



# Continental Cucumbers & Suspected Fusarium Oxysporum



## Disease Background

Fusarium Oxysporum (F.O.C.) has a devastating affect as a fungal disease in many plant species. The first symptoms is normally wilting leaves at the bottom of the plant and the usual entry point for the pathogen is through the root tips of the plant. As F.O.C travels through the plants xylem (and or xylem and sometimes phloem) it interferes with the water conducting vessels. This then progresses through out the plant, spreading the infection, leading to the eventual complete death of the plant.

F.O.C is enduring in its nature and once the growing area is infected, from irrigation water, soil or host associated and transported it is very difficult to control and may lay in dormancy over many years awaiting re activation.



## Trial Objective

The objective of this trial was to ascertain whether using Bioptiv Bactivate granule and Bactivate liquid products could impact the severity or occurrence of F.O.C. in the growing of continental cucumbers grown hydroponically in coir substrate. The objective was to inoculate the substrate with Bactivate products in the attempt to increase the plants defense response systems and immune response to F.O.C.

## Trial Location

- The trial was conducted at a commercial cucumber farm located in SE Qld.
- Trial was initiated on 23<sup>rd</sup> January 2019 and completed on 3<sup>rd</sup> April 2019.
- The cucumbers grown in hydroponic coir grow bags on suspended trellis in greenhouse.
- Plastic housing greenhouses with high wall and ventilation in each end.
- Block consists of 8 arches with rows of 47 metres
- Irrigation through arrow emitters on a climate controlled automatic system.
- UV sterilization of the water supply is in place



# Trial Parameters

## Trial Area

- 8000 Tribunal Continental Cucumber plants in total were utilised for this trial in 4 blocks of trial areas. Each trial area consists of 2000 plants.



## Trial Legend

The trial areas were divided into sections with **2000 plants per trial area**

- **TGF** – treated with Bactivate granule (5 bacillus)
- **CTL 1** - control not treated area 1
- **TLF** – treated with Bactivate Plus Liquid (5 bacillus)
- **CTL 2** - control not treated area 2.

## Testing Parameters

- 11 plant death counts were done throughout trial time frame from 23<sup>rd</sup> January to 3<sup>rd</sup> April 2019
- Leaf test completed comparison from 3 sites taken on 27th February 2019
- All testing completed by independent Australian laboratories. **ASPAC approved.**



## Trial Pre-Treatments

The following was carried out prior to Bactivate biological product applications.

- All plants are dipped in seaweed solution Seasol 750ml to 200 litre of water and included Previcur (active Propamocarb 600 g/L) 150ml .
- Grow bags are pre – wet and calcium nitrate is injected through the system at the initial instance.
- All biological application of products took place after the above and at the 3 days planted stage of the seedlings.
- The normal fertiliser regime was kept in place and equal across all trial areas.



## First Application – 23<sup>rd</sup> January 2019

### TGF - treated Bactivate granule

- 3 grams per plant on top coir in the bag.
- Bactivate Bioboost + liquid at 200ml and Bactivate Seaweed at 100ml to 30 litres water.
- Applied by back pack spray with nozzle removed from lance.

### CTL 1 - control not treated

- Plants not treated.

### TLF – treated liquid biology

- Bactivate Plus Liquid at 100ml, Bactivate Bioboost + liquid at 200ml and Bactivate Seaweed at 100ml to 30 litres water.
- Applied by back pack spray with nozzle removed from lance.

### CTL 2 - control not treated

- Plants not treated.



## Second Application – 8<sup>th</sup> February 2019

### TGF - treated Bactivate granule

- Bactivate at 90ml, Bactivate Bioboost + liquid at 400ml and Bactivate Seaweed at 200ml to 30 litres water
- Applied by back pack spray with nozzle removed from lance.

### CTL 1 - control not treated

- Plants not treated.

### TLF – treated liquid biology

- Bactivate at 90ml, Bactivate Bioboost + liquid at 400ml and Bactivate Seaweed at 200ml to 30 litres water
- Applied by back pack spray with nozzle removed from lance.

