

# Helena Research and Development

## EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce

Trial ID: 618-18\_SP 2019      Location: Yuma, AZ      Trial Year: 2019  
 Protocol ID:      Investigator: Samuel Discua-Duarte  
 Project ID: 618-18      Study Director: Steve Milton  
 Sponsor Contact: sm@sgcropsolutions.com

### General Trial Information

**Study Director:** Steve Milton      **Title:** Sales Manager  
**Investigator:** Samuel Discua-Duarte      **Title:** R&D Desert Manager

**Discipline:** D      fertilizer  
**Trial Status:** E      established      **Trial Reliability:** HIGH

**ARM Trial Created On:** Apr-8-2019

**Initiation Date:** Jan-22-2019

**Completion Date:** Apr-24-2019

### Trial Location

**City:** Yuma      **Country:** USA United States  
**State/Prov.:** Arizona  
**Postal Code:** 85365      **Climate Zone:** BWh Arid Desert Hot

**Latitude of LL Corner** °: 32.38002 N  
**Longitude of LL Corner** °: 114.405501 W

### Directions:

Head west on E 14th St toward S Atlantic Ave  
 2 min (0.7 mi)

Continue on S Pacific Ave. Take E 8th St, Harold C Giss Pkwy and W 1st St to W Riverside Dr  
 11 min (5.6 mi)

Drive to S Ave E/W Riverside Dr  
 4 min (1.8 mi)

**Conducted Under GLP:** No  
**Conducted Under GEP:** Yes

### Objectives:

The objective of this study is to evaluate the biological fertilizer amendment EcoFlora in Lettuce

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### EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce

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 Protocol ID:  
 Project ID: 618-18

Location: Yuma, AZ  
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Trial Year: 2019

#### Conclusions:

This study was conducted to evaluate EcoFlora (SG Crop Solutions), a microbial amendment, for its effect in lettuce growth and yield. The study was conducted in Yuma, Arizona at the University of Arizona Yuma Agricultural Center. The trial was conducted as a randomized complete block design with four replicates. Each replication consisted of 20-liner feet long by one bed wide (42 inches). Soils in the study plots are Holtville clay.

We compared three treatments: 1) untreated check, 2) a preplant application of EcoFlora 12 oz/A, and 3) a mid-season application of EcoFlora 12 oz/A

Treatments were applied on iceberg lettuce (*Lactuca sativa* var. *capitata*) variety 'PYB 7101A'. Pelletized lettuce seed was planted on January 22<sup>nd</sup> on 42 inch (3.5 ft) beds. There were two seed lines spaced 11 inches in each bed. The first application EcoFlora application (pre germination) was made on January 24<sup>th</sup> when the germination irrigation sprinklers were on. The second EcoFlora application (mid-season) was made on March 11<sup>th</sup> shortly before a watering event. Product applications were made as foliar broadcast sprays using a CO<sub>2</sub> research backpack sprayer operating at 30 PSI and calibrated to deliver 30-gallons of spray solution per acre through an 11003 TurboTwin Jet tip.

Best management practices for the field were followed. Research plots were maintained weed and pest free. The experiment was harvested on April 25<sup>th</sup>. Plants in a 5 liner feet section per plot were harvested covering an area of 17.5 ft<sup>2</sup> and weighed fresh. Crop yield (Lb/A, cwt/A) per plot was extrapolated from plant fresh weights.

Data was checked for normality assumptions (kurtosis and skewness) and analyzed using a univariate Analysis of Variance (ANOVA) and the Least Significant Difference (LSD) mean separation test at a significance level of ( $\alpha=0.1$ ). ANOVA means tables showed no significant differences ( $p > 0.1$ ) among treatments.

While there were no significant differences for any of the variables measured, crop yield, head weight, width or vigor, trends in the data show that plants in the Preplant EcoFlora treatment had higher individual head weights and yield than the rest of the treatments, while the Mid-Season EcoFlora treatment did not improve head weights or yield over the grower standard.

