

SynTech Research, Inc.

Effect of Tranlin's 5-0-2 fulvic liquid fertilizer on lettuce yield

Trial ID: Vastly-Lettuce-Fert Location: Sanger CA, UE Trial Year: 2017
 Protocol ID: Vastly-Lettuce-Fert Investigator: Thomas Duvall

General Trial Information

Investigator: Thomas Duvall

Conducted Under GLP: No

Conducted Under GEP: No

Objectives:

Methods

The objective of this trial was test fertilizer 5-0-2 on lettuce. The complete randomized block design consisted of five treatments and four replications. Each plot consisted of four 45 foot rows of lettuce. Each plot received two 45 foot drip lines for applications and irrigation. Each individual drip line used a coupler with a valve to regulate applications to each specific treatment. All irrigation lines used where 5/8" 16mm drip tape. The output of the drip tape was 0.6 GPM/100ft at 15 psi. The applications where made using a Dosatron D14M22 running at 15psi. Large plastic graduated cylinders where used to feed undiluted 5-0-2 into the Dosatron. The Dosatron was set at 0.5% or 1:200 ratio giving a total application time of one hour. For each plot 15 feet was measured and the two center rows were harvested. Lettuce heads were harvested using standard commercial techniques. Evaluations such as total weight, height, and width were conducted in the field. For the root size and weight, 10 samples were gently pulled from each plot and cleaned on wire mesh using a water jet hose nozzle. After cleaning, the roots were weighed on a digital scale and measured for length.

All data were entered into ARM 2018.1 and analyzed using Fisher's unprotected Least Significant Difference test with alpha set at 0.1.

Results

Statistical differences between the control and the treated means were detected in nearly all post-applications evaluations. Plant height, width (N-to-S and E-to-W), yield, and average plant weight were all statistically higher in the treated plots than in the control plots. However, root weight was lower in the treated plots than in the control.

Investigator: Thomas Duvall

Crop Description

Crop 1: LACSA Lactuca sativa
Variety: Inferno
Description: 4 rows lettuce per 5 ft bed

BBCH Scale: BVNH

Planting Date: 10/14/17
Planting Method: TRANSP transplanted

Row Spacing, Unit: 5 FT

Spacing within Row, Unit: 12 IN

Rows per Plot: 4

Harvested Width, Unit: 2.5 FT

Harvested Length, Unit: 15 FT

Site and Design

Treated Plot Width: 5 FT

Treated Plot Length: 50 FT

Treated Plot Area: 250 FT² **Treatments:** 5

Replications: 4

Study Design: RACOB Randomized Complete Block (RCB)

Maintenance

No.	Date	Type	Maintenance Product Name
1.	11/30/17	MAINT	Refer to Fertilization Plan (separate document)
2.	12/07/17	MAINT	Refer to Fertilization Plan (separate document)
3.	12/13/17	MAINT	Refer to Fertilization Plan (separate document)

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Application Description

	A	B	C
Application Date:	10/27/17	11/06/17	11/16/17
Appl. Start Time:	01:30 PM	01:00 PM	01:00 PM
Appl. Stop Time:	02:30 PM	01:35 PM	01:30 PM
Interval to Prev. Appl., Unit:		10 DAYS	10 DAYS
Application Method:	INJECT	INJECT	INJECT
Application Placement:	SOIL	SOIL	SOIL
Applied By:	TD	TD	NV
Air Temperature, Unit:	84.8 F	63 F	70 F
% Relative Humidity:	28	42	44
Wind Velocity, Unit:	3.8 MPH	4 MPH	6.8 MPH
Dew Presence (Y/N):	N no	N no	N no
Soil Temperature, Unit:	70 F	62.6 F	62.8 F
% Cloud Cover:	0	15	100

Crop Stage At Each Application

	A	B	C
Crop 1 Code, BBCH Scale:	LACSA	LACSA	LACSA

Application Equipment

	A	B	C
Appl. Equipment:	Dosatron	Dosatron	Dosatron
Equipment Type:	INJECT	INJECT	INJECT
Carrier:	WATER	WATER	WATER
Minimum Mix/Treatment:	0 liters	0 liters	0 liters

