



Case Study Summary: Jalapeño peppers, Autonomous University of Queretaro, Mexico, 2022



Time

Planting date at Nursery: July 12, 2022

Open sky transplant: September 1, 2022

Harvest: November 16-28, 2022

Place

University of Queretaro, México – Campus Amazcala and Campus Concá.

Details

Researchers: MC. Adán Mercado Luna (Campus Concá), and Dr. Ramón Gerardo Guevara González (Technical support, Campus Amazcala).

Crop: Jalapeño pepper plants (*Capsicum annuum*).

Area: the scientific trial was conducted in greenhouse, with total area 100 square meters .

Setup: four (4) experimental treatments with 20 plants in each, arranged in a randomized block experimental design; the treatments were as listed below:

TREATMENT	WATERING LEVEL
KPCB* and normal irrigation	100% of Field Capacity (FC)**
Control – Normal	100% of Field Capacity (FC)
KPCB under Water Stress	50% of Field Capacity (FC)
Control – Water Stress	50% of Field Capacity (FC)

*KPCB: Kyminasi Plants – Crop Booster

** Field Capacity (FC) is defined as the water content of a soil after gravitational drainage over approximately one (1) day.

Results

Based on the results detailed below, the researchers concluded that KPCB had biostimulating effects on plant growth variables, yield and resilience to high environmental stress.

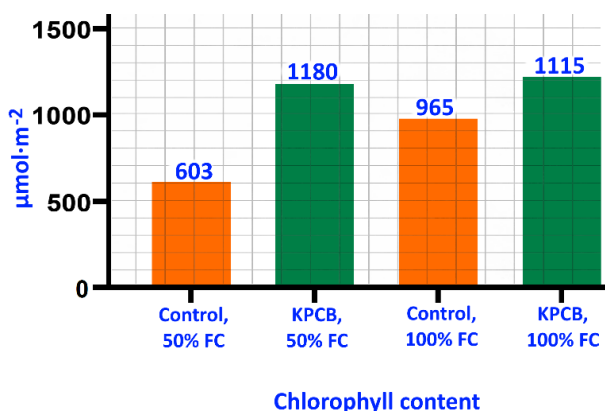


The results on morphological growth variables such as plant height and stem basal diameter (see table below) showed significant increase in plant height compared to the control for both types of irrigation levels evaluated. The researchers found it interesting that the height level of plants irrigated 50% with +KPCB matched the height of plants irrigated 100% without the system.

Peppers	Control, 50% FC	KPCB, 50% FC	Difference	Gain	Control 100% FC	KPCB, 100% FC	Difference	Gain
Stem Height (cm)	37.08	43.14	6.06	16%	38.62	45.44	6.82	18%
Stem Basal Diameter (cm)	10.56	11.47	0.91	9%	12.31	13.98	1.67	14%
Chlorophyll (µmol·m ⁻²), avg.	603	1180	577	96%	965	1215	250	26%
Fruit Weight per Plant (g), avg.	91.39	117.56	26.17	29%	223.01	299.21	76.2	34%

Root dry weight (g)	Control (25 samples): 169	KPCB (25 samples): 246	Difference: 77	Gain: 46%
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The figure clearly shows a biostimulant effect on the amount of **chlorophyll** at both irrigation levels evaluated when the KPCB is used, especially being significant in the case of water stress. Interestingly, the average chlorophyll level with KPCB and 50% reduction in water matched that of KPCB with no reduction, and it was nearly double its control chlorophyll level.



Root dry weight was 46% higher with KPCB, signifying greater carbon sequestration. These results suggest that the Kyminasi system increases the photosynthetic potential and root density of the Jalapeño pepper plant and therefore higher production is expected at the end of the crop.

Yield

The results show significant increases in fruit weight yield per plant for both irrigation levels evaluated in this research: 34% higher yield without water reduction, and 29% with half the water.

Pest, Virus, and Heat Resilience

During the crop cycle, the significantly positive results listed above have been achieved DESPITE high environment stress of numerous types:

- Plants were attacked by several pests that included mainly whiteflies, thrips, and worms.
- Chili producers were affected by a virus that could not be controlled and reduced production, not only in this project but also in a large part of the Conca valley.
- Regarding heat resilience, the researchers stressed that (quote): “It is also VERY IMPORTANT to point out that the planting season of this evaluated crop was carried out during the most complicated time of the year to produce chili peppers in the semi-desert area of Querétaro (place where the Amazcala campus is located), since heat stroke (temperatures which fluctuated between 25-28 degrees Celsius at night and peaks of up to 45-48 degrees during the day, normally make the cultivation of this species very complicated at this time, however, interesting results were obtained on the biostimulant potential of the Kyminasi Plant Booster system.”

Cellular-Level Validation of the Biostimulant Potential of KPCB

Indicators of immunity and biostimulation were measured at the level of antioxidant enzymatic activities at the level of plant tissues such as superoxide dismutase¹ (SOD) and catalase² (CAT), whose results indicated that their activity levels correlate with adequate maintenance of stress levels. Oxidative that favor growth (biostimulation), in both treatments evaluated in comparison with their respective controls despite the aforementioned climatic conditions.

Researchers’ Conclusions

The biostimulant effect of the KPCB system was shown both in greenhouse and open-air tests. Induction of plant immunity indicators (antioxidant enzymes) was shown, as well as a better development of the plant compared to the control.

The KPCB system WORKS AS A BIOSTIMULANT and probably as an elicitor (vaccine) for the plants, the latter based on the result that was observed in the open on production under virus conditions in the Conca region, which caused lower yield, but no production in the area based on reports from other producers in the region who had to abandon their cultivation due to this situation.

¹ Superoxide dismutase (SOD) is an enzyme found in all living cells. It helps break down potentially harmful oxygen molecules in cells.

² Catalase (CAT) is an enzyme found in plants that protects cells from oxidative damage by breaking down hydrogen peroxide (H₂O₂) into water and oxygen.