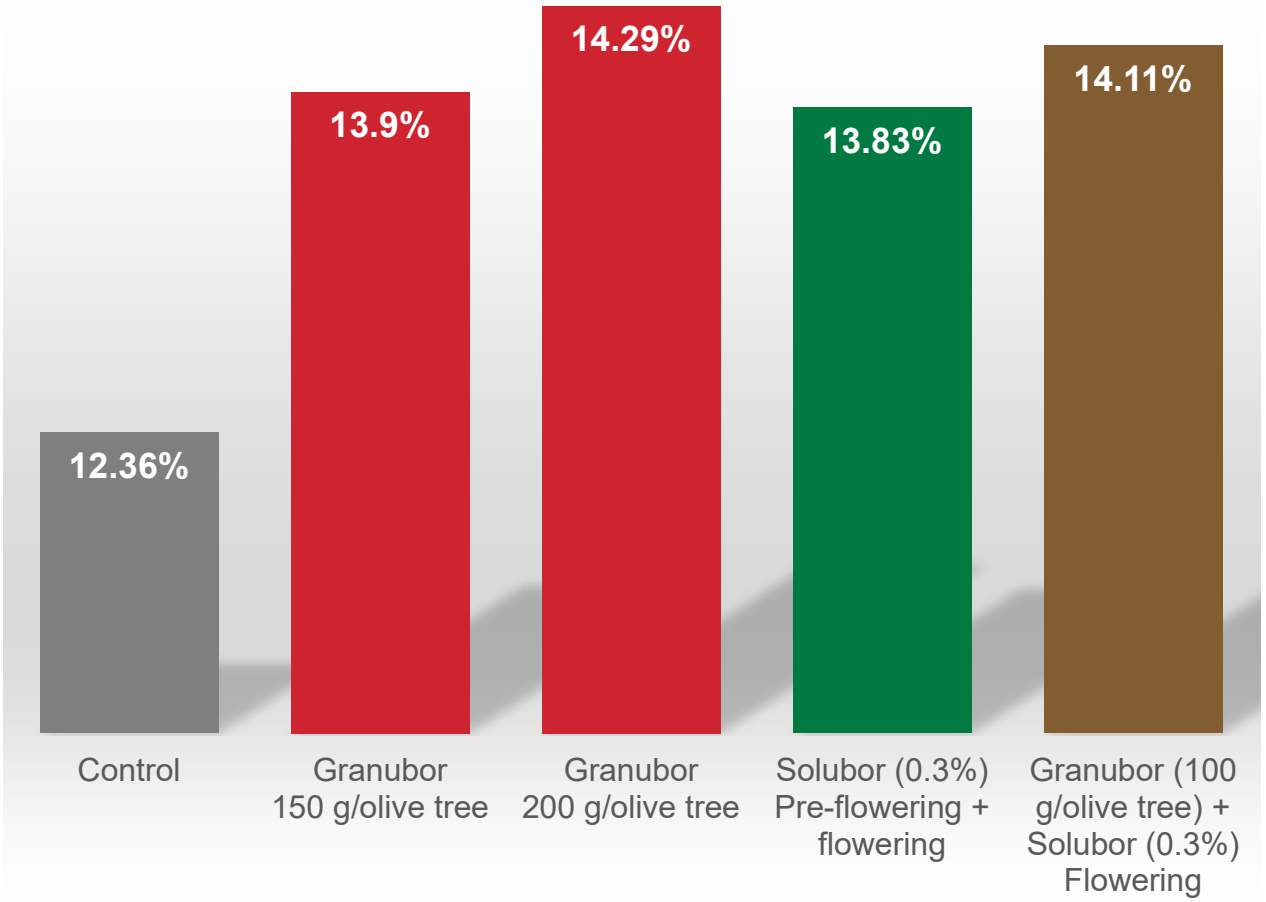
2023 trial		GRANUBOR® 15% B	SOLUBOR® 20.8% B
Treatment 1	Application date	Winter emergence	
	Application dose	150 g/olive	
Treatment 2	Application date	Winter emergence	
	Application dose	200 g/olive	
Treatment 3	Application date		Pre-flowering and flowering
	Application dose		0.3% dose per olive 6l/olive tree
Treatment 4	Application date	Winter emergence	Flowering
	Application dose	100 g/olive	0.3% dose per olive 6l/olive tree