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Crop ID Code	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA
BBCH Scale	BVNH	BVNH	BVNH	BVNH	BVNH	BVNH
Crop Scientific Name	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa
Crop Name	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Crop Variety	Inferno	Inferno	Inferno	Inferno	Inferno	Inferno
Description	Plant Height	Plant Height	Plant Height	Plant Height	Root Length	Root Weight
Part Rated	PLANT C	PLANT C	PLANT C	PLANT C	ROOT C	ROOT C
Rating Date	10/27/17	11/05/17	11/16/17	11/27/17	12/22/17	12/22/17
Rating Type	HEIGHT	HEIGHT	HEIGHT	HEIGHT	LENGTH	WEIFRE
Rating Unit	IN	IN	IN	IN	IN	g
Sample Size, Unit	1 PLANT	1 PLANT	1 PLANT	1 PLANT	1 ROOT	1 ROOT
Number of Subsamples	6	6	6	6	10	10
SE Group No.	1	2	3	4	5	6
Days After First/Last Applic.	0 0	9 9	20 10	31 11	56 36	56 36
Trt-Eval Interval	0 DA-A	9 DA-A	20 DA-A	31 DA-A		
ARM Action Codes					AL	AL
Number of Decimals						
Trt Treatment						
No Name	1	2	3	4	5	6
Rate						
Applic. Code						
1 NF (normal fertilization)	3.375 ab	7.17 a	6.98 b	6.79 b	5.487 a	53.6 a
2 NF 5-0-2 fulvic liquid	3.467 ab 6 gal/a A	6.54 b	8.58 a	9.04 a	5.133 ab	37.9 b
3 NF 5-0-2 fulvic liquid	3.563 a 6 gal/a AB	7.13 a	8.96 a	9.46 a	4.653 bc	36.7 b
4 NF 5-0-2 fulvic liquid	3.625 a 6 gal/a ABC	6.73 b	8.71 a	9.60 a	4.774 bc	35.8 b
5 0.85x NF 5-0-2 fulvic liquid	3.271 b 6 gal/a AB	6.67 b	8.35 a	8.83 a	4.586 c	38.5 b
LSD P=.10	0.2786	0.389	1.001	1.366	0.5428 - 0.5746	7.34 - 9.06
Standard Deviation	0.2211	0.309	0.794	1.084	0.0320t	0.06t
CV	6.39	4.51	9.55	12.4	4.14t	3.88t
Levene's F	1.109	0.799	0.293	0.126	0.82	0.383
Levene's Prob(F)	0.388	0.544	0.878	0.971	0.532	0.817
Skewness	0.0666	-0.209	-0.3688	-0.1136	-0.3673	0.7928
Kurtosis	-0.1436	-0.9114	-0.5819	-0.632	-0.3802	0.674
Replicate F	2.633	9.061	0.846	2.916	4.201	1.724
Replicate Prob(F)	0.0978	0.0021	0.4946	0.0778	0.0301	0.2152
Treatment F	1.653	3.342	3.844	4.388	2.908	5.013
Treatment Prob(F)	0.2250	0.0466	0.0310	0.0205	0.0678	0.0131

Means followed by same letter or symbol do not significantly differ (P=.10, LSD)

t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Could not calculate LSD (% mean diff) for columns 10,14,15,16,17,18,19,20,21,22,23,24 because error mean square = 0.

