

Holden Research and Consulting

21earthsolmandarin01The use ofEarthsol Products for Fruit set and Fruit size enhancement in Mandarins

Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Trt No.	Treatment Name	Other Rate	Other Rate Unit	Growth Stage	Appl Description	Spray Volume	Volume Unit	Comment 1
1	Grower Standard							
2	Grower Standard Seasol Advanced Root Boost	2	qt/a	ABCD	A=Pre-bloom, B=Petal Fall,	250	GAL/AC	A,B foliar.
3	Grower Standard Acadian	2	qt/a	ABCD	C=Early-mid summer or other D=2-3 weeks pre-harvest	250	GAL/AC	C,D in soil -drippers

Replications: 6, Untreated treatments: 1, Design: Randomized Complete Block (RCB), Treatment units: Treated 'Plot' experimental unit size, Dry Form. Unit: %, Treated 'Plot' experimental unit size Width: 20 feet, Treated 'Plot' experimental unit size Length: 36 feet, Application volume: 200 L/ha, Mix size: 2 liters, Format definitions: G-All7.def, G-All7.frm

Product quantities required for listed treatments and applications of trials included in this table:

Amount*	Unit	Treatment Name	Form Conc	Form Type	Lot Code
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* 'Per area' calculations based on spray volume= 200 L/ha, mix size= 2 liters (mix size basis).

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General Trial Information

Study Director: Caroline Kay
Investigator: David Holden

Trial Status: F one-year/final **Trial Reliability:** GOOD
Initiation Date: Apr-1-2021 **Planned Completion Date:** May-31-2022
Completion Date: Apr-30-2022

Trial Location

City: Somis **Country:** USA United States
State/Prov.: California

Conducted Under GLP: No
Conducted Under GEP: No

Objectives:

To determine if the use of an early fruit formation and fruit set treatment with Seaplant products can enhance the set by reducing drop and in turn increase the over-all size and eventual yield of that set crop.

Conclusions:

Methods and Materials:

All cultural aspects for growing this crop of Mandarins (Golden Nugget) were the same across treatments with the exception of the two treatments added to the grower standard compared to the grower's standard. The test area was on a grower farm and was a small plot, randomized complete block trial. These applications were directed toward improving fruit retention and yield in the tested mandarins. Rates and timing of the test products used in this trial can be found in the Treatment Application Table of this report. No adverse effects were observed from the use of any of Earthsol's products.

Results and Discussion:

All data for this trial can be found in columns 1-26 of the attached report. Along with production data a daily report of the seasonal temperatures from a nearby Cimis station is included. No significant heat events were noted during this past season, but rain amounts were about 20% less than the average of 15 inches per season.

Yield data was collected including the number of fruits dropped from the trees on two different assessment dates (columns 1 and 2). The first count, column 1, shows that treatment 2 had numerically less fruit drop than the grower's standard and treatment 3. However, the second rating, column 2, shows the opposite, with treatment 2 having more fruit drop than the grower's standard and treatment 3. Fruit loss to stress was very limited this past season. Fruit weights, recorded in columns 6, 10, 14, and 20, are the weight per two fruit. None of the weight differ significantly. The final data collected for yield was counts of the number of fruits on the trees. The total fruit to be found per tree on the east and west sides were counted and then totaled (columns 3-5, 7-9, 11-13, 15-17, and 20-22). There were no statistically significant differences between the treatments. However, numerically, treatments 2 and 3 had more fruit per count than the grower's standard several times over the course of the season. The average yield per tree and per acre were calculated and that data can be found in columns 24 and 25. The average yield per acres based on the two spring evaluation dates (columns 19 and 25) were averaged for the season and can be found in data column 26. The Seapol program averaged almost 6% yield improvement over the

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grewer standard while the Acadian program showed a 3% yield improvement. There were no significant differences between the treatments.

All data rated as significant was done so utilizing the New Duncan's Multiple Test Range at a 90% confidence level.

Conclusions:

No statistically significant differences were found between any of these treatments. Heat induced stress was deemed minimal for this past season. It is this investigators observation while working with kelp over the past twenty years, that the best results with these inputs occur when there is significant in season stress which did not occur during this past season.

Contacts

Study Director: Caroline Kay
Investigator: David Holden
Organization: Holden Research and Consulting

Crop Description

Crop 1: CIDRE Citrus reticulata s.s. Mandarin
Variety: Golden Nugget **BBCH Scale:** BCIT

Site and Design

Treated Plot Width: 20 FT
Treated Plot Length: 36 FT
Treated Plot Area: 720 FT² **Treatments:** 3
Replications: 6 **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A	B	C	D
Application Date:	May-12-2021	Jun-3-2021	Jul-28-2021	Mar-9-2022
Appl. Start Time:	1000	1030	10	10
Application Method:	SPRAY	SPRAY	IRRINJ	IRRINJ
Application Placement:	FOLIAR	FOLIAR	SOIL	SOIL
Applied By:	Holden	Holden	Holden	Holden
Air Temperature, Unit:	64 F	64 F	75 F	70 F
% Relative Humidity:	80	70	70	50
Wind Velocity, Unit:	2 mph	1 mph	1 mph	1 mph
Wind Direction:	w	w	w	w
Dew Presence (Y/N):	N no	N no	N no	N no
% Cloud Cover:	100	0	0	0
Next Moisture Occurred On:	May-18-2021	Jul-6-2021	Jul-28-2021	Mar-15-2022

