PRIMARY BEAG

Trial Data

Developed in coordination with Primary Ocean, Public Benefit Corporation





Executive Summary

Primary Ocean owns intellectual property for the production and processing of *Macrocystis pyrifera*, giant kelp, the fastest growing macroalgae in the world, into a range of high value specialty organic agricultural and horticultural crop inputs. Our product development portfolio currently consists of a liquid biostimulant giant kelp extract and we are working toward organic cloning mediums, biopesticides and more. Primary currently has trial data from sixteen crop trials from California, Colorado, and Mexico. We seek partners to conduct more trials on high value specialty crops.

Strawberries (*F.* × *ananassa*)

• +82.5% root mass development; + \$2,250 marketable yield increase per acre Grape Vine (*Vitis vinifera*)

• +39% Yield Increase at 35 Liters per Hectare with 10 applications **Pecan** (*Carya illinoensis*)

• +20% Yield Increase at 64 Liters per Hectare with 8 applications Tomato (*Licopersicum esculentum*)

• +94% increase Weight of Fruits at 9 Liters per Hectare with 10 applications Broccoli (*Brassica oleracea*)

• +70% head weight; +35% head diameter at 9 Liters per Hectare with 4 applications Carrot (*Daucus carota*)

• +25% Weight; +11% Height at 9 Liters per Hectare with 4 applications Cucumber (*Cucumis sativus*)

• +24% Weight at 6 Liters per Hectare with 3 applications

Chickpea (Cicer arietinum)

• +15% increase in Weight of grains at 9 Liters per Hectare with 3 applications **Pumpkin** (*Cucurbita pepo*)

• +46% Dry weight; +70% number of fruits at 6 Liters per Hectare with 4 applications Bean (*phaseolus vulgaris*)

• +22% increase in Weight of grains at 9 Liters per Hectare with 4 applications Wheat (*Triticum aestivum*)

• +24% 1000 grain weight at 16 Liters per Hectare with 3 applications Alfalfa (*Medicago sativa*)

• +16% Dry Weight of Grains at 9 Liters per Hectare with 6 applications Chile (*Capsicum annum L*.)

• +13% number of fruits at 9 Liters per Hectare with 3 applications Watermelon (*Citrullus lanatus*)

• +5% Weight; +37% Number of Fruits at 6 Liters per Hectare with 3 applications Cauliflower (*Brassica oleracea*)

• +6% Height +11% Central Head Diameter at 9 Liters per Hectare with 4 applications **Potato** (*Solanum tuberosum*)

• +21% Root Length +4.6% Height at 3 Liters per Hectare with 4 applications Hemp (*Cannabis sativa*)

• First commercial trial resulted in first customer.



Strawberries (*F.* × *ananassa*)

Holden Research & Consulting, a premier Bioag independent researcher in California, has found that seaweed biostimulants fit into agriculture production programs by 1) increasing Nutrient Use Efficiency, 2) competitive inhibition of pathogens in the rhizosphere, 3) stimulation of plant's natural defense mechanisms, 4) are supplemental in nature, that is they are not a replacement for the seventeen essential elements, but they can help alongside fertilization and pest control. This year we used Holden Research to test Primary's Organikelp, which uses the species Macrocystis Pyrifera, head-to-head against the industry incumbent, Acadian, which uses Ascophyllum Nodosum. After 18 picks, Primary's Organikelp outperformed Acadian and delivered the farmer an increase of \$2,500 in marketable yield per acre over the grower standard.



Primary Ocean in Strawberries - Ventura County - Winter 2020 - Cumulative Differential from Grower Standard Return

Means followed by the same letter do not significantly differ (P=.10,NDMRT)

Holden Research and Consulting - David Holden



Latin American Trial Data

Our Latin American trials were conducted by a group of researchers at the University of Sonora in Mexico through a combination of greenhouse and field trials which we have summarized in this executive summary. We believe that the extraordinary claims that are reported in these Latin American trials should be tested in the United States. The soil and varietals and weather are different and the plants are likely to experience different biotic and abiotic stresses. We also believe that there needs to be more research into the best application rates because our Latin American trials show that there are differences in results dependent on the rate of application.

