Phyto-C_3™ Field Story

Greenhouse application in the production of Habanero chili peppers

Location (21°2'35.47" N, 87°5'21.75" W)
Township of Leona Vicario in the Municipality of Puerto Morelos, Quintana Roo, Mexico. Agronomist engineer Eliseo Sanchez | in collaboration with agriculture engineering students of the FESC facility for the National Autonomous University of Mexico (UNAM).



Product
Liquid biocatalyst; transparent; nontoxic; non caustic. Contains highly purified water; yeast extracts and nonionic surfactant.

Objective
Demonstrate the benefits offered by the technology for agriculture applications:

1. Added to the irrigation system in 2 to 4 ppm (parts per million)
   - Maintain the irrigation clean.
   - Increase plant strength and production yield.
2. Foliar application at 1:1000 (product-water ratio)
   - Pest control

Methadology
Three independent set, or lots, of drip irrigation systems were used (A), (B) and (C), each with its own irrigation tank of 1,000 L and 340 plants each. Each set was subdivided into two varieties of Habanero plants; 50% Mayan Kisin and 50% Mayan Bal'che. The water for every irrigation tank was supplied from the same water well, with a depth of 20 meters into the aquifer. Each lot received the same amount of water and nutrients from the moment of transplant in January 2019; 5 daily liters of water per plant and 1 kg of nutrients for each 1,000 liters of water during the plant's mature phase, all through the initial harvest on May 9th.

Product dilution for each lot of drip irrigation systems:

(A) 1 part product (BOC) for each 500,000 parts of water (2 ppm)

(B) 1 part product (BOC) for each 250,000 parts of water (4 ppm)

(C) Control lot, with no product use (BOC) in the irrigation systems.

March 12th

(A) BOC 2ppm

Average height = 60 cm Avg. ramifications = 2-3 Flowering -> YES

(B) BOC 4ppm

Average height = 60 cm Avg. ramifications = 4 Flowering -> YES greater

(C) control

Average height = 28 cm Avg. ramifications = 2 Flowering -> NO

March 18th

Filters check:

(A) BOC 2ppm

Saturation from micro-algae -> NO Need for acid purge -> NO

(B) BOC 4ppm

Saturation from micro-algae -> NO Need for acid purge -> NO

(C) Control

Saturation from micro-algae -> YES Need for acid purge -> YES

May 9th

Initial harvest

1st evaluation

(A) BOC 2ppm

340 Plants
Average fruits per plant 7.48
Average weight fresh
13.69 gr. per fruit
Number of fruits per Kg. 73
Total yield 34.8 Kg.

(B) BOC 4ppm

340 Plants
Average fruits per plant 11.68
Average weight fresh
9 gr. x fruit
Number of fruits per Kg. 111
Total yield 35.75 Kg.

(C) control

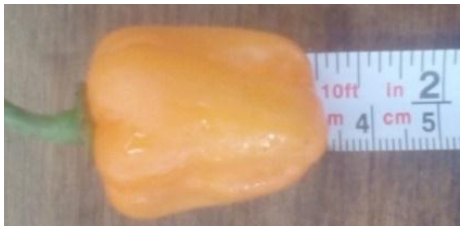
340 Plants
Average fruit per plant 5.73
Average weight fresh
13.51 gr. x fruit
Number of fruits per Kg. 74
Total yield 26.30 Kg.

Initial conclusions:

1. Yield increase = 32% with 2ppm (A) in relation to (C)
2. Yield increase = 36% with 4ppm (B) in relation to (C)
3. Yield increase = 03.6% with 4ppm (B) compared to the 2ppm lot (A)

(A) BOC 2ppm

(B) BOC 4ppm



(C) control

Consecutive evaluations; total yields at harvest:

2nd evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 38.62 Kg.	Total yield 33.31 Kg.	Total yield 31.93 Kg.

3rd evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 31.06 Kg.	Total yield 32.471 Kg.	Total yield 28.76 Kg.

4th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 40.97 Kg.	Total yield 40.51 Kg.	Total yield 25.26 Kg.

5th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 39.68 Kg.	Total yield 34.95 Kg.	Total yield 25.46 Kg.

6th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 27.59 Kg.	Total yield 38.30 Kg.	Total yield 16.33 Kg.