Crop Stage At Each Application

	A	B	C	D
Crop 1 Code, BBCH Scale:	CIDRE BCIT	CIDRE BCIT	CIDRE BCIT	CIDRE BCIT

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Application Equipment

	A	B	C	D
Appl. Equipment:	Hypro Pump	Hypro Pump	Hypro Pump	Hypro Pump
Operation Pressure, Unit:	300 psi	300 psi	40 psi	40 psi
Carrier:	WATER	WATER	WATER	WATER
Spray Volume, Unit:	250 GAL/AC	250 GAL/AC	8 GAL/AC	8 GAL/AC
Mix Size, Unit:	20 Gallons	20 Gallons	12 Gallons	12 Gallons

Trt No Treatment Application Comment

1 No negative effects noted from any of the treatments.

Date By Notes

Jun-24-2021 Holden Preliminary inspection for "June" drop from heat. Set is late this year, so do not expect any drop for at least two more weeks. None found today.
 Oct-7-2021 Holden No extreme heat days or stress has occurred in this orchard yet this year. Not cold, but no heat waves either.
 Nov-15-2021 Holden Trees pruned, so fruit count about half on November 29, 2021

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Pest Type	CIDRE		CIDRE		CIDRE		CIDRE		CIDRE	
Pest Code	BCIT		BCIT		BCIT		BCIT		BCIT	
Pest Scientific Name	Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>	
Pest Name	Mandarin		Mandarin		Mandarin		Mandarin		Mandarin	
Crop Code	Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget	
BBCH Scale	FRUDRO C		FRUDRO C		- C		- C		- C	
Crop Scientific Name	Jul-28-2021		Sep-9-2021		Nov-4-2021		Nov-4-2021		Nov-4-2021	
Crop Name	COUNT		COUNT		COUNT		COUNT		COUNT	
Crop Variety	NUMBER		NUMBER		NUMBER		NUMBER		NUMBER	
Description	2 TREE		2 TREE		1 YD2		1 YD2		1 YD2	
Part Rated	1 PLOT		1 PLOT		1 PLOT		1 PLOT		1 PLOT	
Rating Date	1		1		1		1		1	
Rating Type	1		1		1		1		1	
Rating Unit	1		1		1		1		1	
Sample Size, Unit	1		1		1		1		1	
Collection Basis, Unit	1		1		1		1		1	
Number of Subsamples	1		1		1		1		1	
Crop Stage Majority	1		1		1		1		1	
Crop Stage Scale	Holden		Holden		Shelton		Shelton		Shelton	
Crop Density, Unit	1		2		3		6		6	
Footnote Number	77 55		120 43		176 99		176 99		176 99	
Assessed By	55 DA-B		43 DA-C		99 DA-C		99 DA-C		99 DA-C	
SE Group No.										
Rating Timing										
Days After First/Last Applic.										
Trt-Eval Interval										
Plant-Eval Interval										
Days After Emergence										
ARM Action Codes									T1	
Number of Decimals	0		0		0		0		0	
Trt Treatment	Other	Other								
No. Name	Rate	Rate	Unit	Plot	1	2	3	4	5	
1 Grower Standard					4	13	39	46	85	
					0	26	42	45	87	
					2	12	28	33	61	
					6	32	37	34	71	
					1	18	51	48	99	
					7	9	43	49	92	
					3	18	40	43	83	
2 Grower Standard					0	25	45	47	92	
Season Advanced Root Boost	2 qt/a				0	5	34	38	72	
					1	25	32	40	72	
					4	13	28	32	60	
					0	43	21	29	50	
					1	12	36	38	74	
					1	21	33	37	70	
3 Grower Standard					0	20	43	40	83	
Acadian	2 qt/a				14	24	51	48	99	
					0	15	48	53	101	
					0	24	39	42	81	
					6	6	34	38	72	
					7	9	35	45	80	
					5	16	42	44	86	