### CTL 2 - control not treated

- Bactivate liquid at 105ml to 45 litres water applied through backpack. Used to treat powdery mildew.





## Third Application – 1<sup>st</sup> March 2019

### TGF - treated Bactivate granule

- Bactivate Bioboost + liquid at 400ml and Bactivate Seaweed at 200ml to 30 litres water
- Applied by back pack spray with nozzle removed from lance.

### CTL 1 - control not treated

- Plants not treated.

### TLF – treated liquid biology

- Bactivate Bioboost + liquid at 400ml and Bactivate Seaweed at 200ml to 30 litres water
- Applied by back pack spray with nozzle removed from lance.

### CTL 2 - control not treated

- Bactivate liquid at 105ml to 45 litres water applied through backpack. Used to treat powdery mildew.



# Trial Results

## Trial Visuals

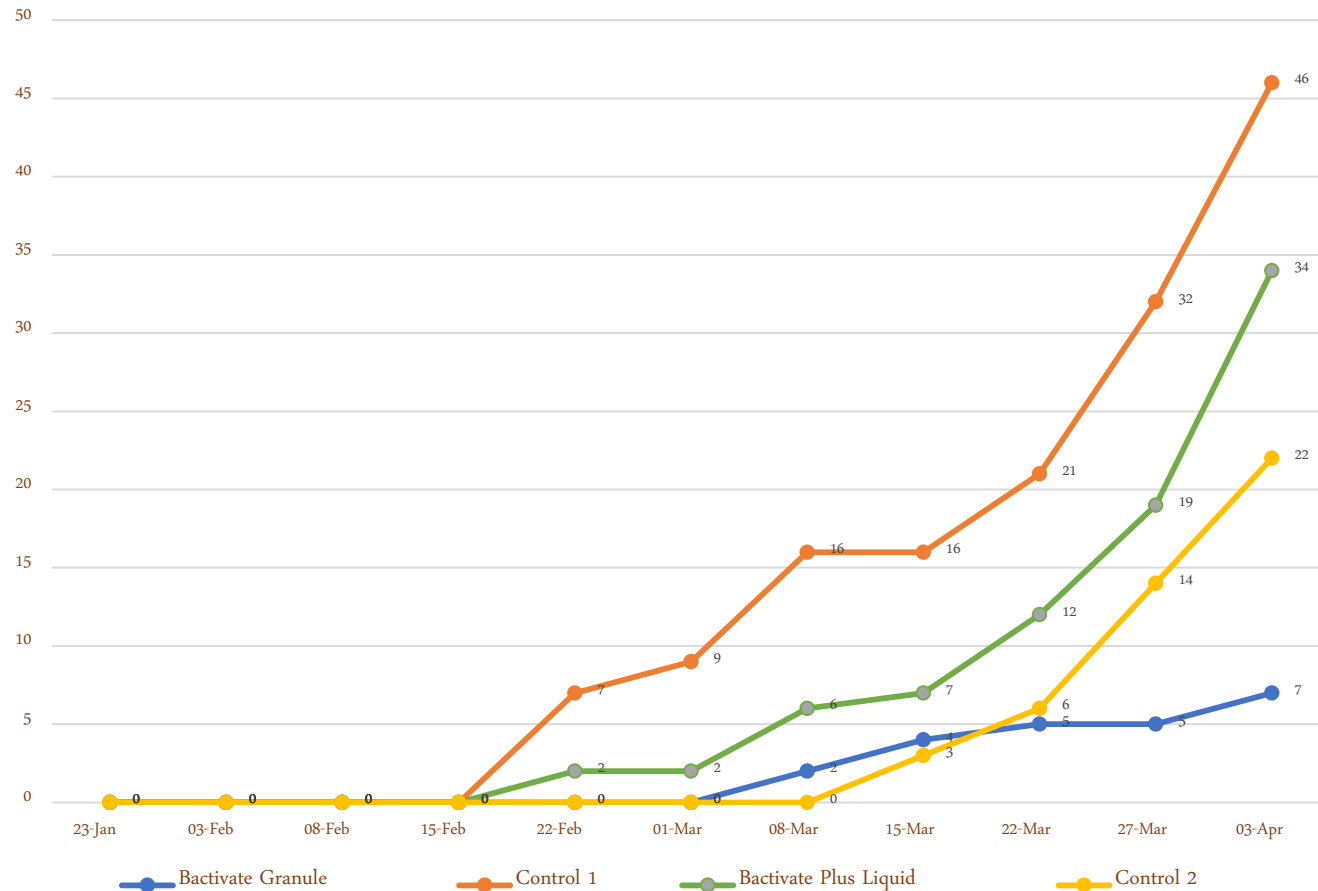
Cucumber plants suffering suspected F.O.C.