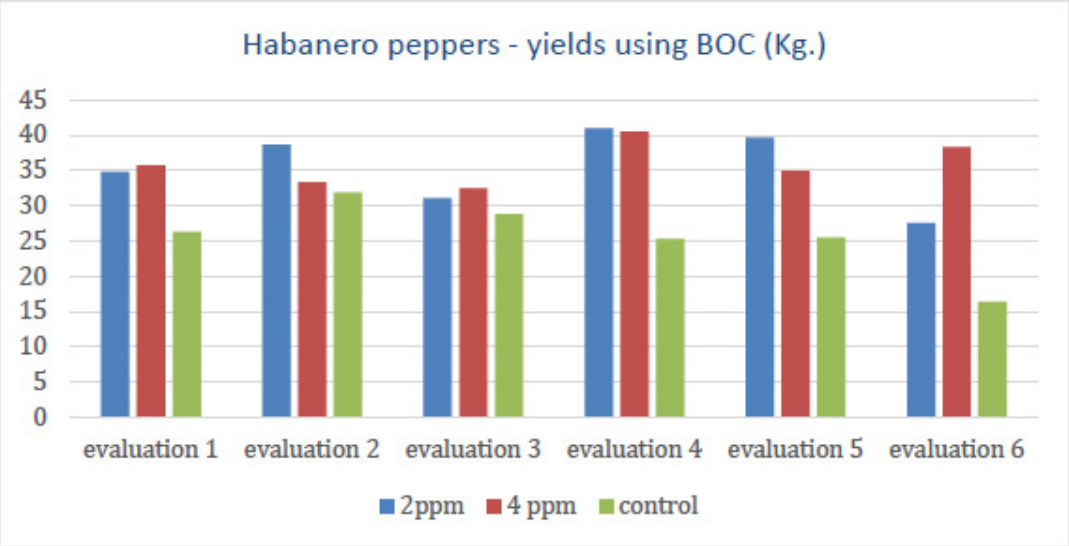
Adjustment: After the fifth evaluation it was deemed necessary to increment the nutrient delivery to 2 kg for each 1,000 liters of water (double), to compensate for the high increase in yields on the 4 ppm lot but significant reduction in fruit size and weight.

7th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Average weight fresh 12.99 gr. per fruit Number of fruits per kg. 77 Total yield 28.43 Kg.	Average weight fresh 10.20 gr. per fruit Number of fruits per Kg. 98 Total yield 36.52 Kg.	Average weight fresh 11.49 gr. per fruit Number of fruits per Kg. 87 Total yield 14.05 Kg.

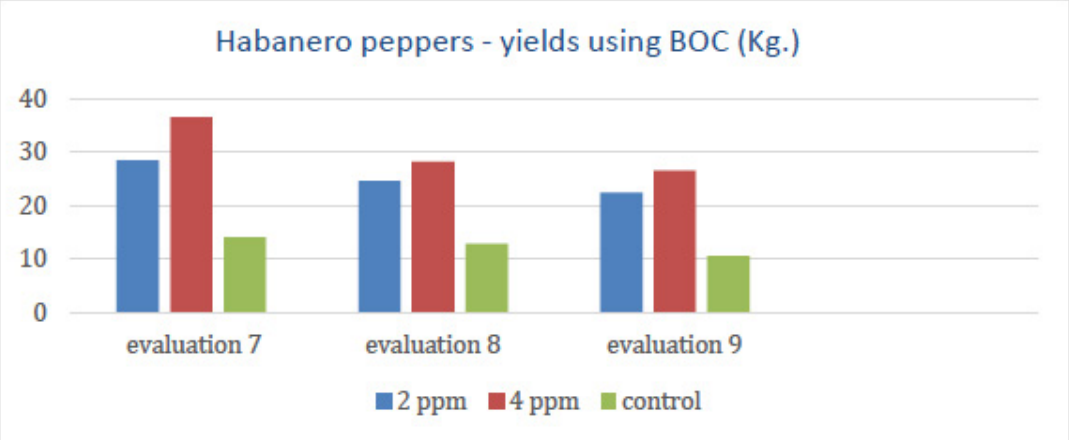
8th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Total yield 24.58 Kg.	Total yield 28.17 Kg.	Total yield 12.87 Kg.