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Pest Type									
Pest Code									
Pest Scientific Name									
Pest Name									
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE				
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT				
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>				
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin				
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget				
Description	Fruit Weight	East Side Ft Ct	West Side Ft Ct	Total	Fruit Weight				
Part Rated	- C	- C	- C	- C	- C				
Rating Date	Nov-4-2021	Nov-29-2021	Nov-29-2021	Nov-29-2021	Dec-2-2021				
Rating Type	WEIFRE	COUNT	COUNT	COUNT	WEIFRE				
Rating Unit	g	NUMBER	NUMBER	NUMBER	g				
Sample Size, Unit	2 FRUIT	1 YD2	1 YD2	1 YD2	2 FRUIT				
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT				
Number of Subsamples	1	1	1	1	1				
Crop Stage Majority									
Crop Stage Scale									
Crop Density, Unit									
Footnote Number	1	1	1	1	1				
Assessed By	Shelton	Holden	Holden	Holden	Shelton				
SE Group No.	7	8	9	9	10				
Rating Timing									
Days After First/Last Applic.	176 99	201 124	201 124	201 124	204 127				
Trt-Eval Interval	99 DA-C	124 DA-C	124 DA-C	124 DA-C	127 DA-C				
Plant-Eval Interval									
Days After Emergence									
ARM Action Codes				T2					
Number of Decimals	0	0	0	0	0				
Trt Treatment	Other	Other							
No. Name	Rate	Rate	Unit	Plot					
1 Grower Standard				6	7	8	9	10	
				101	36	17	0	17	34
				201	33	18	12	30	22
				301	31	26	14	40	46
				401	28	8	17	25	44
				501	24	19	18	37	38
				601	39	18	17	35	29
				Mean =	32	18	13	31	36
2 Grower Standard				102	26	33	22	55	21
Season Advanced Root Boost	2 qt/a			202	35	20	6	26	47
				302	26	12	20	32	37
				402	22	33	29	62	36
				502	41	30	20	50	30
				602	38	16	23	39	32
				Mean =	31	24	20	44	34
3 Grower Standard				103	39	5	26	31	35
Acadian	2 qt/a			203	32	24	26	50	34
				303	30	12	24	36	28
				403	28	19	9	28	27
				503	21	25	12	37	36
				603	40	33	24	57	20
				Mean =	32	20	20	40	30

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Pest Type	CIDRE		CIDRE		CIDRE		CIDRE		CIDRE	
Pest Code	BCIT		BCIT		BCIT		BCIT		BCIT	
Pest Scientific Name	Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>	
Pest Name	Mandarin		Mandarin		Mandarin		Mandarin		Mandarin	
Crop Code	Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget	
BBCH Scale	East Side Ft Ct		West Side Ft Ct		Total		Fruit Weight		East Side Ft Ct	
Crop Scientific Name	- C		- C		- C		- C		- C	
Crop Name	Dec-2-2021		Dec-2-2021		Dec-2-2021		Feb-8-2022		Feb-8-2022	
Crop Variety	COUNT		COUNT		COUNT		WEIFRE		COUNT	
Description	NUMBER		NUMBER		NUMBER		g		NUMBER	
Part Rated	1 YD2		1 YD2		1 YD2		2 FRUIT		1 TREE	
Rating Date	1 PLOT		1 PLOT		1 PLOT		1 PLOT		1 PLOT	
Rating Type	1		1		1		1		1	
Rating Unit	1		1		1		1		1	
Sample Size, Unit	1		1		1		1		1	
Collection Basis, Unit	1		1		1		1		1	
Number of Subsamples	1		1		1		1		1	
Crop Stage Majority	1		1		1		1		1	
Crop Stage Scale	Holden		Holden		Holden		Shelton		Holden	
Crop Density, Unit	15		16		18		19		26	
Footnote Number	204 127		204 127		204 127		272 195		272 195	
Assessed By	127 DA-C		127 DA-C		127 DA-C		195 DA-C		195 DA-C	
SE Group No.										
Rating Timing										
Days After First/Last Applic.										
Trt-Eval Interval										
Plant-Eval Interval										
Days After Emergence										
ARM Action Codes					T3					
Number of Decimals	0		0		0		0		0	
Trt Treatment	Other Other									
No. Name	Rate	Rate	Unit	Plot	11	12	13	14	15	
1 Grower Standard				101	21	4	25	117	97	
				201	15	17	32	99	103	
				301	29	19	48	107	100	
				401	12	20	32	124	83	
				501	25	22	47	136	124	
				601	24	23	47	142	104	
				Mean =	21	18	39	121	102	
2 Grower Standard				102	27	29	56	143	124	
Season Advanced Root Boost	2 qt/a			202	28	14	42	131	133	
				302	18	30	48	130	132	
				402	28	28	56	122	129	
				502	34	25	59	107	109	
				602	19	29	48	104	98	
				Mean =	26	26	52	123	121	
3 Grower Standard				103	11	30	41	108	98	
Acadian	2 qt/a			203	19	25	44	113	98	
				303	17	32	49	139	142	
				403	17	16	33	126	128	
				503	20	19	39	146	107	
				603	28	29	57	123	136	
				Mean =	19	25	44	126	118	