# Trial Results

## Plant Death Counts

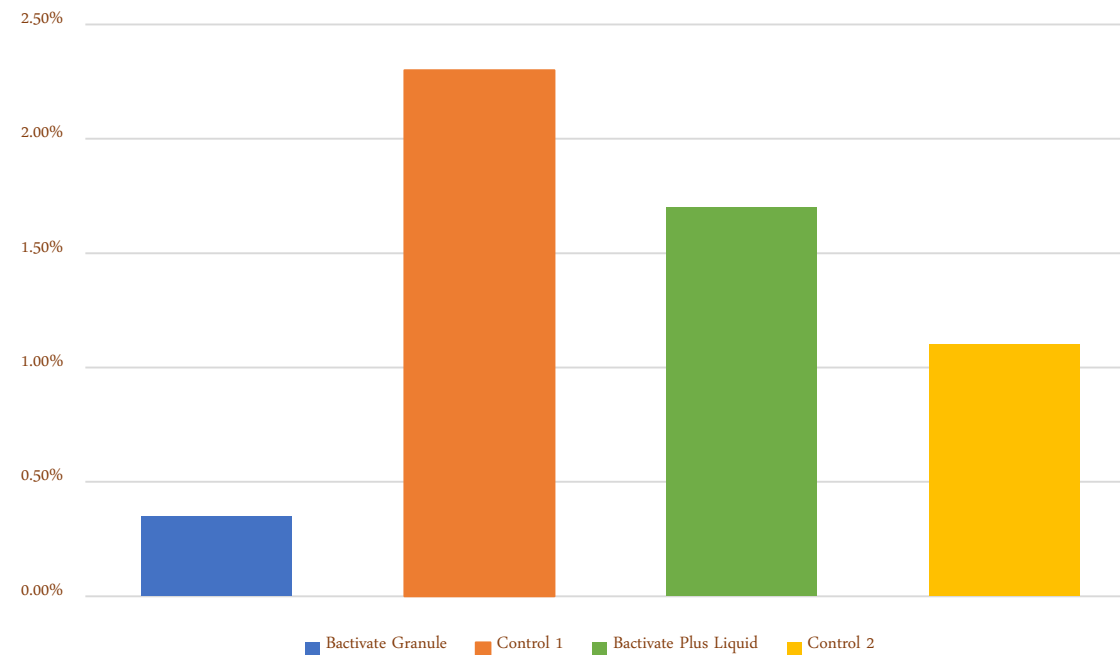
- Plant death counts were conducted from 23<sup>rd</sup> January through to 3<sup>rd</sup> April.
- 11 plant counts were done in total



## Plant Death Counts

- TGF – Showed showed the best results with the number of plant losses stabilizing after this trials initial plant losses.
- TLF – This area displayed lower plant losses at the beginning of this particular trial but higher losses towards the end of the applications of biological inputs.