#### Contacts

**Study Director:** Steve Milton    **Title:** Sales Manager  
**Organization:** SG Crop Solutions

**Mobile No.:** (559) 269-4824

**E-mail:** sm@sgcropsolutions.com

**Country:** USA    United States

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                                  Sponsor Contact: sm@sgcropsolutions.com

**Investigator:** Samuel Discua-Duarte      **Title:** R&D Desert Manager  
**Organization:** Helena Agri-Enterprises, LLC  
**Address:** 2775 E. 14th Street      **Phone No.:** (928) 344-9400  
**City+State/Prov:** Yuma, AZ      **Mobile No.:** (928) 276-2399  
**Postal Code:** 85365      **E-mail:** Discua-DuarteS@helenaagri.com  
**Country:** USA      United States

**Crop Description**  
**Crop 1:** LACSA    Lactuca sativa    Lettuce      **BBCH Scale:** BVNH  
**Entry Date:** Jun-17-2019      **Stage Scale:** BBCH  
**Variety:** PYB 7101A  
**Seed Shape:** PELLTD  
**Planting Date:** Jan-22-2019  
**Rows per Plot:** 2      **Planting Method:** DRILLE drilled  
**Row Spacing:** 11    IN      **Planting Equipment:** SR    drilling machine  
**Spacing within Row:** 3.5    FT      **Seed Bed:** FINE    fine  
    **Soil Moisture:** DRY    dry  
**Emergence Date:** Jan-30-2019  
**Harvest Date:** Apr-25-2019  
**Harvested Width:** 3.5 FT  
**Harvested Length:** 5 FT

**Site and Design**  
**Treated Plot Width:** 3.5 FT      **Site Type:** FIELD    field  
**Treated Plot Length:** 20 FT      **Experimental Unit:** 1    PLOT    plot  
**Treated Plot Area:** 70 FT2    **Treatments:** 3      **Tillage Type:** CONTIL    conventional-till  
**Replications:** 4      **Study Design:** RACOB    Randomized Complete Block (RCB)

**Soil Description**  
**Description Name:** Holtville clay  
**% OM:** 2.5      **Texture:** C    clay  
**pH:** 7.3      **Soil Name:** Holtville Clay  
**CEC:** 28.3      **Fert. Level:** E    excellent  
**Soil Drainage:** E      excellent

**Application Description**

	A	B
<b>Application Date</b>	Jan-24-2019	Mar-11-2019
<b>Interval to Prev. Appl.</b>		46 DAYS
<b>Application Method</b>	SPRAY	SPRAY
<b>Application Timing</b>	PREMCR	ATTHIN
<b>Application Placement</b>	BROADC	BROADC
<b>Appl. Entry Date</b>	Jun-17-2019	Jun-17-2019

**Crop Stage At Each Application**

	A	B
<b>Crop 1 Code, BBCH Scale</b>	LACSA BVNH	LACSA BVNH
<b>Days after Emergence</b>	-6	40

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Application Equipment		
	A	B
Equipment Type	SPRBAC	SPRBAC
Operation Pressure	30 PSI	30 PSI
Nozzle Type	FLAFAN	FLAFAN
Nozzle Size	8003	8003
Nozzle Spacing	6 IN	6 IN
Nozzles/Row	2	2
Band Width	3.5 FT	3.5 FT
% Coverage	100	100
Boom Length	3 FT	3 FT
Boom Height	1 FT	1 FT
Carrier	WATER	WATER
Water Hardness (ppm CaCO3)	163	163
Spray Volume	20 GAL/AC	20 GAL/AC
Mix Overage	25 %	25 %
Mix Size	0.6083 L	0.6083 L
Spray pH	6.68	6.68
Propellant	COMCO2	COMCO2
Tank Mix (Y/N)	Y yes	Y yes

Date	By	Context	Notes
Apr-8-2019	Samuel Discua-Duarte	STATUS	Automatically added by ARM: Trial Status updated to 'S' during trial creation.
Apr-8-2019	Samuel Discua-Duarte	STATUS	Automatically added by ARM: Trial Status updated to 'E' when Initiation Date entered.

Trt No.	Type	Treatment Name	Rate	Rate Unit	Appl Code	Spray Volume	Volume Unit	Comment
1	FERT	Grower Standard						1
2	FERT	EcoFlora	12	oz/a	A	15	GAL/AC	Post Seed/Pre Germ Water
3	FERT	SurVeda MicroFlora	6	g ai/a	A	15	GAL/AC	Post Seed/Pre Germ Water
	FERT	EcoFlora	12	oz/a	A	15	GAL/AC	Mid-Season