Average weight of 100 olives (grams)



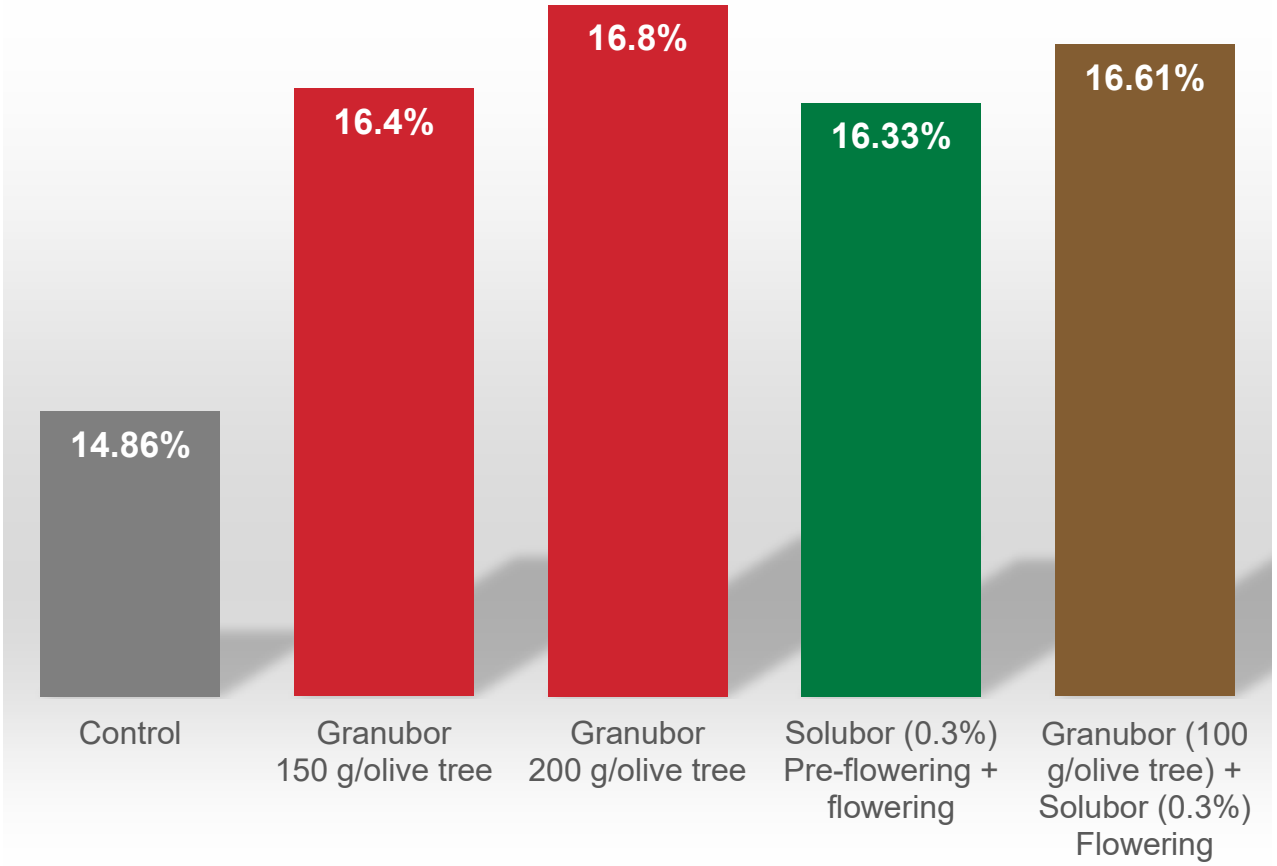
Source: Juan Vilar, 2025

Industrial yield



Source: Juan Vilar, 2025

WET Fat



Source: Juan Vilar, 2025

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Study #1 results

Regarding fat yield, which is partly reflected in productivity, all trials with boron showed higher fat content compared to the control treatment, highlighting the potential effect of boron application on improving this parameter.

This is the second of the three years planned for the trial to be completed, so it is risky to draw conclusions, which will need to be analyzed in the remaining years.