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Pest Type					
Pest Code					
Pest Scientific Name					
Pest Name					
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Ave	Golden Nugget
Description	West Side Ft Ct	Total Fruit	Fruit Weight	Early est. Yie>	Fruit Weight
Part Rated	- C	- C	- C		- C
Rating Date	Feb-8-2022	Feb-8-2022	Feb-8-2022	Feb-8-2022	Apr-6-2022
Rating Type	COUNT	COUNT	WEIFRE	Yield	WEIFRE
Rating Unit	NUMBER	NUMBER	lb	BU25LB	g
Sample Size, Unit	1 TREE	1 TREE	1 Tree	1 A	1 FRUIT
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT		1 PLOT
Number of Subsamples	1	1	1	1	1
Crop Stage Majority					
Crop Stage Scale					
Crop Density, Unit					
Footnote Number	1	1	1	1	1
Assessed By	Holden	Holden	Shelton		Shelton
SE Group No.	27	29	31	53	34
Rating Timing					
Days After First/Last Applic.	272 195	272 195	272 195	272 195	329 28
Trt-Eval Interval	195 DA-C	195 DA-C	195 DA-C	195 DA-C	28 DA-D
Plant-Eval Interval					
Days After Emergence					
ARM Action Codes		T4	T5	T8	
Number of Decimals	0	0	0	0	0
Trt Treatment	Other	Other			
No. Name	Rate Rate Unit Plot				
1 Grower Standard		16	17	18	19
					20
	101	78	175	45	332
	201	120	223	49	358
	301	138	238	56	413
	401	91	174	48	350
	501	152	276	83	609
	601	148	252	79	580
	Mean =	121	223	60	440
2 Grower Standard					
Seasonal Advanced Root Boost	2 qt/a				
	102	123	247	78	573
	202	99	232	67	493
	302	137	269	77	567
	402	145	274	74	542
	502	114	223	53	387
	602	149	247	57	416
	Mean =	128	249	67	496
3 Grower Standard					
Acadian	2 qt/a				
	103	72	170	40	298
	203	67	165	41	302
	303	139	281	86	633
	403	82	210	58	429
	503	114	221	71	523
	603	127	263	71	524
	Mean =	100	218	61	452

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Pest Type									
Pest Code									
Pest Scientific Name									
Pest Name									
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE				
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT				
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>				
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin				
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Ave	Ave				
Description	East Side Ft Ct	West Side Ft Ct	Total	Yield per Tree	Yield per Acre				
Part Rated	- C	- C	- C						
Rating Date	Apr-6-2022	Apr-6-2022	Apr-6-2022	Apr-6-2022	Apr-6-2022				
Rating Type	COUNT	COUNT	COUNT	WEIFRE	Yield				
Rating Unit	NUMBER	NUMBER	NUMBER	LB	BU25LB				
Sample Size, Unit	1 TREE	1 TREE	1 TREE	1 Tree	1 A				
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT						
Number of Subsamples	1	1	1	1	1				
Crop Stage Majority									
Crop Stage Scale									
Crop Density, Unit									
Footnote Number	1	1	1		1				
Assessed By	Holden	Holden	Holden						
SE Group No.	32	33	36	52	56				
Rating Timing									
Days After First/Last Applic.	329 28	329 28	329 28	329 28	329 28				
Trt-Eval Interval	28 DA-D	28 DA-D	28 DA-D	28 DA-D	28 DA-D				
Plant-Eval Interval									
Days After Emergence									
ARM Action Codes			T6	T7	T9				
Number of Decimals	0	0	0	0	0				
Trt Treatment	Other	Other							
No. Name	Rate	Rate	Unit	Plot					
				21	22				
				23	24				
				25					
1 Grower Standard				101	55	25	80	28	206
				201	88	126	214	83	611
				301	89	136	225	80	591
				401	105	98	203	93	688
				501	99	82	181	59	434
				601	87	93	180	78	572
				Mean =	87	93	181	70	517
2 Grower Standard				102	100	114	214	87	638
Seasol Advanced Root Boost	2 qt/a			202	121	111	232	95	696
				302	110	99	209	61	447
				402	92	76	168	40	291
				502	120	144	264	75	552
				602	98	104	202	66	485
				Mean =	107	108	215	70	518
3 Grower Standard				103	97	67	164	39	290
Acadian	2 qt/a			203	102	93	195	65	481
				303	113	122	235	84	621
				403	88	95	183	85	623
				503	148	120	268	103	756
				603	78	75	153	63	461
				Mean =	104	95	200	73	539

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Project ID:	Study Director: Caroline Kay	
	Sponsor Contact:	

Pest Type		
Pest Code		
Pest Scientific Name		
Pest Name		
Crop Code	CIDRE	
BBCH Scale	BCIT	
Crop Scientific Name	Citrus reticul>	
Crop Name	Mandarin	
Crop Variety	Ave from Feb a>	
Description	Yield per Acre	
Part Rated		
Rating Date		
Rating Type	Yield	
Rating Unit	BU25LB	
Sample Size, Unit	1 A	
Collection Basis, Unit		
Number of Subsamples	1	
Crop Stage Majority		
Crop Stage Scale		
Crop Density, Unit		
Footnote Number	1	
Assessed By		
SE Group No.	58	
Rating Timing		
Days After First/Last Applic.		
Trt-Eval Interval	28 DA-D	
Plant-Eval Interval		
Days After Emergence		
ARM Action Codes	T10	
Number of Decimals	0	
Trt Treatment	Other Other	
No. Name	Rate Rate Unit Plot	26
1 Grower Standard	101	269
	201	484
	301	502
	401	519
	501	521
	601	576
	Mean =	479
2 Grower Standard	102	605
Season Advanced Root Boost 2 qt/a	202	594
	302	507
	402	417
	502	469
	602	451
	Mean =	507
3 Grower Standard	103	294
Acadian 2 qt/a	203	391
	303	627
	403	526
	503	640
	603	493
	Mean =	495