Replications: 4, Untreated treatments: 1, Conduct under GLP/GEP: Yes (GEP with no protection), Design: Randomized Complete Block (RCB), Treatment units: US standard, Treated 'Plot' experimental unit size Width: 6.67 feet, Treated 'Plot' experimental unit size Length: 25 feet, Application volume: 200 L/ha, Mix size: 1.2393 L, Format definitions: G-All7.def, G-All7.frm

	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	LACSC	LACSC	LACSC	LACSC	LACSC	LACSC
BBCH Scale	BVHF	BVHF	BVHF	BVHF	BVHF	BVHF
Crop Scientific Name	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
Crop Name	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Variety	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Description	Plant height	Plant width	Plant color	Plant vigor	Plant height	Plant width
Rating Date	Feb-28-2019	Feb-28-2019	Feb-28-2019	Feb-28-2019	Mar-11-2019	Mar-11-2019
SE Group No.	3	4	7	9	3	4
Part Rated	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C
Rating Type	HEIGHT	WIDTH	COLOR	VIGOR	HEIGHT	WIDTH
Rating Unit	cm	cm	1-10	0-5	cm	cm
Sample Size	10	10	10	10	10	10
Collection Basis	10	10	10	10	10	10
Reporting Basis	1	1	1	1	1	1
Number of Subsamples	10	10	10	10	10	10
Data Entry Date	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019
Days After First/Last Applic.	35 35	35 35	35 35	35 35	46 46	46 46
Trt-Eval Interval	35 DA-A	35 DA-A	35 DA-A	35 DA-A	46 DA-A	46 DA-A
Plant-Eval Interval	37 DP-1	37 DP-1	37 DP-1	37 DP-1	48 DP-1	48 DP-1
Days After Emergence	29 DE-1	29 DE-1	29 DE-1	29 DE-1	40 DE-1	40 DE-1
ARM Action Codes	ET3				EC	
Number of Decimals						
Trt No.	1*	2*	3*	4*	5*	6*
Treatment Name	1 Grower Standard					
Rate	2.3 -	5.4 -	7.1 -	4.1 -	5.6	12.0 -
Unit	1.5 Min	4.0 Min	6.0 Min	3.0 Min	0.9 Min	8.5 Min
Code	4.0 Max	7.5 Max	8.0 Max	5.0 Max	15.3 Max	15.3 Max

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	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>
BBCH Scale	3	4	7	9	3	4
Crop Scientific Name	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
Crop Name	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Variety	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Description	Plant height	Plant width	Plant color	Plant vigor	Plant height	Plant width
Rating Date	Feb-28-2019	Feb-28-2019	Feb-28-2019	Feb-28-2019	Mar-11-2019	Mar-11-2019
SE Group No.	3	4	7	9	3	4
Part Rated	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C
Rating Type	HEIGHT	WIDTH	COLOR	VIGOR	HEIGHT	WIDTH
Rating Unit	cm	cm	1-10	0-5	cm	cm
Sample Size	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Collection Basis	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Reporting Basis	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Number of Subsamples	10	10	10	10	10	10
Data Entry Date	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019
Days After First/Last Applic.	35 35	35 35	35 35	35 35	46 46	46 46
Trt-Eval Interval	35 DA-A	35 DA-A	35 DA-A	35 DA-A	46 DA-A	46 DA-A
Plant-Eval Interval	37 DP-1	37 DP-1	37 DP-1	37 DP-1	48 DP-1	48 DP-1
Days After Emergence	29 DE-1	29 DE-1	29 DE-1	29 DE-1	40 DE-1	40 DE-1
ARM Action Codes	ET3				EC	
Number of Decimals						
Trt Treatment	1*	2*	3*	4*	5*	6*
No. Name						
Rate Appl						
Rate Unit						
Code						
	0.6 StDev	1.0 StDev	0.4 StDev	0.8 StDev	4.8 StDev	1.7 StDev
	2.0 Median	5.5 Median	7.0 Median	4.0 Median	3.4 Median	12.2 Median
2 EcoFlora	12 oz/a A					
	2.2 -	5.4 -	7.3 -	4.0 -	5.3 -	12.2 -
	1.5 Min	4.0 Min	6.0 Min	3.0 Min	1.2 Min	8.5 Min
	4.0 Max	7.0 Max	9.0 Max	5.0 Max	14.6 Max	14.6 Max
	0.8 StDev	1.0 StDev	0.6 StDev	0.7 StDev	4.0 StDev	1.4 StDev
	2.0 Median	5.0 Median	7.0 Median	4.0 Median	3.8 Median	12.4 Median
3 EcoFlora	12 oz/a B					
	2.0	5.1 -	7.5 -	3.9 -	5.1 -	11.7 -
	1.5 Min	3.5 Min	7.0 Min	2.0 Min	1.1 Min	7.8 Min
	3.0 Max	6.5 Max	9.0 Max	5.0 Max	14.2 Max	14.2 Max
	0.4 StDev	0.8 StDev	0.7 StDev	0.7 StDev	3.7 StDev	1.7 StDev
	2.0 Median	5.0 Median	7.0 Median	4.0 Median	3.4 Median	11.9 Median
LSD P=.10	0.64	0.74	0.32	0.67	0.70	1.51
Standard Deviation	0.38	0.53	0.23	0.48	0.42	1.10
CV	16.94	10.14	3.2	12.14	8.02	9.16
Grand Mean	2.26	5.28	7.27	3.99	5.24	11.98
Levene's F	0.035	0.124	3.196	0.086	0.005	2.378
Levene's Prob(F)	0.857	0.885	0.089	0.919	0.947	0.148
Friedman's X2	0.0	0.5	2.625	0.5	0.0	0.5
P(Friedman's X2)	1.00	0.779	0.269	0.779	1.00	0.779
Skewness	1.1024	0.9184	-0.6717	0.4346	1.3978	-0.0337
Kurtosis	0.4515	-0.0532	-1.0754	-1.0185	-0.0431	-0.1484
Replicate F	2.802	0.220	0.369	0.183	178.222	0.131
Replicate Prob(F)	0.2100	0.8789	0.7784	0.9039	0.0007	0.9381
Treatment F	0.105	0.369	3.338	0.110	0.548	0.196
Treatment Prob(F)	0.7674	0.7060	0.1060	0.8975	0.5127	0.8269

