Extended Practice Abstract Nº 13

CLIMED-FRUIT

Evaluation of the effects of the biostimulant Calbio on Mediterranean crops subjected to abiotic stress such as drought and low fertilisation

Challenge

The Mediterranean region is feeling the effects of climate change. The increase in temperatures and the low availability of water resources make it necessary to study new cultivation methods that are more efficient and adapted to these conditions.

Solution

The use of biostimulants based on natural and seaweed extracts provide crops with stress tolerance conditions, activating plant response mechanisms and protecting them against heat episodes or deficit irrigation.

Benefits

- Increase in soil organic matter
- Increase in biological relationships between soil microorganisms
- Increased synthesis of protective hormones in plant roots
- Crop more resistant to drought, salinity or heat due to the induction of defences
- Reduction of the cost of cultivation by reducing the water and fertilizer needed
- Increase in the final harvest

Applicability box

Theme
Mediterranean crops, efficient management, drought, salinity, heat, biostimulants, algae

Context
Mediterranean production area, especially with a risk of water availability in the future

Application time
From March to September

Required implementation time
1 day

Period of impact
Immediately after applying the biostimulant

Equipment
Specific irrigation equipment is required for incorporation into water or for foliar application

Practical recommendation

- For application via irrigation, the soil must be wetted beforehand. After application, an extra irrigation must be carried out to incorporate the product into the deepest areas of the roots.
- The field must be prepared beforehand, eliminating weeds and levelling the ground if necessary.
- Avoid making applications, either foliar or via irrigation, where there is the possibility of subsequent rain.
- Avoid mixing the biostimulant product with copper-based phytosanitary products.
- Periodically check and recalibrate irrigation, as it will almost certainly be necessary to reduce the previous water allocation. It is advisable to install capacitance probes in the plot to control the wet front and the need for irrigation water.
- It is recommended to evaluate the efficacy of the tested product by tree fruit counting or non-destructive evaluations, such as SPAD, NDVI, etc.

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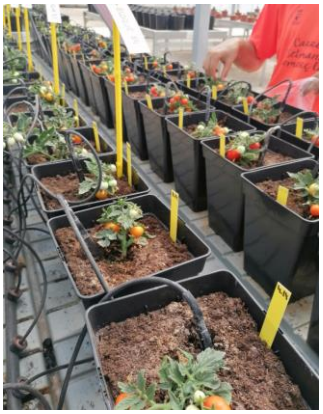
Picture 1. Field evaluation of broccoli trial

Picture 2. Broccoli rows with salinity and biostimulant

Picture 3. Avocado size measurement applied to avocados



Picture 4. Tomatoes in greenhouses under drought conditions

Further information

Web links

Project website:

https://www.larazon.es/comunidad-valenciana/hallan-producto-que-aumenta-rentabilidad-lechuga-brocoli-terrenos-sequia_20241014670ce340e2e54f0001801aae.html

Further reading

Effects and application of the product on avocado crop.

https://www.youtube.com/watch?v=P1CtzThDofQ&feature=youtu.be

https://www.youtube.com/watch?v=UEoD15IcLGk&list=PLqU_4ysqg2QmO7plsRi5r5C_M4mMFuVwW&index=1&t=1s&ab_channel=CLIMED-FRUIT

Contact information

Publisher: Valencian Farmers' Association (AVA-ASAJA)
C/ Guillem de Castro, 79. 46008 Valencia (Spain)
+34 96 380 46 06, www.avaasaja.org
Author(s): Montesinos, Carlos
Contact: info@avaasaja.org
Project partners: AVA-ASAJA, CALDIC, IBMCP

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Simplified cost/benefit analysis

Use of the new biostimulant Calbio® on Mediterranean crops subjected to abiotic stress such as drought and low fertilization

Introduction – presentation of ex-ante and ex-post situation

The effects of climate change are directly affecting crop productivity. Drought or salinity of irrigation water or soil are increasingly common phenomena in our region. Therefore, many crops have been displaced or have seen their yields reduced. In the context of global population growth and a reduction in the availability of natural resources used in agriculture, it is very important to find biotechnological solutions to increase the tolerance of crops to these abiotic stresses. Biostimulants are substances or microorganisms whose function stimulates plant processes related to nutrient absorption, nutrient efficiency, tolerance to abiotic stresses or the quality characteristics of the agricultural products obtained. Product development is focused on evaluating the agronomic efficacy of a combination of natural extracts in different Mediterranean crops under water and salinity stress conditions.

Under conventional management, the ex-ante situation considers a summer and winter vegetable crop in the Mediterranean zone. The ex-post situation considers the same crop, but with the biostimulant product applied and the irrigation dose reduced. The calculations have been made for a typical plot of 1 hectare.