Variety	Testing Area	Cycle	L/ ha	Yield Increase	Irrigation System	Administration L/ha
Cabernet Sauvignon	Rancho Llano Colorado, Valle de Santo Tomas, Ensenada, B.C.	May- Oct	35	39.00%	Drip Irrigation	Once every 2 weeks: May: $4L + 4L$ June: $4L + 4L$ July: $4L + 4L$ August: $3L + 3L$ September: $3L + 2L$ October: $0L$
Perlette and Superior	Campo Agrícola San Luis, Costa De Hermosillo, Sonora.	Feb - May	30	No abnormalities or negative outcomes. Normal physiological development	Drip Irrigation Foliar spraying	15 days prior to the beginning of the flowering stage until fruit development. Drip irrigation: 5 L/ha (3 applications) Foliar spraying: 3 L/ha (5 applications)
Flame and Superior	Campo Agrícola Paulino Fontes, Valle De H. Caborca, Sonora.	One Year	35	40% less fertilizer 100% less root growth promoters. 100% less soil amendments. No soil insecticide use. 70% less foliar insecticide. 90% less foliar fertilizer application. 50% less fungicides. 40% less water use. 30% less electricity cost (kw/h).	Not specified	Not specified

Grape vine (Vitis vinifera)



Pecan (Carya illinoensis)

Variety	Testing Area	Cycle	L/ ha	Yield Increase	Irrigation System	Administration L/ha
Wichita and Western	Campo Agrícola La Brea. Costa de Hermosillo, Son.	March - June	64	20.46%	Drip Irrigation	Once every 2 weeks: March: 9L + 9L April: 8L + 8L May: 8L + 8L June: 7L + 7L
Wichita and Western	Campo Agrícola La Brea. Costa de Hermosillo, Son.	June - Sept	30	33.41%	Drip IrrigationA nd Foliar spraying	Once a month: June: 10 (drip) July: 3 (foliar spray) August: 7 (drip) September: 10 (drip)
Mahan	Campo Agrícola San Rafael, Costa De Hermosillo, Son.	June - Aug	30	37.88 %	Drip Irrigation	Once a month: June: 10 July: 10 August: 10







Tomato (Licopersicum esculentum)

Best Application Rate	9 Liters per Hectare with 10 applications after first true leaves on 12/15, 1/4, 1/18, 2/8, 2/22, 3/8, 3/23, 4/7, 4/21, 5/5
Height	+5.8%
Number of Fruits	+97.9%
Chlorophyll	+11.4%
Polar Diameter	+15.6%
Equatorial Diameter	+9.8%
Weight	+94.9%
Time & Location of Study	The experiment was carried out under shady house conditions in the company Agrícola Boui SA de CV, located in Block 515, 13th street between 400 and 500 of the Yaqui Valley, Sonora. In 2011.
Treatments and Experimental Design	A simple random design was used, with four treatments, where $T0 = 0$ (Liters per hectare) of Primary Ocean Biostimulant; $T1 = 3$ (Liters per hectare); $T2 = 6$ (Liters per hectare); $T3 = 9$ (Liters per hectare).



Broccoli (Brassica oleracea)

Best Application Rate	9 Liters per Hectare with 4 applications on 9/17 (floral induction), 9/24 (flowering), 10/7 (fruiting), 10/20 (grain filing)
Height	Highest Individual Height
Relative Growth Rate Increase	+14.3%
Chlorophyll	Highest chlorophyll units
Central Head Weight	+70%
Center Head Diameter	+34.7%
Number of Side Heads	+10.81%
Aerial Dry Matter	+15.86%
Time & Location of Study	The experiment was done at the Greenhouse at Technological Institute of Sonora, Mexico. The greenhouse has glass coated and shaded mesh, conditions of controlled temperature, cement floor with unevenness for the drainage of water, four pipe wrenches for the water intake and a room for the storage of inputs and equipment in 2011.
Treatments and Experimental Design	A simple random design was used, with four treatments, where $T0 = 0$ (Liters per hectare) of Primary Ocean Biostimulant; $T1 = 3$ (Liters per hectare); $T2 = 6$, $T3 = 9$.



Pumpkin (*Cucurbita pepo*)

Best Application Rate	6 Liters per Hectare with 4 applications after the first true leaves on 12/7, 12/13, 12/21, 1/11
Number of Fruits	+70%
Weight of the Fruits	+710%
Dry Weight of the Plant	+46%
Time & Location of Study	The experiment was done at the in the field San Francisco Javier Valle del Yaquí, SPR de RL in Cd. Obregón, Sonora, located in Block 1015, Calle 13 and 900. Valle del Yaqui, Sonora in 2010.
Treatments and Experimental Design	A simple random design was used, with four treatments, where $T0 = 0$ (Liters per hectare) of Primary Ocean Biostimulant; $T1 = 3$ (Liters per hectare); $T2 = 6$ (Liters per hectare); $T3 = 9$ (Liters per hectare).