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	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
BBCH Scale	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Scientific Name	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Crop Name	Plant color	Plant vigor	Plant height	Plant width	Plant color	Plant vigor
Crop Variety	Mar-11-2019	Mar-11-2019	Apr-5-2019	Apr-5-2019	Apr-5-2019	Apr-5-2019
Description	7	9	3	4	7	9
Rating Date	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C
SE Group No.	COLOR	VIGOR	HEIGHT	WIDTH	COLOR	VIGOR
Part Rated	1-10	0-5	cm	cm	0-5	0-5
Rating Type	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Rating Unit	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Sample Size	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Collection Basis	10	10	10	10	10	10
Reporting Basis	Jun-17-2019	Jun-17-2019	Apr-8-2019	Apr-8-2019	Apr-8-2019	Apr-8-2019
Number of Subsamples	46 46	46 46	71 25	71 25	71 25	71 25
Data Entry Date	46 DA-A	46 DA-A	71 DA-A	71 DA-A	71 DA-A	71 DA-A
Days After First/Last Applic.	48 DP-1	48 DP-1	73 DP-1	73 DP-1	73 DP-1	73 DP-1
Trt-Eval Interval	40 DE-1	40 DE-1	65 DE-1	65 DE-1	65 DE-1	65 DE-1
Plant-Eval Interval					ET3	
Days After Emergence						
ARM Action Codes						
Number of Decimals						
Trt Treatment	7*	8*	9*	10*	11*	12*
Rate Appl						
No. Name						
Rate Unit Code						
1 Grower Standard	7.6 - 7.0 Min 8.0 Max	4.0 - 3.0 Min 5.0 Max	7.3 - 5.0 Min 8.5 Max	4.0 - 2.0 Min 5.5 Max	8.0 - 8.0 Min 8.0 Max	3.5 - 2.0 Min 4.0 Max