Economical costs and benefits

The data refer to Valencia, a province located in the Mediterranean region of Spain. The seaweed part of the biostimulant products tested in the field comes from northern Europe. The microorganisms and natural extracts are prepared at the IBMCP facilities in Valencia and CALDIC's headquarters. The company that markets the biostimulant product will define its cost to the farmer.

Legend

Estimated indicator

Measured indicator

	Ex-ante	Ex-post
Variable costs	**€7000/ha**	**€6740/ha**
Input		
Soil preparation	€300	€300
Seeds	€1000	€1000
Fertilisers	€800	€640
Phytosanitary products	€600	€600
Irrigation water	€500	€400
Labor	€2500	€2500
Machinery and fuel	€700	€700
Other indirect expenses	€600	€600
COMPARISON	Global reduction of 4% of the cost: 	

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Environmental costs and benefits

Energy	Indicator improvement of 20%: 
The energy used to extract irrigation water was measured to obtain this indicator, either from a well or from the plot itself. No extra energy cost is considered in the ex-post analysis since the product is applied to the irrigation water.	
Water	Indicator improvement of 20%: 
The amount of water used for irrigation was measured in ex-ante and ex-post situations. These data were obtained through measurements made by the sensors used in the experimental plots, in parallel with other technologies such as automatic and flow meters.	
Soil	Indicator improvement of 15%: 
Incorporating biostimulants together with microorganisms helps to increase the organic matter content and the microbial populations of the soil, as well as the processes that occur in it. Improving soil structure helps to improve water retention. This indicator has been estimated with referenced literature data and checked with the Soil Department of the Polytechnic University of Valencia[4] [5] [2].	
Air	Not affected: 
Studies show no direct changes in air quality with biostimulant products. Nevertheless, if a yield increase is obtained with the same inputs due to stress alleviation, the amount of CO_2 per kg of the product decreases, diminishing the CO_2 footprint[3].	
Biodiversity	Indicator improvement of 15%: 
The application of biostimulant products based on algae extracts and microorganisms improves soil biodiversity, either due to the incorporation of the product itself or by improving the health and properties of the soil, favouring its establishment and the biological processes that occur in the initial centimetres of the soil. The indicator has been estimated from existing literature[1].	

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MODELCALBIOSTRESS –
Evaluation of the effects of a biostimulant on Mediterranean crops

Short description of the OG/project

The main objective of the project is to evaluate and characterise the biostimulant effect of the Calbio product, alone or combined with microbial biostimulants, in crops of high agronomic interest under conditions of abiotic stress such as drought, soil salinity or nutrient deficiency.

The data obtained allows us to characterise and quantify the effect of Calbio at an agronomic, physiological and molecular level to provide new products useful to farmers to maintain yield under adverse environmental conditions. Calbio is being tested for this purpose, both alone and combined with microbial biostimulants, in tomato, lettuce and pepper crops under greenhouse conditions, as well as in eggplant, pepper, onion, broccoli and avocado under field conditions. The stress conditions in the trial are drought, salinity and nutrient deficiency, and abiotic stresses that are increasingly common in agriculture.

Benefits

One of the benefits this project seeks is to increase the production of crops subjected to different abiotic stresses, as well as to reduce the use of agrochemicals, replacing them with biostimulants, not only in organic farming but also in conventional agriculture.

Stage of implementation

In progress; field trial development

Applicability box

Theme
Vegetables, broccoli; adaptive management; biotechnological technologies; energy efficiency; water-use efficiency

Context
Horticultural production area, especially at risk of water availability in the future.

Application time
All year

Required implementation time
1 month

Period of impact
Immediately after confirming the effect of the biostimulant for drought tolerance

Equipment
System for product application, via irrigation or foliar spraying

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Main achieved or expected results

- The application of the biostimulant Calbio, alone or in combination with microorganisms, stimulated the production of tomato and lettuce, not only under normal conditions, but also under salt stress. Of particular interest is the combination of Calbio with the bacterial strain *Bacillus* BM08, which resulted in a production increase of over 40% under salt stress.
- In addition, it was observed that combined treatment with the biostimulant Calbio and the bacterial strain BM08 stimulated the antioxidant regulation of lettuce and tomato plants under salt stress, as well as the production of isopentenyladenosine, a hormone from the cytokinin family related to the regulation of abiotic stress.
- In the current development of avocado trials, it is expected that foliar application of Calbio will improve avocado fruit set and reduce abiotic stress due to climatic conditions and soil properties.
- In the eggplant assays, currently in development, it is expected applying Calbio through fertigation will increase fruit production and quality under drought conditions, as well as its osmotic, antioxidant and hormonal defence.

Picture 1. Broccoli trial

Picture 2. Field evaluation

Picture 3. Greenhouse tomato trial

Existing materials

Web links

Project website:

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Further reading

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