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Crop Code

CIDRE, BCIT, Citrus reticulata s.s., = US

Part Rated

FRUDRO = fruit - dropped

C = Crop is Part Rated

Rating Type

COUNT = count

WEIFRE = weight - fresh

Yield = yield

Rating Unit

NUMBER = number

g = gram

lb = pound

BU25LB = bushel 25 lb

TREE = tree

YD2 = square yard

FRUIT = fruit

A = acre

PLOT = total plot

ARM Action Codes

T1 = [C3]+[C4]

T2 = [C7]+[C8]

T3 = [C11]+[C12]

T4 = [C15]+[C16]

T5 = ([C14]*[C17])/454

T8 = ([C18]*184)/25

T6 = [C21]+[C22]

T7 = &([C23]*[C20])/454

T9 = ([C24]*184)/25

T10 = &([19]+[25])/2

Holden Research and Consulting

21earthsolmandarin01The use of Earthsol Products for Fruit set and Fruit size enhancement in Mandarins

Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Pest Type					
Pest Code					
Pest Scientific Name					
Pest Name					
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget
Description			East Side Ft Ct	West Side Ft Ct	Total
Part Rated	FRUDRO C	FRUDRO C	- C	- C	- C
Rating Date	Jul-28-2021	Sep-9-2021	Nov-4-2021	Nov-4-2021	Nov-4-2021
Rating Type	COUNT	COUNT	COUNT	COUNT	COUNT
Rating Unit	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER
Sample Size, Unit	2 TREE	2 TREE	1 YD2	1 YD2	1 YD2
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Number of Subsamples	1	1	1	1	1
Crop Stage Majority					
Crop Stage Scale					
Crop Density, Unit					
Footnote Number	1	1	1	1	1
Assessed By	Holden	Holden	Shelton	Shelton	Shelton
SE Group No.	1	2	3	6	6
Rating Timing					
Days After First/Last Applic.	77 55	120 43	176 99	176 99	176 99
Trt-Eval Interval	55 DA-B	43 DA-C	99 DA-C	99 DA-C	99 DA-C
Plant-Eval Interval					
Days After Emergence					
ARM Action Codes					T1
Number of Decimals	0	0	0	0	0
Trt Treatment No. Name	Other Rate	Other Rate Unit			
1 Grower Standard			1	2	3
2 Grower Standard Seasol Advanced Root Boost	2 qt/a		4	5	
3 Grower Standard Acadian	2 qt/a				
LSD P=.05	5.3	14.6	10.5	8.4	18.2
Standard Deviation	4.1	11.3	8.2	6.5	14.2
CV	139.43	61.59	21.5	15.8	17.83
Bartlett's X2	7.214	1.703	0.107	0.296	0.254
P(Bartlett's X2)	0.027*	0.427	0.948	0.863	0.881
Skewness	1.5854*	0.8196	-0.1984	-0.1958	-0.2723
Kurtosis	2.7304*	0.6549	-0.2275	-0.8421	-0.4679
Replicate F	0.502	0.511	0.533	0.833	0.640
Replicate Prob(F)	0.7689	0.7625	0.7471	0.5547	0.6753
Treatment F	1.131	0.203	2.048	1.848	2.113
Treatment Prob(F)	0.3609	0.8194	0.1796	0.2076	0.1716

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
 Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Holden Research and Consulting