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	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>
BBCH Scale	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Scientific Name	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Crop Name	Plant color	Plant vigor	Plant height	Plant width	Plant color	Plant vigor
Crop Variety	Mar-11-2019	Mar-11-2019	Apr-5-2019	Apr-5-2019	Apr-5-2019	Apr-5-2019
Description	7	9	3	4	7	9
Rating Date	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C	PLATOT C
SE Group No.	COLOR	VIGOR	HEIGHT	WIDTH	COLOR	VIGOR
Part Rated	1-10	0-5	cm	cm	0-5	0-5
Rating Type	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Rating Unit	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP	10 PLATOP
Sample Size	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Collection Basis	10	10	10	10	10	10
Reporting Basis	Jun-17-2019	Jun-17-2019	Apr-8-2019	Apr-8-2019	Apr-8-2019	Apr-8-2019
Number of Subsamples	46 46	46 46	71 25	71 25	71 25	71 25
Data Entry Date	46 DA-A	46 DA-A	71 DA-A	71 DA-A	71 DA-A	71 DA-A
Days After First/Last Applic.	48 DP-1	48 DP-1	73 DP-1	73 DP-1	73 DP-1	73 DP-1
Trt-Eval Interval	40 DE-1	40 DE-1	65 DE-1	65 DE-1	65 DE-1	65 DE-1
Plant-Eval Interval					ET3	
Days After Emergence						
ARM Action Codes						
Number of Decimals						
Trt Treatment	7*	8*	9*	10*	11*	12*
No. Name						
Rate Appl						
Rate Unit						
Code						
	0.5 StDev	0.7 StDev	0.9 StDev	0.7 StDev	0.0 StDev	0.6 StDev
	8.0 Median	4.0 Median	7.5 Median	4.0 Median	8.0 Median	4.0 Median
2 EcoFlora	12 oz/a A					
	7.3 -	3.9 -	7.2 -	4.2 -	8.0 -	3.6 -
	7.0 Min	2.0 Min	5.0 Min	3.0 Min	8.0 Min	2.0 Min
	8.0 Max	5.0 Max	8.5 Max	5.0 Max	8.0 Max	4.0 Max
	0.5 StDev	1.0 StDev	0.9 StDev	0.6 StDev	0.0 StDev	0.6 StDev
	7.0 Median	4.0 Median	7.5 Median	4.0 Median	8.0 Median	4.0 Median
3 EcoFlora	12 oz/a B					
	7.4 -	3.8 -	6.9 -	3.8 -	8.0	3.4 -
	6.0 Min	2.0 Min	5.0 Min	2.5 Min	8.0 Min	2.0 Min
	8.0 Max	5.0 Max	9.0 Max	5.0 Max	9.0 Max	4.0 Max
	0.5 StDev	0.9 StDev	1.0 StDev	0.6 StDev	0.2 StDev	0.7 StDev
	7.0 Median	4.0 Median	7.0 Median	4.0 Median	8.0 Median	3.0 Median
LSD P=.10	0.32	0.42	1.14	0.57	.	0.52
Standard Deviation	0.24	0.31	0.83	0.41	0.00	0.38
CV	3.19	7.81	11.61	10.31	0.0	10.94
Grand Mean	7.41	3.91	7.14	4.00	8.00	3.49
Levene's F	0.123	0.092	0.179	1.291	0.00	0.16
Levene's Prob(F)	0.886	0.913	0.839	0.321	.	0.854
Friedman's X2	3.5	0.5	0.5	1.5	0.0	0.5
P(Friedman's X2)	0.174	0.779	0.779	0.472	1.00	0.779
Skewness	0.4621	-1.1391	-0.3719	-0.4215	.	-0.2878
Kurtosis	-0.252	0.2697	-1.4643	-0.2255	.	-1.1332
Replicate F	3.239	14.075	0.039	0.468	0.000	0.234
Replicate Prob(F)	0.1027	0.0040	0.9886	0.7153	1.0000	0.8694
Treatment F	1.537	0.546	0.288	0.775	0.000	0.520
Treatment Prob(F)	0.2890	0.6054	0.7598	0.5018	1.0000	0.6191

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	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	LACSC	LACSC	LACSC	LACSC	LACSC	LACSC
BBCH Scale	BVHF	BVHF	BVHF	BVHF	BVHF	BVHF
Crop Scientific Name	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
Crop Name	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Variety	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Description	Head Weight	Head Length	Head Width	Head Color	Head Vigor	Head Density
Rating Date	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019
SE Group No.	10	10	10	10	12	13
Part Rated	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C
Rating Type	WEIFRE	LENGTH	WIDTH	COLOR	VIGOR	DENSTY
Rating Unit	g	cm	cm	0-10	0-5	1-5
Sample Size	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2
Collection Basis	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2
Reporting Basis	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Number of Subsamples	15	15	15	15	15	15
Data Entry Date	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019
Days After First/Last Applic.	90 44	90 44	90 44	90 44	90 44	90 44
Trt-Eval Interval	90 DA-A	90 DA-A	90 DA-A	90 DA-A	90 DA-A	90 DA-A
Plant-Eval Interval	92 DP-1	92 DP-1	92 DP-1	92 DP-1	92 DP-1	92 DP-1
Days After Emergence	84 DE-1	84 DE-1	84 DE-1	84 DE-1	84 DE-1	84 DE-1
ARM Action Codes				ER1		
Number of Decimals						
Trt Treatment						
No. Name	13*	14*	15*	16*	17*	18*
Rate Appl						
Rate Unit						
Code						
1 Grower Standard	450.6 - 253.2 Min 617.8 Max	11.1 ab 9.0 Min 14.0 Max	12.5 - 10.0 Min 14.5 Max	7.2 - 6.0 Min 8.0 Max	3.8 - 2.0 Min 5.0 Max	2.8 - 1.0 Min 5.0 Max