Carrot (Daucus carota)

Best Application Rate	9 Liters per Hectare with 4 applications first in tray before transplant on 8/19, 9/11, 9/26, 10/16
Height	+11.39%
Relative Rate of Growth	+30%
Number of Sheets	+15.18%
Foliar Area	+34.95%
Air Fresh Weight	+25.14%
Root Fresh Weight	+12.18%
Equatorial Diameter	+10.74%
Radical Volume	+11%
Root Length	+18.3%
Time & Location of Study	The experiment was carried out in the greenhouse of the Technological Institute of Sonora (Figure 1), where environmental factors were controlled for proper management of the culture such as the temperature of 20-25 ° C and 60-70% relative humidity in 2011.
Treatments and Experimental Design	This experiment was carried out under a simple completely random design, which consisted of 4 treatments and 5 repetitions, having a total of 20 experimental units.



Cucumber (Cucumis sativus)

Best Application Rate	3 Liters per Hectare with 3 applications after first true leaves on 9/25, 10/1, 10/8
Number of Fruits	+6%
Height of the Fruits	+22% (6 Liters per Hectare)
Dry Weight of the Plant	+48% (3 Liters per Hectare)
Time & Location of Study	The experiment was carried out under shady house conditions in the company Agrícola Boui SA de CV, located at Block 515, 13th street between 400 and 500 of the Yaqui Valley, Sonora in 2010.
Treatments and Experimental Design	An experimental block design was used randomly, with four treatments, which were shown in the following table 1. The experimental area (figure 2) used was 326.8 m ² ; divided into 4 blocks, where each one consisted of 3 furrows of 0.95 m by 21.5 m in length.



Chickpea (Cicer arietinum)

Best Application Rate	9 Liters per Hectare with 3 applications from first mature leaves on 1/28, 2/11, 2/26
Height	+7% (6 Liters per Hectare)
Total Chlorophyll	+1% (6 Liters per Hectare)
Number of Grains	+15% (9 Liters per Hectare)
Weight of the Grains	+15% (9 Liters per Hectare)
Time & Location of Study	The experiment was developed under open field conditions, located in Block 1916, Lot 30 of the Yaqui Valley, Sonora in 2011.
Treatments and Experimental Design	An experimental block design was used randomly, with four treatments. The experimental area used is 168 m ² ; divided into 4 Blocks, each block being 4 grooves 5 m wide by 20 m long.



Bean (Phaseolus vulgaris)

Best Application Rate	9 Liters per Hectare with 4 applications first in tray before transplant on 8/19, then on 9/11, 9/26, 10/16
Chlorophyll	+11.6%
Number of Pods	+21.18%
Number of Pods without Grain	TBD
Weight of the Grains	+22.5%
Root Length	+3.85%
Radical Volume	+90.4%
Aerial Dry Matter	+19.53%
Root Dry Matter	+61%
Time & Location of Study	This experiment was carried out in the greenhouse of the Technological Institute of Sonora, Náinari Unit, which is located in the street Antonio Caso Colonia Villa ITSON, Ciudad Obregón, Sonora in 2011.
Treatments and Experimental Design	This experiment was carried out under a simple completely random design, which consists of 4 treatments and 5 repetitions, having a total of 20 experimental units.



Wheat (*Triticum aestivum*)

Best Application Rate	16 Liters per Hectare with 3 applications at the three stages of wheat development, encañe, embuche and espigamiento
Chlorophyll	+27.3% (9 Liters per Hectare)
Relative Growth Rate	+27.13% (16 Liters per Hectare)
Performance	+87.5% (16 Liters per Hectare)
1000 Grams Weight	+24.53% (16 Liters per Hectare)
Number of Pins	+37.30% (16 Liters per Hectare)
Spike Length	+5.6% (16 Liters per Hectare)
Protein	TBD
Time & Location of Study	The experiment was carried out in Field 28, belonging to Cd. Obregón, Sonora. The Post-harvest variables were determined in the Plant Biotechnology laboratory of CIIBAA, in the Technological Institute of Sonora 2011.
Treatments and Experimental Design	The experimental design was in divided plots, the plots were arranged in a randomized block design with five treatments and four repetitions. In one of the two plots the application of the treatments was carried out in three (III) Stages of the development of wheat: encase, embuche and espigamiento. On the other plot the treatments were performed in only two (II) stages: encase and embuche. Totalizing 40 experimental units, 20 per plot.



Alfalfa (Medicago sativa)

Best Application Rate	9 Liters per hectare with 6 applications on 2/26, 3/18, 3/24, 6/9, 6/15, 6/20
Height	+13.75%
Relative Rate of Growth	+16%
Time & Location of Study	The experiment was developed under open field conditions in block 1012 located in Emiliano Zapata street of the Yaqui Valley, Sonora in 2011.
Treatments and Experimental Design	A randomized block experimental design was used, with four treatments which were shown in table 1: The plot used was 400 m ² ; divided into 4 Blocks, without furrows is 5 m. Wide 20 m long.