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Study #2 details

Research institution: Juan Vilar Consultores Estratégicos
Date: 2022
Location: Baeza, Jaén, Spain
Soil: Clayey loam; pH ($CaCl_2$) = 8.51
Fertilizers: *Solubor*®
Crop variety: Picual
Trial design: 1B: 0.3% stocking rate, 6l/olive, 1.8 kg/ha; 2B: 0.6% broth consumption, 6l/olive, 3.6 kg/ha;
Control: Boron is not applied.

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Characteristics and location of the trial

2022	Municipal area	Designation	SIGPAC reference	Cultivation system	Planting density olive trees/ha	Water regime	Variety
Olive trees	Baeza (Jaén)	Fuente del Olivar	23/9/25/359	Traditional	100	Rainfed	Picual

Soil type: Clayey loam

Soil pH ($CaCl_2$): 8.51

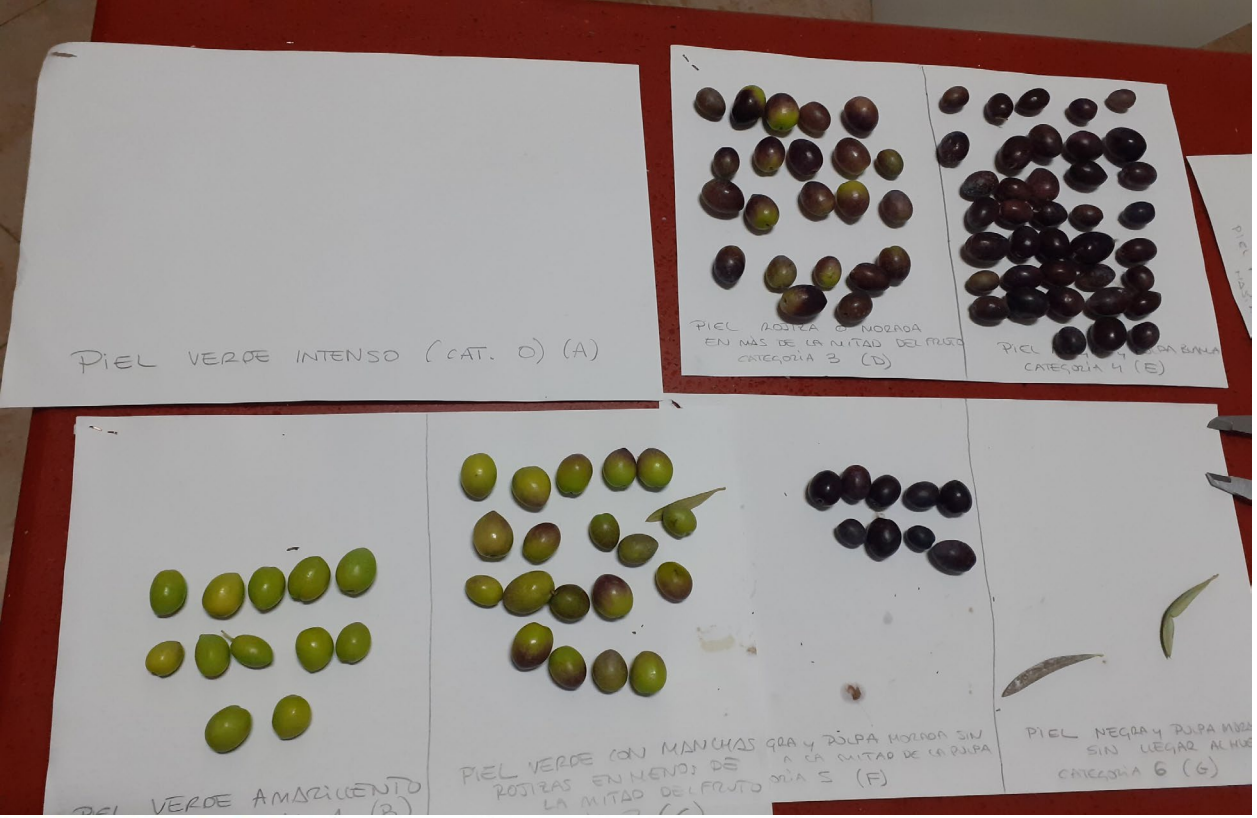
EC: 0.41 Ds/m

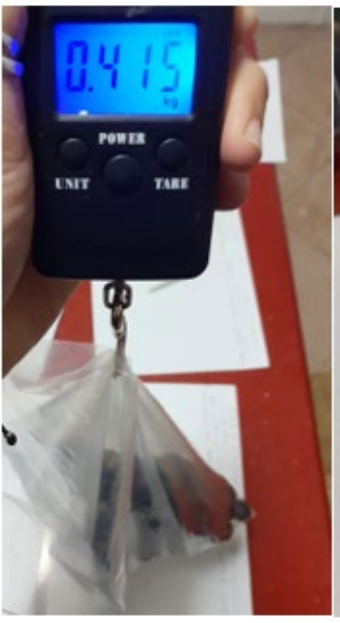
O.M: %: 1,3%

CEC : 29.11 Cmolc/kg soil

C/N 10.68

PSI 2.71%





Boron in olive trees

Test description

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Annual trial

Parameters evaluated:

- Micro and macro nutrients at foliar level
- Fat yield
- Physical characteristics of the fruit (weight/shape index and ripening index)
- General behavior of the crop

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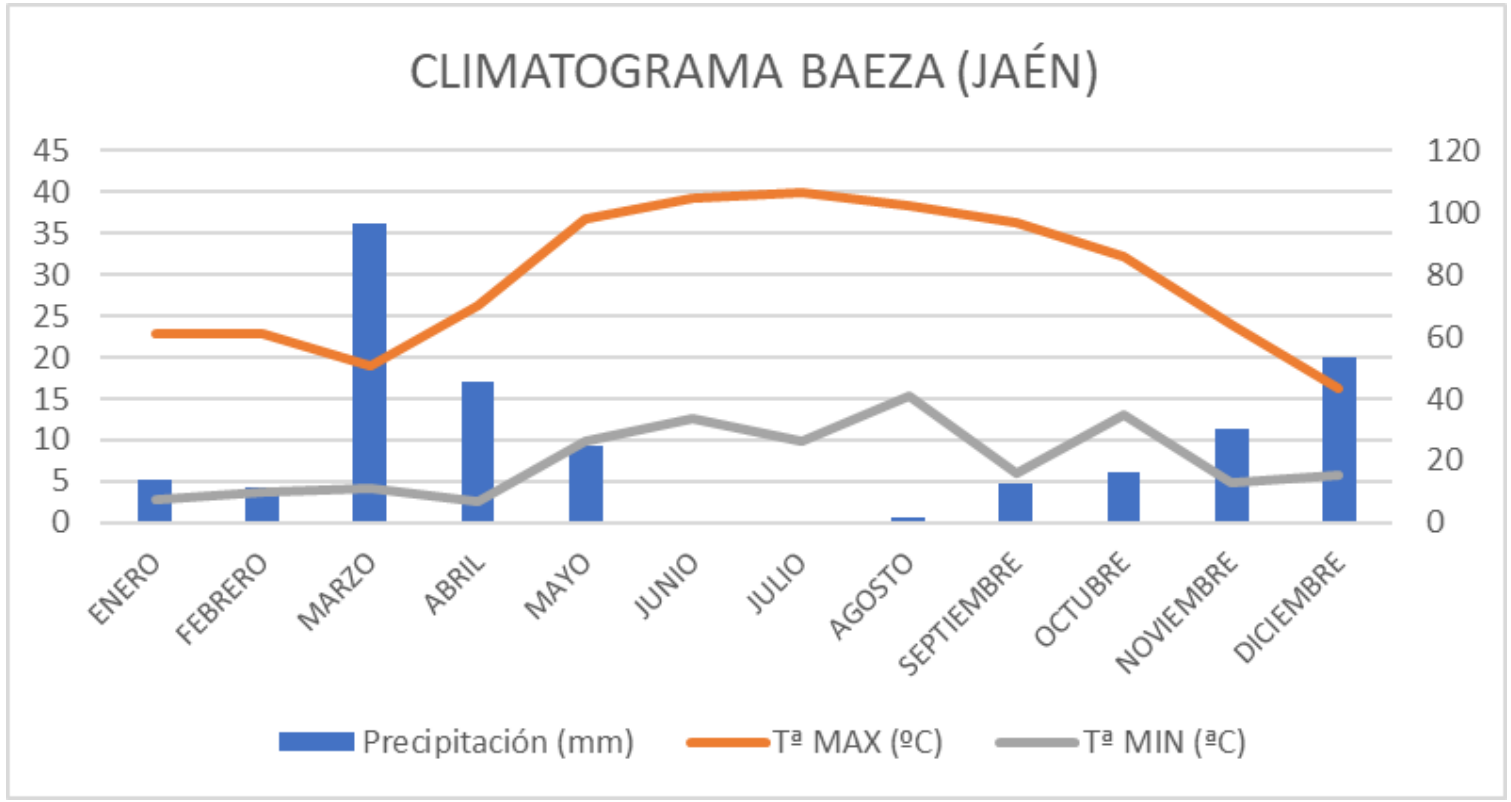
Climatology