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Crop ID Code	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA
BBCH Scale	BVNH	BVNH	BVNH	BVNH	BVNH	BVNH
Crop Scientific Name	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa
Crop Name	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Crop Variety	Inferno	Inferno	Inferno	Inferno	Inferno	Inferno
Description	Plant Height	Size East/West	Size North/Sou>	#Plants	Yield Weight	Avg plant weig>
Part Rated	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C
Rating Date	12/22/17	12/22/17	12/22/17	12/22/17	12/22/17	12/22/17
Rating Type	HEIGHT	WIDTH	WIDTH	COUNT	WEIFRE	WEIFRE
Rating Unit	IN	IN	IN	NUMBER	LB	LB
Sample Size, Unit	1 PLANT	1 PLANT	1 PLANT		1 PLOT	
Number of Subsamples	10	10	10	1	1	1
SE Group No.	7	8	9	10	11	17
Days After First/Last Applic.	56 36	56 36	56 36	56 36	56 36	56 36
Trt-Eval Interval						
ARM Action Codes				NM		T1
Number of Decimals						2
Trt Treatment						
No Name	7	8	9	10	11	12
Rate						
App Unit Code						
1 NF (normal fertilization)	9.48 b	10.93 b	10.94 c	33.0	23.250 b	0.70 b
2 NF 5-0-2 fulvic liquid	11.30 a	11.65 a	12.05 ab	32.8	33.250 a	1.02 a
3 NF 5-0-2 fulvic liquid	11.38 a	11.76 a	11.98 ab	32.8	30.625 a	0.94 a
4 NF 5-0-2 fulvic liquid	11.66 a	11.28 ab	11.75 b	33.0	31.375 a	0.95 a
5 0.85x NF 5-0-2 fulvic liquid	11.34 a	11.81 a	12.36 a	33.0	32.563 a	0.98 a
LSD P=.10	1.082	0.692	0.506	.	7.0829	0.205
Standard Deviation	0.859	0.549	0.402	.	5.6202	0.163
CV	7.78	4.78	3.4	.	18.6	17.75
Levene's F	1.226	0.833	0.733	.	0.197	0.183
Levene's Prob(F)	0.341	0.525	0.584	.	0.936	0.944
Skewness	0.2059	-0.3049	-0.0961	.	0.4634	0.6648
Kurtosis	-1.0413	-0.4228	-1.2913	.	0.1217	0.4869
Replicate F	4.372	2.785	4.698		3.469	4.151
Replicate Prob(F)	0.0268	0.0864	0.0216		0.0508	0.0311
Treatment F	4.211	1.889	7.155		2.050	2.337
Treatment Prob(F)	0.0234	0.1772	0.0035		0.1510	0.1144

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Crop ID Code	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA
BBCH Scale	BVNH	BVNH	BVNH	BVNH	BVNH	BVNH
Crop Scientific Name	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa
Crop Name	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Crop Variety	Inferno	Inferno	Inferno	Inferno	Inferno	Inferno
Description	Yield Weight/A>	N	P	K	Zn	Mn
Part Rated	PLANT C	LEAF C	LEAF C	LEAF C	LEAF -	LEAF -
Rating Date	12/22/17	12/27/17	12/27/17	12/27/17	12/27/17	12/27/17
Rating Type	YIELD	CONNIT	CONP	CONK	CONZN	CONMN
Rating Unit	LB/ACRE	%	%	%	mg/kg	mg/kg
Sample Size, Unit	1 A	1 SAMPLE	1 SAMPLE	1 SAMPLE	1 SAMPLE	1 SAMPLE
Number of Subsamples	1	1	1	1	1	1
SE Group No.	19	12	13	14	15	15
Days After First/Last Applic.	56 36	61 41	61 41	61 41	61 41	61 41
Trt-Eval Interval						
ARM Action Codes	TY2					
Number of Decimals	1					
Trt Treatment						
No Name						
Rate						
Unit						
Code						
1 NF (normal fertilization)	27007.2 b	.	.	.	.	.
2 NF 5-0-2 fulvic liquid	38623.2 a	.	.	.	.	.
3 NF 5-0-2 fulvic liquid	35574.0 a	.	.	.	.	.
4 NF 5-0-2 fulvic liquid	36445.2 a	2.790	0.420	4.610	28.0	71.0
5 0.85x NF 5-0-2 fulvic liquid	37824.6 a	.	.	.	.	.
LSD P=.10	8227.54	.	.	.	.	.
Standard Deviation	6528.41	.	.	.	.	.
CV	18.6	.	.	.	.	.
Levene's F	0.197	.	.	.	.	.
Levene's Prob(F)	0.936	.	.	.	.	.
Skewness	0.4634	.	.	.	.	.
Kurtosis	0.1217	.	.	.	.	.
Replicate F	3.469					
Replicate Prob(F)	0.0508					
Treatment F	2.050					
Treatment Prob(F)	0.1510					