Percentage Plant Deaths in Trial Areas



# Trial Results

## Leaf Tissue Test – 27<sup>th</sup> February 2019

		Sample 1	Sample 2	Sample 3
	Sample ID:	TGF	TLF	CNT
	Crop:	Cucumber	Cucumber	Cucumber
	Client:	Pham	Pham	Pham
Parameter	Method reference	H8970/1	H8970/2	H8970/3
Nitrogen (%)	LECO Trumac Analyser - Inhouse S4a	5.87	5.79	5.91
Phosphorus (%)	Nitric Acid digest - APHA 3125 ICPMS	0.72	0.70	0.76
Potassium (%)	Nitric Acid digest - APHA 3125 ICPMS	5.65	5.58	5.34
Sulfur (%)	LECO Trumac Analyser - Inhouse S4a	0.95	0.89	1.05
Carbon (%)	LECO Trumac Analyser - Inhouse S4a	39.4	39.5	39.7
Calcium (%)	Nitric Acid digest - APHA 3125 ICPMS	3.29	3.12	2.99
Magnesium (%)	Nitric Acid digest - APHA 3125 ICPMS	0.54	0.54	0.48
Sodium (%)	Nitric Acid digest - APHA 3125 ICPMS	0.03	0.03	0.03
Copper (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	12	11	12
Zinc (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	26	31	29
Manganese (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	208	214	191
Iron (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	208	185	127
Boron (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	89	89	84
Molybdenum (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	5.6	5.0	5.9
Cobalt (mg/kg)	Nitric Acid digest - APHA 3125 ICPMS	<0.1	<0.1	<0.1
Silicon (mg/kg)	**Nitric Acid digest - APHA 3125 ICPMS	551	533	534
Nitrogen : Sulfur Ratio		6.2	6.5	5.6
Nitrogen : Phosphorus Ratio	**Calculations	8.2	8.2	7.8
Nitrogen : Potassium Ratio		1.0	1.0	1.1
Carbon : Nitrogen Ratio		6.7	6.8	6.7
Crude Protein (%)	**Calculation: Total Nitrogen x 6.25	36.7	36.2	36.9



## Leaf Tissue Test Analysis

- The leaf test results show the correction of the Biochemical sequence bringing the high N and P back into normal parameters.
- Also the test illustrate increasing Silicon, Boron, Calcium, Magnesium, Manganese, Iron which will aid in fruit quality and colour as well as plant structure and health.