## Helena Research and Development

<b>EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce</b>							
Trial ID: 618-18_SP 2019	Location: Yuma, AZ	Trial Year: 2019					
Protocol ID:	Investigator: Samuel Discua-Duarte						
Project ID: 618-18	Study Director: Steve Milton						
Sponsor Contact: sm@sgcropsolutions.com							

	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF	
Crop Code	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	LACTUCA SATIVA>	
BBCH Scale	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	Head lettuce	
Crop Scientific Name	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A	
Crop Name	Head Weight	Head Length	Head Width	Head Color	Head Vigor	Head Density	
Crop Variety	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019	
Description	10	10	10	10	12	13	
Rating Date	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C	HEAHAR C	
SE Group No.	WEIFRE	LENGTH	WIDTH	COLOR	VIGOR	DENSTY	
Part Rated	g	cm	cm	0-10	0-5	1-5	
Rating Type	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	
Rating Unit	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2	
Sample Size	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	
Collection Basis	15	15	15	15	15	15	
Reporting Basis	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019	
Number of Subsamples	90 44	90 44	90 44	90 44	90 44	90 44	
Data Entry Date	90 DA-A	90 DA-A	90 DA-A	90 DA-A	90 DA-A	90 DA-A	
Days After First/Last Applic.	92 DP-1	92 DP-1	92 DP-1	92 DP-1	92 DP-1	92 DP-1	
Trt-Eval Interval	84 DE-1	84 DE-1	84 DE-1	84 DE-1	84 DE-1	84 DE-1	
Plant-Eval Interval							
Days After Emergence							
ARM Action Codes				ER1			
Number of Decimals							
Trt Treatment	13*	14*	15*	16*	17*	18*	
No. Name	Rate Appl Rate Unit Code						
	93.4 StDev 457.8 Median	0.9 StDev 11.0 Median	1.1 StDev 12.0 Median	0.6 StDev 7.0 Median	0.6 StDev 4.0 Median	0.8 StDev 3.0 Median	
2 EcoFlora	12 oz/a A	464.4 - 148.0 Min 706.2 Max 103.7 StDev 465.5 Median	11.3 a 9.0 Min 13.0 Max 0.9 StDev 11.5 Median	12.3 - 10.0 Min 16.5 Max 1.3 StDev 12.0 Median	7.0 - 6.0 Min 8.0 Max 0.7 StDev 7.0 Median	3.8 - 2.0 Min 5.0 Max 0.7 StDev 4.0 Median	2.4 - 1.0 Min 4.0 Max 0.8 StDev 2.5 Median
3 EcoFlora	12 oz/a B	435.6 - 180.9 Min 584.5 Max 101.8 StDev 443.9 Median	11.0 b 9.0 Min 13.5 Max 1.0 StDev 11.0 Median	11.9 - 8.0 Min 14.5 Max 1.3 StDev 12.0 Median	7.2 - 6.0 Min 8.0 Max 0.8 StDev 7.0 Median	3.8 - 2.0 Min 5.0 Max 0.8 StDev 4.0 Median	2.6 - 1.0 Min 5.0 Max 0.9 StDev 3.0 Median
LSD P=.10	73.05	0.26	0.82	0.57	0.27	0.70	
Standard Deviation	53.17	0.19	0.47	0.41	0.19	0.51	
CV	11.81	1.7	3.83	5.78	5.09	19.65	
Grand Mean	450.21	11.14	12.23	7.14	3.79	2.61	
Levene's F	0.032	3.295	4.759	1.529	0.725	0.27	
Levene's Prob(F)	0.969	0.084	0.058	0.268	0.511	0.769	
Friedman's X2	0.0	4.5	2.667	0.0	0.5	0.5	
P(Friedman's X2)	1.00	0.105	0.264	1.00	0.779	0.779	
Skewness	-0.1543	0.4819	0.2828	0.1319	-0.5016	-0.3236	
Kurtosis	-0.5733	0.4146	-1.7784	-0.8066	-0.5318	-0.7557	
Replicate F	0.302	4.046	0.225	0.184	1.485	0.282	
Replicate Prob(F)	0.8234	0.0686	0.8081	0.9035	0.3107	0.8366	
Treatment F	0.292	3.556	1.366	0.285	0.037	0.511	
Treatment Prob(F)	0.7567	0.0958	0.3529	0.7616	0.9641	0.6237	