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	1 LACSA BVNH Lactuca sativa Lettuce Inferno Na	1 LACSA BVNH Lactuca sativa Lettuce Inferno B	1 LACSA BVNH Lactuca sativa Lettuce Inferno Ca	1 LACSA BVNH Lactuca sativa Lettuce Inferno Mg	1 LACSA BVNH Lactuca sativa Lettuce Inferno Fe	1 LACSA BVNH Lactuca sativa Lettuce Inferno Cu
Crop ID Code	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA	1 LACSA
BBCH Scale	BVNH	BVNH	BVNH	BVNH	BVNH	BVNH
Crop Scientific Name	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa	Lactuca sativa
Crop Name	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Crop Variety	Inferno	Inferno	Inferno	Inferno	Inferno	Inferno
Description	Na	B	Ca	Mg	Fe	Cu
Part Rated	LEAF -	LEAF -	LEAF -	LEAF -	LEAF -	LEAF -
Rating Date	12/27/17	12/27/17	12/27/17	12/27/17	12/27/17	12/27/17
Rating Type	CONNA	CONB	CONCa	CONMg	CONFe	CONCu
Rating Unit	%	mg/kg	%	%	mg/kg	mg/kg
Sample Size, Unit	1 SAMPLE	1 SAMPLE	1 SAMPLE	1 SAMPLE	1 SAMPLE	1 SAMPLE
Number of Subsamples	1	1	1	1	1	1
SE Group No.	15	15	15	15	15	15
Days After First/Last Applic.	61 41	61 41	61 41	61 41	61 41	61 41
Trt-Eval Interval						
ARM Action Codes						
Number of Decimals						
Trt Treatment						
No Name	19	20	21	22	23	24
Rate						
Applicator						
1 NF (normal fertilization)	.	.	.	.	.	.
2 NF 5-0-2 fulvic liquid	6 gal/a A	.	.	.	.	.
3 NF 5-0-2 fulvic liquid	6 gal/a AB	.	.	.	.	.
4 NF 5-0-2 fulvic liquid	0.070 6 gal/a ABC	23.0	0.530	0.210	91.0	4.0
5 0.85x NF 5-0-2 fulvic liquid	6 gal/a AB	.	.	.	.	.
LSD P=.10	.	.	.	.	.	.
Standard Deviation	.	.	.	.	.	.
CV	.	.	.	.	.	.
Levene's F	.	.	.	.	.	.
Levene's Prob(F)	.	.	.	.	.	.
Skewness
Kurtosis
Replicate F						
Replicate Prob(F)						
Treatment F						
Treatment Prob(F)						

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Crop ID Code

1, LACSA, BVNH, Lactuca sativa, Lettuce, Inferno = 4 rows lettuce per 5 ft bed

Part Rated

PLANT = plant

ROOT = root

LEAF = leaf

C = Crop is Part Rated

Rating Type

HEIGHT = height

LENGTH = length

WEIFRE = weight - fresh

WIDTH = width

COUNT = count

YIELD = yield

CONNIT = content - nitrogen

CONP = content - phosphorus

CONK = content - potassium

CONZN = content - zinc

CONMN = content - manganese

CONNA = content - sodium

CONCa = content - calcium

CONMg = content - magnesium

Rating Unit

IN = inch

g = gram

NUMBER = number

LB = pound

% = percent

PLANT = plant/plant biomass/shrub

ROOT = root

PLOT = total plot

A = acre

SAMPLE = sample

ARM Action Codes

AL = Automatic log transformation of X+1

NM = Do not analyze data (no statistics or mean comparisons), and report treatment means on Summary reports

T1 = [C11]/[C10]

TY2 = 1161.6*[11]