9th evaluation	(A) BOC 2ppm	(B) BOC 4ppm	(C) control
	Average weight fresh 12.99 gr. per fruit Number of fruits per kg. 77 Total yield 28.43 Kg.	Average weight fresh 10.20 gr. per fruit Number of fruits per Kg. 98 Total yield 36.52 Kg.	Average weight fresh 11.49 gr. per fruit Number of fruits per Kg. 87 Total yield 14.05 Kg.

Initial Harvests



After Adjustment



Final conclusions:

Average results of initial harvests; 1 through 6
1. Yield increase = 38% using 2ppm (A) in relation to control (C)
2. Yield increase = 40% using 4 ppm (B) in relation to control (C)
3. Yield increase = 1.7% using 4ppm (B) compared to using 2ppm (A)

Average results in total harvests; evaluations 1 through 9
1. Yield increase = 50% using 2ppm (A) in relation to control (C)
2. Yield increase = 60% using 4 ppm (B) in relation to control (C)
3. Yield increase = 9.5% using 4ppm (B) compared to using 2ppm (A)

NOTE – Once the nutrients were adjusted, there was an increase in the average weight of the fruit from the 4 ppm lot, which normalized its size and weight in relation to the other two lots.

Average results in harvests after the amount of nutrients were adjusted; harvests 7 through 9
1. Yield increase = 100% using 2ppm (A) in relation to control (C)
2. Yield increase = 140% using 4 ppm (B) in relation to control (C)
3. Yield increase = 42.1% using 4ppm (B) compared to using 2ppm (A)

Foliar application for plague control

A. Applying only BOC at the recommended doses of 1 c.c. per liter of water - once a week.

B. Applying BOC combined with pesticide 1 c.c. and 2 c.c. respectively – once a week.

C. Applying BOC combined with organic pesticide 1 c.c. and 3 c.c. respectively – once a week.

D. Applying only pesticide at the recommended doses of 1 c.c. per liter of water – once a week.

E. Applying only BOC at 1 c.c. per liter of water - twice a week.

F. Applying only BOC at 1 c.c. per liter of water – three times a week.

	White Fly		Mites	observations
	settlement	presence	presence	
A	YES	YES	NO	White Fly settlement started to occur in April.
B	NO	NO	NO	**OPTIMUM RESULTS**
C	YES	YES	NO	No control of White Fly
D	YES	YES	NO	Does not help to control White Fly settlement and only provides marginal control of its presence, as it quickly develops a resistance to the product.
E	YES	YES	NO	
F	NO	YES	NO	Even though it managed to prevent any settlement, the presence of White Fly represented a significant damage to the plants.

Fruit Quailty

The use of BOC both in the irrigation system as well as with foliar applications did not affect the appearance, taste or spiciness of the fruit.

A blind taste test was conducted with 10 people that consume habanero peppers on a regular basis. None of them were able to detect any difference between fruit samples from either of the three test lots; (A), (B) or (C).

Case Study conducted by Grupo Drako.

TRANSLATION: SIGNED LETTER OF ACKNOWLEDMENT FROM THE STATE MINISTRY OF AGRICULTURE, RURAL AND FISHING DEVELOPMENT

Quintana Roo
STATE LOGO

C.P. FRANCISCO ATONDO MACHADO

Director for the northern region

S E D A R P E

Ministry of Agriculture,
Rural and Fishing

Official letter no. SEDARPE/OS/SDI/DRZN/41/2019
Subject: Letter of Validation
Cancun, Quintana Roo, July 23rd 2019
"2019, Year of respect for Human Rights"

To whom it may concern:

By the present official letter I do hereby faithfully attest to the reliability of the field tests and results that were obtained by agronomist engineer Eliseo Sanchez Hernandez and his team, in the application of the liquid biocatalyst BOC, for its English acronym, under controlled conditions, in the production of Habanero chili peppers by way of drip irrigation greenhouse system in the region of Leona Vicario, Municipality of Puerto Morelos, Quintana Roo.

Engineer Sanchez has been engaged in continual testing with said technology since December of 2018, assisted by students of the school of higher studies of Cuautitlan of the National Autonomous University of Mexico, for whom the work has served as a central subject for their professional thesis for their degree in agriculture engineering.

S I N C E R E L Y

MINISTRY SEAL

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