- Continental Mediterranean climate, with hot summers with low rainfall and cold winters
- Low rainfalls
- Very high temperatures from May to October
- Very adverse conditions for cultivation

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Maturity index and fruit weight

2022	Maturity index			Fruit weight (g)		
	1B	2B	Control	1B	2B	Control
Olive grove fountain	3.04	3.48	3.6	3.98	3.86	3.79

- Little high maturity index in olive trees treated with boron
- Fruit weight not evaluable due to harvest discrepancy of olive trees

Fruit size is a critical factor for the quality of olives, especially table or green olives. In the normal evolution of fruit growth, the tree load—ie, the number of olives—is possibly the main determinant of fruit size in a given environment and crop conditions. In other words, **the greater the number of fruit, the smaller the fruit size.**

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Analytical determination

Description	Essay	HUMIDITY	FAT ON WET MATTER (%)	THEORETICAL INDUSTRIAL YIELD (%)	FAT ON DRY MATTER (%)
Olive grove fountain	Control	41,59	16,17	13,17	27,68
	1B	43,69	21,74	18,74	38,61
	2B	43,06	16,43	13,43	28,86

These results show that the treatment with boron, based on *Solubor* applied to olive groves, not only improves the nutritional status of the plant, but also improves the fat yield of the olive, which has a direct impact on the profitability of the crop.

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Foliar analysis

Descripción	Ensayo	% N	% P	% K	% Ca	% Mg	% Na	ppm Mg	ppm Cu	ppm Zn	ppm B	ppm Fe
Fuente del olivar	1B	1,33	0,05	0,47	1,50	0,21	0,01	27,65	45,00	9,20	18,75	37,35
	2B	1,21	0,06	0,49	1,43	0,15	0,01	26,70	95,25	9,15	18,75	58,00
	Control	1,29	0,06	0,41	1,52	0,19	0,01	31,30	54,60	9,85	15,60	48,05

An improvement in potassium levels was found in boron-treated olive trees with respect to the control treatment.

The results indicate that treatment with boron at normal doses *a priori*, improves the level of this nutrient and therefore the availability of the same for the crop—improving its agronomic characteristics and its development, which is visually manifested by a greater growth of shoots

Although the olive tree can adapt to high boron concentrations as it is tolerant to excess boron, it lives in drought conditions where boron is usually less available to the plant.

One consideration is that there has been less presence of parthenocarpic fruits in the boron-treated olive trees.

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Study #2 results

Solubor treatment improves potassium levels in the olive tree—improving the morphology and weight of the fruit, as well as the fat yield, therefore the production of the olive tree will be higher.

- Boron-treated olive trees show a lower maturity index than untreated ones. The olive remains in veraison for a longer period of time—allowing a greater harvesting supply.
- Regarding fat in dry matter: Boron treatment improves yield by up to 5.5%
- These results show that boron treatment applied to olive trees not only improves potassium levels in leaves, but also improves fruit morphology, providing the olive tree with heavier fruits and higher olive fat yield, which has a direct impact on the profitability of the crop.
- The treatment with *Solubor* has an effect on a lower presence of parthenocarpic fruits, which implies a better fruiting and ripening process

Finally, it could be stated and ratified that the treatment with *Solubor* exerts the following positive effects on the olive tree after its treatment: It improves the levels of potassium in the olive tree, improving the morphology and weight of the fruit, as well as the fat yield of the same, therefore the production of the olive tree will be higher. In this study, subject to future ratifications.