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Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Pest Type	CIDRE		CIDRE		CIDRE		CIDRE		CIDRE	
Pest Code	BCIT		BCIT		BCIT		BCIT		BCIT	
Pest Scientific Name	Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>		Citrus reticul>	
Pest Name	Mandarin		Mandarin		Mandarin		Mandarin		Mandarin	
Crop Code	Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget		Golden Nugget	
BBCH Scale	Fruit Weight		East Side Ft Ct		West Side Ft Ct		Total		Fruit Weight	
Crop Scientific Name	- C		- C		- C		- C		- C	
Crop Name	Nov-4-2021		Nov-29-2021		Nov-29-2021		Nov-29-2021		Dec-2-2021	
Crop Variety	WEIFRE		COUNT		COUNT		COUNT		WEIFRE	
Description	g		NUMBER		NUMBER		NUMBER		g	
Part Rated	2 FRUIT		1 YD2		1 YD2		1 YD2		2 FRUIT	
Rating Date	1 PLOT		1 PLOT		1 PLOT		1 PLOT		1 PLOT	
Rating Type	1		1		1		1		1	
Rating Unit	1		1		1		1		1	
Sample Size, Unit	1		1		1		1		1	
Collection Basis, Unit	1		1		1		1		1	
Number of Subsamples	1		1		1		1		1	
Crop Stage Majority	1		1		1		1		1	
Crop Stage Scale	1		1		1		1		1	
Crop Density, Unit	1		1		1		1		1	
Footnote Number	1		1		1		1		1	
Assessed By	Shelton		Holden		Holden		Holden		Shelton	
SE Group No.	7		8		9		9		10	
Rating Timing	176 99		201 124		201 124		201 124		204 127	
Days After First/Last Applic.	99 DA-C		124 DA-C		124 DA-C		124 DA-C		127 DA-C	
Trt-Eval Interval	99 DA-C		124 DA-C		124 DA-C		124 DA-C		127 DA-C	
Plant-Eval Interval										
Days After Emergence										
ARM Action Codes							T2			
Number of Decimals	0		0		0		0		0	
Trt Treatment No. Name	Other Rate	Other Rate Unit								
1 Grower Standard	32 a		18 a		13 a		31 a		36 a	
2 Grower Standard Seasol Advanced Root Boost	31 a	2 qt/a	24 a		20 a		44 a		34 a	
3 Grower Standard Acadian	32 a	2 qt/a	20 a		20 a		40 a		30 a	
LSD P=.05	7.8		12.6		10.9		17.1		11.2	
Standard Deviation	6.1		9.8		8.5		13.3		8.7	
CV	19.22		48.06		47.83		34.91		26.3	
Bartlett's X2	0.595		1.466		0.087		1.095		0.771	
P(Bartlett's X2)	0.743		0.481		0.957		0.578		0.68	
Skewness	-0.0918		0.0156		-0.7186		0.4538		0.0633	
Kurtosis	-1.2263		-0.7106		0.0975		-0.4496		-0.479	
Replicate F	1.767		0.251		0.246		0.229		0.574	
Replicate Prob(F)	0.2073		0.9299		0.9327		0.9413		0.7192	
Treatment F	0.011		0.651		1.397		1.573		0.629	
Treatment Prob(F)	0.9895		0.5421		0.2917		0.2547		0.5529	

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Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Pest Type					
Pest Code					
Pest Scientific Name					
Pest Name					
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget	Golden Nugget
Description	East Side Ft Ct	West Side Ft Ct	Total	Fruit Weight	East Side Ft Ct
Part Rated	- C	- C	- C	- C	- C
Rating Date	Dec-2-2021	Dec-2-2021	Dec-2-2021	Feb-8-2022	Feb-8-2022
Rating Type	COUNT	COUNT	COUNT	WEIFRE	COUNT
Rating Unit	NUMBER	NUMBER	NUMBER	g	NUMBER
Sample Size, Unit	1 YD2	1 YD2	1 YD2	2 FRUIT	1 TREE
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Number of Subsamples	1	1	1	1	1
Crop Stage Majority					
Crop Stage Scale					
Crop Density, Unit					
Footnote Number	1	1	1	1	1
Assessed By	Holden	Holden	Holden	Shelton	Holden
SE Group No.	15	16	18	19	26
Rating Timing					
Days After First/Last Applic.	204 127	204 127	204 127	272 195	272 195
Trt-Eval Interval	127 DA-C	127 DA-C	127 DA-C	195 DA-C	195 DA-C
Plant-Eval Interval					
Days After Emergence					
ARM Action Codes			T3		
Number of Decimals	0	0	0	0	0
Trt Treatment	Other	Other			
No. Name	Rate Rate Unit				
1 Grower Standard					
2 Grower Standard					
Seasol Advanced Root Boost	2 qt/a				
3 Grower Standard					
Acadian	2 qt/a				
LSD P=.05	8.4	8.7	10.6	23.0	23.2
Standard Deviation	6.6	6.8	8.3	17.9	18.1
CV	30.14	29.57	18.53	14.51	15.91
Bartlett's X2	0.104	0.092	0.854	0.081	0.864
P(Bartlett's X2)	0.949	0.955	0.652	0.96	0.649
Skewness	0.0738	-0.9904	-0.3934	-0.0229	0.0871
Kurtosis	-0.7946	1.0876	-0.4965	-1.1993	-1.2951
Replicate F	0.528	0.768	1.107	0.237	0.333
Replicate Prob(F)	0.7507	0.5933	0.4150	0.9374	0.8816
Treatment F	1.769	2.822	3.748	0.119	1.944
Treatment Prob(F)	0.2199	0.1067	0.0610	0.8891	0.1936