Chili (Capsicum annum L.)

Best Application Rate	9 Liters per Hectare with 3 applications after first leaves on 1/6, 3/29, 4/13
Height of the Plant	+4% (6 Liters per Hectare)
Total Chlorophyll	+3.54%
Number of Fruits	+13%
Weight of Fruits	+15%
Time & Location of Study	The experiment was carried out in the field San Francisco Javier Valle del Yaqui, SPR de RL, located at Block 1015, Calle 13 and 900 of Valle del Yaqui, Sonora (Figure 1) in 2011.
Treatments and Experimental Design	An experimental block design was used randomly, with four treatments, which were The plot used was 320 m ² ; divided into 4 blocks, each block was 3 rows: 4 m wide by 20 m long.



Watermelon (*Citrullus lanatus*)

Best Application Rate	6 Liters per Hectare with 3 applications after first true leaves on 2/26, 3/15, 4/21
Number of Fruits	+37.5%
Weight of the Fruits	+5.41%
Equatorial Diameter	+3.5%
Polar Diameter	+1.43%
Time & Location of Study	The experiment was carried out in Block 517 13th Street between 400 and 500 of the Yaqui Valley, Sonora in 2011.
Treatments and Experimental Design	An experimental block design was used randomly, with four treatments, which were shown in the following table 1. The experimental area used is 240 m ² ; divided into 4 blocks, each block being 3 grooves wide by 20 meters long.



Cauliflower (*Brassica oleracea*)

Best Application Rate	3 or 9 Liters/Hectare with 4 Applications first in tray before transplant 8/19, 9/11, 9/26, 10/16
Height	+6% (9 Liters per Hectare)
Relative Growth Rate Increase	+3.75%
Chlorophyll	Highest chlorophyll units
Central Head Weight	+11% (3 Liters per Hectare)
Center Head Diameter	+10% (9 Liters per Hectare)
Aerial Dry Weight	+6% (3 Liters per Hectare)
Time & Location of Study	Greenhouse at Technological Institute of Sonora, Mexico. The greenhouse has glass coated and shaded mesh, conditions of controlled temperature, cement floor with unevenness for the drainage of water, four pipe wrenches for the water intake and a room for the storage of inputs and equipment. 2011.
Treatments and Experimental Design	A simple random design was used, with four treatments, which were shown in the following table. This experiment was carried out under a simple completely random design, which consisted of 4 treatments and 5 repetitions, having a total of 20 experimental units.



Potato (Solanum tuberosum)

Best Application Rate	3, 6 or 9 Liters per Hectare with 4 applications after first true leaves on 5/4, 5/18, 6/2, 6/15
Height	+4.6% (3 Liters per Hectare)
Chlorophyll	+3.7% (3 Liters per Hectare)
Total Weight of the Tuber	+12.5% (9 Liter per Hectare)
Number of the Tubers	+13.5% (6 Liters per Hectare)
Individual Weight of Tuber	+6.5% (9 Liters per Hectare)
Equatorial Diameter of Tuber	+4.05% (3 Liters per Hectare)
Polar Diameter of the Tuber	+1.46% (9 Liters per Hectare)
Root Length	+21.6% (3 Liters per Hectare)
Root Dry Weight	+10% (3 Liters per Hectare)
Aerial Dry Weight	-4.37% (9 Liters per Hectare)
Time & Location of Study	The experiment was carried out in the greenhouse of the Technological Institute of Sonora (Figure 1), where environmental factors were controlled for proper management of the culture such as the temperature and relative humidity in 2011
Treatments and Experimental Design	A randomized block experimental design was used, with four treatments and 5 repetitions.



Hemp (Cannabis sativa)

Primary Ocean's first successful commercial crop trial was conducted in 2018 in Colorado on hemp. The commercial grower did not execute the protocol that was provided, but the large hemp grower became Primary Ocean's first paying customer after our first trial ended. We are conducting additional trials and will provide more support to ensure that the protocol is followed so that the results are valid

Customer Testimony for Hemp (Colorado Cultivars)

"We are very impressed with this food as a basic input but also to use in heavier doses for plant rehab. This is one of the best nutrients I have seen. The plants that receive the kelp are significantly better than the plants that haven't. You have an amazing product & we look forward to continuing our relationship through this next year." -Damian, Founder/CEO of Colorado Cultivars in 2018