# Helena Research and Development

Trial ID: 618-18_SP 2019 Protocol ID: Project ID: 618-18	<b>EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce</b> Location: Yuma, AZ Investigator: Samuel Discua-Duarte Study Director: Steve Milton Sponsor Contact: sm@sgcropsolutions.com	Trial Year: 2019
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	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	LACSC	LACSC	LACSC	LACSC
BBCH Scale	BVHF	BVHF	BVHF	BVHF
Crop Scientific Name	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
Crop Name	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Variety	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Description	Core lenght	Core width	Sum of head we>	Yield
Rating Date	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019
SE Group No.	12	14	15	16
Part Rated	HEART C	HEART C	HEAHAR C	HEAHAR C
Rating Type	LENGTH	WIDTH	WEIFRE	YIELD
Rating Unit	cm	cm	g	T-MET
Sample Size	17.5 FT2	17.5 FT2	17.5 FT2	1 ha
Collection Basis	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2
Reporting Basis	1 PLOT	1 PLOT	1 PLOT	
Number of Subsamples	15	15	1	1
Data Entry Date	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019
Days After First/Last Applic.	90 44	90 44	90 44	90 44
Trt-Eval Interval	90 DA-A	90 DA-A	90 DA-A	90 DA-A
Plant-Eval Interval	92 DP-1	92 DP-1	92 DP-1	92 DP-1
Days After Emergence	84 DE-1	84 DE-1	84 DE-1	84 DE-1
ARM Action Codes			TSS[13]	TY1
Number of Decimals				1
Trt Treatment				
Rate Appl				
No. Name	Rate Unit Code			
1 Grower Standard	19*	20*	21*	22*
	22.4 - 0.0 Min 35.1 Max	21.8 - 0.0 Min 28.1 Max	5281.3 - 4497.6 Min 5995.4 Max	32.5 - 27.7 Min 36.9 Max

# Helena Research and Development

## EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce

Trial ID: 618-18_SP 2019	Location: Yuma, AZ	Trial Year: 2019
Protocol ID:	Investigator: Samuel Discua-Duarte	
Project ID: 618-18	Study Director: Steve Milton	
	Sponsor Contact: sm@sgcropsolutions.com	