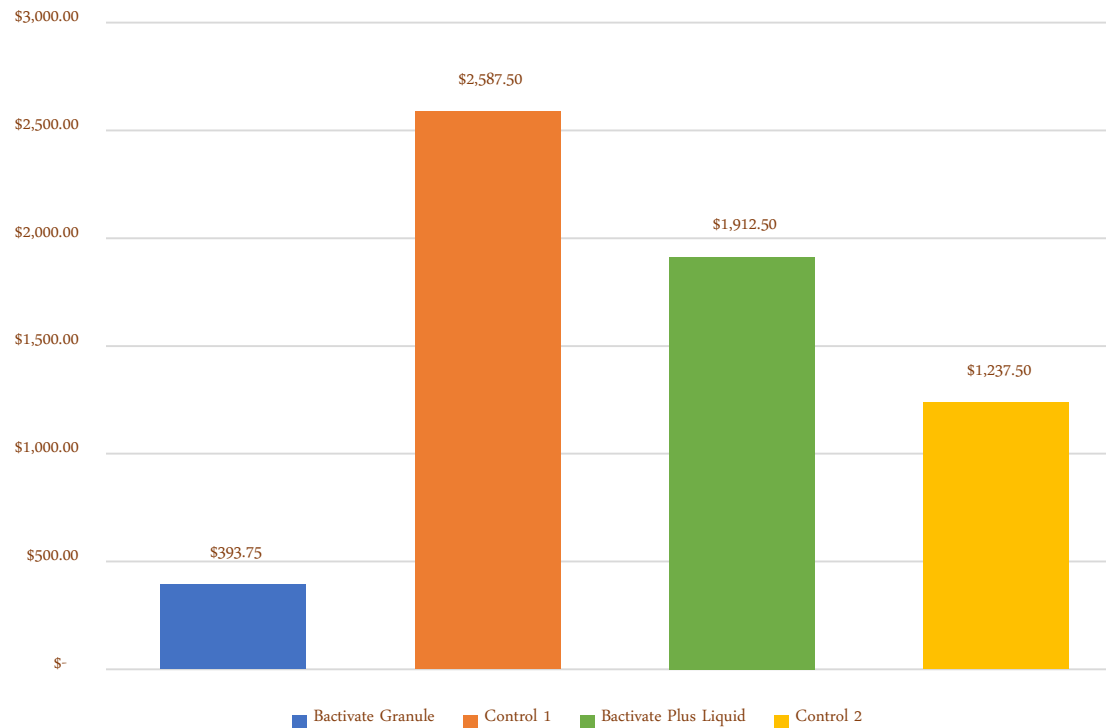
% Change on Control

	TGF	TLF
Nitrogen	-0.60	-2
Phosphorus	-5.5	-8.5
Potassium	5	4.49
Sulphur	-10.5	-17.9
Carbon	-0.7	-0.5
Calcium	10	4.3
Magnesium	12	12
Sodium	0	0
Copper	0	0
Zinc	-11.5	6.9
Manganese	8.9	12
Iron	63.7	45.6
Boron	5.9	5.9
Molybdenum	-5	-18
Cobalt	0	0
Silicon	3.1	-0.1
N/S Ratio	10.7	16
N/P Ratio	5	5
Carbon/N Ratio	0	1.4
Crude Protein	-0.5	-1.9



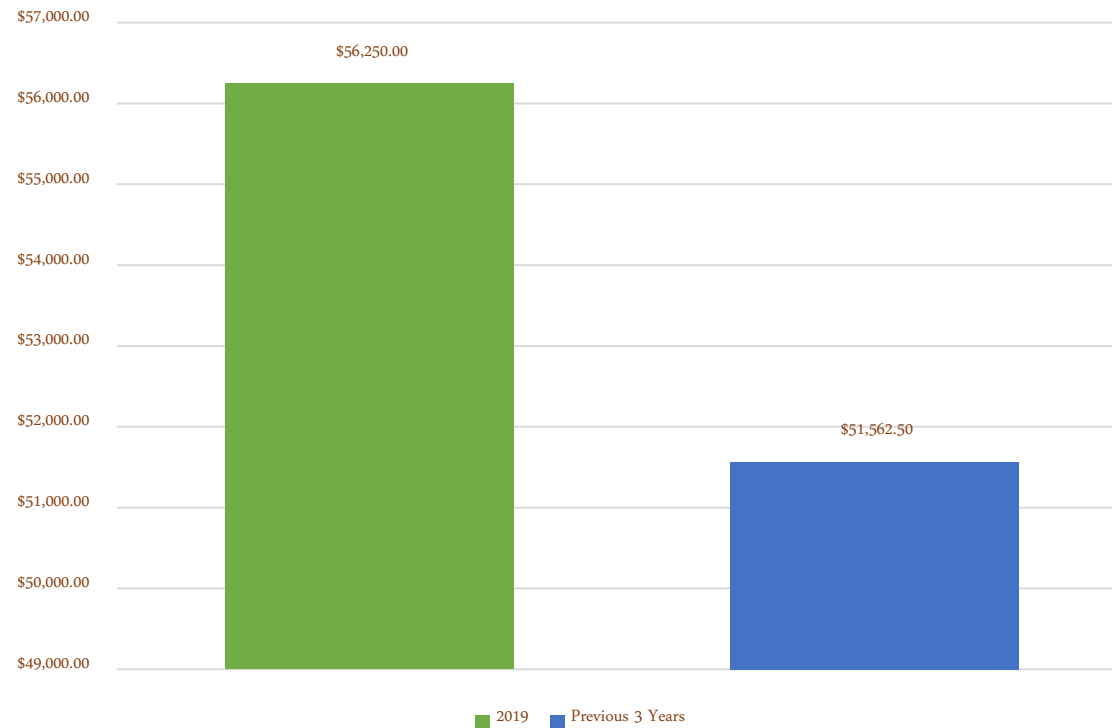
## Financial Analysis – Loss of Yield per 8,000 Plants

- Figures are based upon pick figures for entire area planted. 8000 plants
- 4,500 bags picked from 8,000 plants with 15 fruit per bag
- Sell per bag for annual average is \$12.50 per bag.
- Cost of Bioactive Soil Solutions program, per 8,000 plants, is \$1,159.95