Holden Research and Consulting

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Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Pest Type					
Pest Code					
Pest Scientific Name					
Pest Name					
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Ave	Golden Nugget
Description	West Side Ft Ct	Total Fruit	Fruit Weight	Early est. Yie>	Fruit Weight
Part Rated	- C	- C	- C		- C
Rating Date	Feb-8-2022	Feb-8-2022	Feb-8-2022	Feb-8-2022	Apr-6-2022
Rating Type	COUNT	COUNT	WEIFRE	Yield	WEIFRE
Rating Unit	NUMBER	NUMBER	lb	BU25LB	g
Sample Size, Unit	1 TREE	1 TREE	1 Tree	1 A	1 FRUIT
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT		1 PLOT
Number of Subsamples	1	1	1	1	1
Crop Stage Majority					
Crop Stage Scale					
Crop Density, Unit					
Footnote Number	1	1	1	1	1
Assessed By	Holden	Holden	Shelton		Shelton
SE Group No.	27	29	31	53	34
Rating Timing					
Days After First/Last Applic.	272 195	272 195	272 195	272 195	329 28
Trt-Eval Interval	195 DA-C	195 DA-C	195 DA-C	195 DA-C	28 DA-D
Plant-Eval Interval					
Days After Emergence					
ARM Action Codes		T4	T5	T8	
Number of Decimals	0	0	0	0	0
Trt Treatment	Other	Other			
No. Name	Rate Rate Unit				
1 Grower Standard		16	17	18	19
2 Grower Standard		121 a	223 a	60 a	440 a
Seasol Advanced Root Boost	2 qt/a	128 a	249 a	67 a	496 a
3 Grower Standard		100 a	218 a	61 a	452 a
Acadian	2 qt/a				166 a
LSD P=.05		26.0	43.3	20.4	150.4
Standard Deviation		20.2	33.7	15.9	116.9
CV		17.34	14.65	25.26	25.26
Bartlett's X2		1.168	3.25	1.336	1.336
P(Bartlett's X2)		0.558	0.197	0.513	0.513
Skewness		-0.4606	-0.483	-0.0501	-0.0501
Kurtosis		-1.1777	-0.9344	-1.4396	-1.4396
Replicate F		3.523	1.833	0.877	0.877
Replicate Prob(F)		0.0427	0.1939	0.5300	0.5300
Treatment F		3.072	1.410	0.385	0.385
Treatment Prob(F)		0.0912	0.2887	0.6899	0.6899

Holden Research and Consulting

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Trial ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Protocol ID: 21earthsolmandarin01 Investigator: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Pest Type					
Pest Code					
Pest Scientific Name					
Pest Name					
Crop Code	CIDRE	CIDRE	CIDRE	CIDRE	CIDRE
BBCH Scale	BCIT	BCIT	BCIT	BCIT	BCIT
Crop Scientific Name	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>	Citrus reticul>
Crop Name	Mandarin	Mandarin	Mandarin	Mandarin	Mandarin
Crop Variety	Golden Nugget	Golden Nugget	Golden Nugget	Ave	Ave
Description	East Side Ft Ct	West Side Ft Ct	Total	Yield per Tree	Yield per Acre
Part Rated	- C	- C	- C		
Rating Date	Apr-6-2022	Apr-6-2022	Apr-6-2022	Apr-6-2022	Apr-6-2022
Rating Type	COUNT	COUNT	COUNT	WEIFRE	Yield
Rating Unit	NUMBER	NUMBER	NUMBER	LB	BU25LB
Sample Size, Unit	1 TREE	1 TREE	1 TREE	1 Tree	1 A
Collection Basis, Unit	1 PLOT	1 PLOT	1 PLOT		
Number of Subsamples	1	1	1	1	1
Crop Stage Majority					
Crop Stage Scale					
Crop Density, Unit					
Footnote Number	1	1	1		1
Assessed By	Holden	Holden	Holden		
SE Group No.	32	33	36	52	56
Rating Timing					
Days After First/Last Applic.	329 28	329 28	329 28	329 28	329 28
Trt-Eval Interval	28 DA-D	28 DA-D	28 DA-D	28 DA-D	28 DA-D
Plant-Eval Interval					
Days After Emergence					
ARM Action Codes			T6	T7	T9
Number of Decimals	0	0	0	0	0
Trt Treatment No. Name	Other Rate	Other Rate			
	21	22	23	24	25
1 Grower Standard	87 a	93 a	181 a	70 a	517 a
2 Grower Standard Seasol Advanced Root Boost	107 a	108 a	215 a	70 a	518 a
2 qt/a					
3 Grower Standard Acadian	104 a	95 a	200 a	73 a	539 a
2 qt/a					
LSD P=.05	19.7	34.3	46.9	30.0	220.7
Standard Deviation	15.3	26.7	36.5	23.3	171.5
CV	15.41	26.98	18.38	32.7	32.7
Bartlett's X2	2.264	2.151	1.109	0.153	0.153
P(Bartlett's X2)	0.322	0.341	0.574	0.926	0.926
Skewness	0.2843	-0.8213	-0.8873	-0.6389	-0.6389
Kurtosis	2.0484	1.5496	2.2581*	-0.2045	-0.2045
Replicate F	2.451	1.572	2.285	0.630	0.630
Replicate Prob(F)	0.1067	0.2536	0.1246	0.6816	0.6816
Treatment F	2.928	0.533	1.336	0.030	0.030
Treatment Prob(F)	0.0998	0.6025	0.3060	0.9705	0.9705

Holden Research and Consulting

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Trial ID: 21earthsolmandarin01	Location: Somis, CA	Trial Year: 2021
Protocol ID: 21earthsolmandarin01	Investigator: David Holden	
Project ID:	Study Director: Caroline Kay	
	Sponsor Contact:	