	LACSC BVHF	LACSC BVHF	LACSC BVHF	LACSC BVHF
Crop Code	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>	Lactuca sativa>
BBCH Scale	Head lettuce	Head lettuce	Head lettuce	Head lettuce
Crop Scientific Name	PYB 7101A	PYB 7101A	PYB 7101A	PYB 7101A
Crop Name	Core lenght	Core width	Sum of head we>	Yield
Crop Variety	Apr-24-2019	Apr-24-2019	Apr-24-2019	Apr-24-2019
Description	12	14	15	16
Rating Date	HEART C	HEART C	HEAHAR C	HEAHAR C
SE Group No.	LENGTH	WIDTH	WEIFRE	YIELD
Part Rated	cm	cm	g	T-MET
Rating Type	17.5 FT2	17.5 FT2	17.5 FT2	1 ha
Rating Unit	17.5 FT2	17.5 FT2	17.5 FT2	17.5 FT2
Sample Size	1 PLOT	1 PLOT	1 PLOT	
Collection Basis	15	15	1	1
Reporting Basis	Jun-17-2019	Jun-17-2019	Jun-17-2019	Jun-17-2019
Number of Subsamples	90 44	90 44	90 44	90 44
Data Entry Date	90 DA-A	90 DA-A	90 DA-A	90 DA-A
Days After First/Last Applic.	92 DP-1	92 DP-1	92 DP-1	92 DP-1
Trt-Eval Interval	84 DE-1	84 DE-1	84 DE-1	84 DE-1
Plant-Eval Interval			TSS[13]	TY1
Days After Emergence				1
ARM Action Codes				
Number of Decimals				
Trt Treatment	19*	20*	21*	22*
No. Name				
Rate Appl				
Rate Unit				
Code				
	8.3 StDev	6.2 StDev	620.5 StDev	3.8 StDev
	23.8 Median	23.6 Median	5316.0 Median	32.7 Median
2 EcoFlora	12 oz/a A			
	24.4 -	22.3 -	5547.9 -	34.1 -
	0.0 Min	0.0 Min	4765.2 Min	29.3 Min
	40.1 Max	29.3 Max	6310.0 Max	38.8 Max
	8.1 StDev	5.7 StDev	645.5 StDev	4.0 StDev
	24.2 Median	22.6 Median	5558.1 Median	34.2 Median
3 EcoFlora	12 oz/a B			
	25.5 -	22.6 -	4914.0 -	30.2 -
	0.0 Min	0.0 Min	4430.7 Min	27.3 Min
	41.9 Max	29.3 Max	6173.2 Max	38.0 Max
	8.1 StDev	4.7 StDev	843.8 StDev	5.2 StDev
	26.6 Median	23.2 Median	4526.1 Median	27.8 Median
LSD P=.10	5.05	4.00	1001.65	6.16
Standard Deviation	3.68	2.91	728.98	4.48
CV	15.25	13.1	13.89	13.89
Grand Mean	24.10	22.22	5247.71	32.28
Levene's F	0.024	0.347	0.008	0.008
Levene's Prob(F)	0.976	0.716	0.992	0.992
Friedman's X2	1.5	0.5	1.5	1.5
P(Friedman's X2)	0.472	0.779	0.472	0.472
Skewness	0.3774	-0.2344	0.2133	0.2133
Kurtosis	0.448	-0.6141	-1.5158	-1.5158
Replicate F	0.534	0.202	0.848	0.848
Replicate Prob(F)	0.6755	0.8913	0.5160	0.5160
Treatment F	0.703	0.065	0.762	0.762
Treatment Prob(F)	0.5318	0.9373	0.5070	0.5070

# Helena Research and Development

Trial ID: 618-18_SP 2019 Protocol ID: Project ID: 618-18	<b>EcoFlora Biological Fertilizer Ammendment Evaluation in Lettuce</b> Location: Yuma, AZ Investigator: Samuel Discua-Duarte Study Director: Steve Milton Sponsor Contact: sm@sgcropsolutions.com	Trial Year: 2019
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**Crop Code**  
 LACSC, BVHF, Lactuca sativa var. capitata, Head lettuce = US

**Part Rated**  
 PLATOT = plant - total  
 HEAHAR = head - harvestable  
 HEART = hearts  
 C = Crop is Part Rated

**Rating Type**  
 HEIGHT = height  
 WIDTH = width  
 COLOR = color  
 VIGOR = vigor  
 WEIFRE = weight - fresh  
 LENGTH = length  
 DENSTY = density  
 YIELD = yield

**Rating Unit**  
 cm = centimeter  
 1-10 = 1-10 index/scale  
 0-5 = 0-5 index/scale  
 g = gram  
 0-10 = 0-10 index/scale  
 1-5 = 1-5 index/scale  
 T-MET = ton (metric=1000 kg)

PLATOP = plant top  
 FT2 = square foot  
 ha = hectare

PLATOP = plant top  
 FT2 = square foot

PLOT = total plot

**Plant-Eval Interval**  
 37 DP-1 = 1 LACSA Jan-22-2019  
 48 DP-1 = 1 LACSA Jan-22-2019  
 73 DP-1 = 1 LACSA Jan-22-2019  
 92 DP-1 = 1 LACSA Jan-22-2019

**ARM Action Codes**  
 ET3 = Excluded treatment 3  
 EC = Do not analyze untreated check, while still reporting treatment mean on AOV Means Table  
 ER1 = Excluded replicate 1  
 TSS[13] = Sum subsamples([13])  
 TY1 = 0.00615078\*[21]

Rep	Blk					
4	4	401	3	402	1	403
3	3	301	2	302	3	303
2	2	201	3	202	1	203
1	1	101	1	102	2	103