## Financial Analysis – Yield Improvements per 8,000 Plants

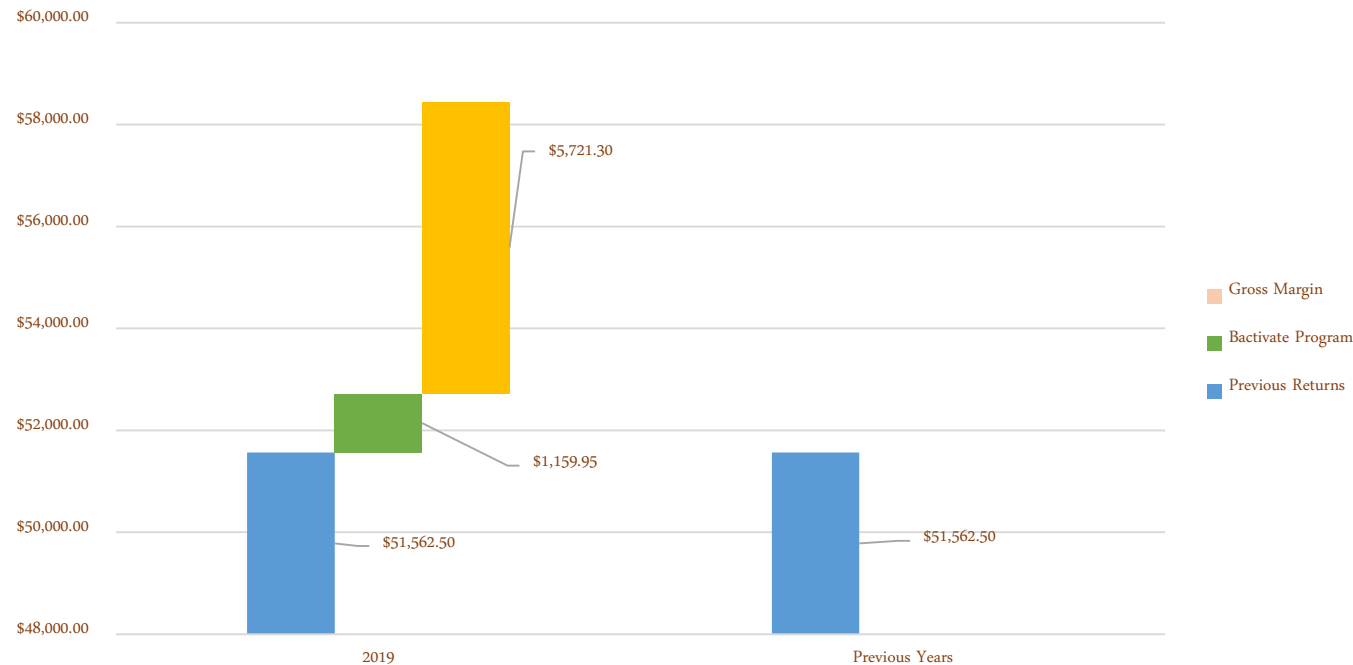
- Figures are based upon pick figures for trial. 8000 plants
- 4,500 bags picked from 8,000 plants with 15 fruit per bag.
- Previous 3 per year average 4,125 bags for 8,000 plants.
- **Improvement of \$4687.50 per 8000 plants.**





## Gross Margin Analysis

- The trial demonstrates that there is a advantage for both disease suppression assistance and yield improvements.
- With a combined return of \$6881.25 the Bioactive program provides a return of **5.9 times on investment** per 8,000 plants.
- **For this trial farm it represents an annual return of \$34,327.80**



## Other Potential Savings

There are of other savings that will be investigated for future applications

- Non use of Metham Sodium. This represents a cost of \$830.00 plus labour to prepare are and remove covers for fumigation.
- The savings with coir bags. These are replaced when disease levels exceed 20%, which is normally the third crop. Replacement bags cost \$19,000.00 plus labour and disposal.
- Further disease suppression utilising biology for
  - Dipping tools
  - Hygiene
  - Spraying greenhouse





# BIOACTIVE

SOIL SOLUTIONS