Pest Type		
Pest Code		
Pest Scientific Name		
Pest Name		
Crop Code		CIDRE
BBCH Scale		BCIT
Crop Scientific Name		Citrus reticul>
Crop Name		Mandarin
Crop Variety		Ave from Feb a>
Description		Yield per Acre
Part Rated		
Rating Date		
Rating Type		Yield
Rating Unit		BU25LB
Sample Size, Unit		1 A
Collection Basis, Unit		
Number of Subsamples		1
Crop Stage Majority		
Crop Stage Scale		
Crop Density, Unit		
Footnote Number		1
Assessed By		
SE Group No.		58
Rating Timing		
Days After First/Last Applic.		
Trt-Eval Interval		28 DA-D
Plant-Eval Interval		
Days After Emergence		
ARM Action Codes		T10
Number of Decimals		0
Trt Treatment	Other Other	
No. Name	Rate Rate Unit	26
1 Grower Standard		479 a
2 Grower Standard		507 a
Seasol Advanced Root Boost	2 qt/a	
3 Grower Standard		495 a
Acadian	2 qt/a	
LSD P=.05		146.3
Standard Deviation		113.7
CV		23.04
Bartlett's X2		1.371
P(Bartlett's X2)		0.504
Skewness		-0.7501
Kurtosis		0.3767
Replicate F		0.753
Replicate Prob(F)		0.6024
Treatment F		0.096
Treatment Prob(F)		0.9092

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Project ID: Study Director: Caroline Kay
Sponsor Contact:

Crop Code

CIDRE, BCIT, Citrus reticulata s.s., = US

Part Rated

FRUDRO = fruit - dropped

C = Crop is Part Rated

Rating Type

COUNT = count

WEIFRE = weight - fresh

Yield = yield

Rating Unit

NUMBER = number

g = gram

lb = pound

BU25LB = bushel 25 lb

TREE = tree

YD2 = square yard

FRUIT = fruit

A = acre

PLOT = total plot

ARM Action Codes

T1 = [C3]+[C4]

T2 = [C7]+[C8]

T3 = [C11]+[C12]

T4 = [C15]+[C16]

T5 = ([C14]*[C17])/454

T8 = ([C18]*184)/25

T6 = [C21]+[C22]

T7 = &([C23]*[C20])/454

T9 = ([C24]*184)/25

T10 = &([19]+[25])/2

Holden Research and Consulting

21earthsolmandarin01The use ofEarthsol Products for Fruit set and Fruit size enhancement in Mandarins

Protocol ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
Trial ID: By: David Holden
Project ID: Study Director: Caroline Kay
Sponsor Contact:

Trial Establishment Guidelines

Revision Date: Mar-16-2021 **Developer:** Holden
Replications: 6 **Issue Date:** Jan-14-2021

Number of Trials
1

Total Trials: 1

Conduct Under GLP: No
Conduct Under GEP: No

Objectives:

To determine if the use of an early fruit formation and fruit set treatment with Seaplant products can enhance the set by reducing drop and in turn increase the over-all size and eventual yield of that set crop.

Crop Description

Crop 1: CIDRE Citrus reticulata s.s. Mandarin
Variety: Golden Nugget
BBCH Scale: BCIT

Application Directions:

Foliar applications of seaplant products in replicated trial.

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	CIDRE BCIT

Geographic Area/Environmental Considerations:

Mandarins grown in Ventura county

Cropping Considerations:

Any variety grown in Ventura county

Data to Collect:

1. Post set counts of fruit on the tree after initial drop at 8-10 weeks post treat on north and south sides of the trees utilizing counting squares. Drop evaluations if possible.
2. RE-evaluations at 16-20 weeks post set.
3. Sizing data collection at two or three key developement times.
4. Pre-harvest harvest estimation of final crop.

Statistical Analysis:

DMRT or other appropriate analysis at at least 90% confidence level

Summarize and Submit Study By (Date): May-31-2022

Holden Research and Consulting

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Protocol ID: 21earthsolmandarin01 Location: Somis, CA Trial Year: 2021
 Trial ID: By: David Holden
 Project ID: Study Director: Caroline Kay
 Sponsor Contact:

Trt No.	Treatment Name	Other Rate	Other Rate Unit	Growth Stage	Appl Description	Spray Volume	Volume Unit	Comment 1
1	Grower Standard							
2	Grower Standard Seasol Advanced Root Boost	2	qt/a	ABCD	A=Pre-bloom, B=Petal Fall,	250	GAL/AC	A,B foliar.
3	Grower Standard Acadian	2	qt/a	ABCD	C=Early-mid summer or other D=2-3 weeks pre-harvest	250	GAL/AC	C,D in soil -drippers

Replications: 6, Untreated treatments: 1, Design: Randomized Complete Block (RCB), Treatment units: Treated 'Plot' experimental unit size, Dry Form. Unit: %, Treated 'Plot' experimental unit size Width: 20 feet, Treated 'Plot' experimental unit size Length: 36 feet, Application volume: 200 L/ha, Mix size: 2 liters, Format definitions: G-All7.def, G-All7.frm