

## CRDF Study on Preharvest Fruit Drop Prevention using PGRs July 2023 Report

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**Introduction:** The Citrus Research and Development Foundation (CRDF) commissioned a series of field trials in June 2022 to investigate the effectiveness of exogenous applications of plant growth regulators (PGRs) to stop or reduce preharvest fruit drop in citrus. The project was developed by CRDF and conducted by John Curtis of Better Crops.

Ten treatments were investigated in this project. There were six trial sites. Three sites evaluated the early maturing Hamlin orange. The three other sites evaluated the late maturing Valencia orange. For both Hamlin and Valencia, there was a site on the East Coast, a site in the southwest Flatwoods, and a site in the central Ridge. The geographic distribution of these sites was intended to account for the environmental variability of the Florida citrus production ecoregions.

The PGR treatments (listed at the beginning of Appendix A) evaluated in this project were constructed through discussions with citrus growers. In the 2021 – 2022 crop season there were numerous reports of growers experimenting with different PGR spray programs. A few growers reported their PGR application programs resulted in a noticeable difference in fruit drop. Discussion with these growers led to the identification of commonalities among their PGR programs. The most common factor in all discussions was the use a surfactant or spray oil. Currently, the Florida-specific 24c specimen label for 2,4-D does not provide any instructions for the use of surfactants or spray oil. Until this project was commissioned, there had been little work done on the use of PGRs - specifically 2,4-D - with tank mix partners, application scheduling, and tank mixing of different PGRs.

**Trial Evaluation:** Each trial site evaluated 10 treatments in a side-by-side replicated trial. Each treatment consisted of five replicated plots with each replicate having seven trees. The center five trees of the seven-tree plot were used for evaluation. The plot design was constructed to eliminate over-spray or cross contamination of adjacent plots. A detailed list of spray dates and treatments can be found in Appendix A. All spray applications were applied with a Rears PAK Blast sprayer at a volume of 200 gallons per acre.

For each trial site, the trees used for evaluation were of the same age, scion, and rootstock. To the best of the CC's ability, trees of similar health status were chosen. The same evaluations were performed at all sites. Evaluation consisted of DI Ratings, fruit drop count, yield, and fruit quality. Using the values for fruit drop and yield, a calculation could be made to determine the percentage of fruit drop by treatment.

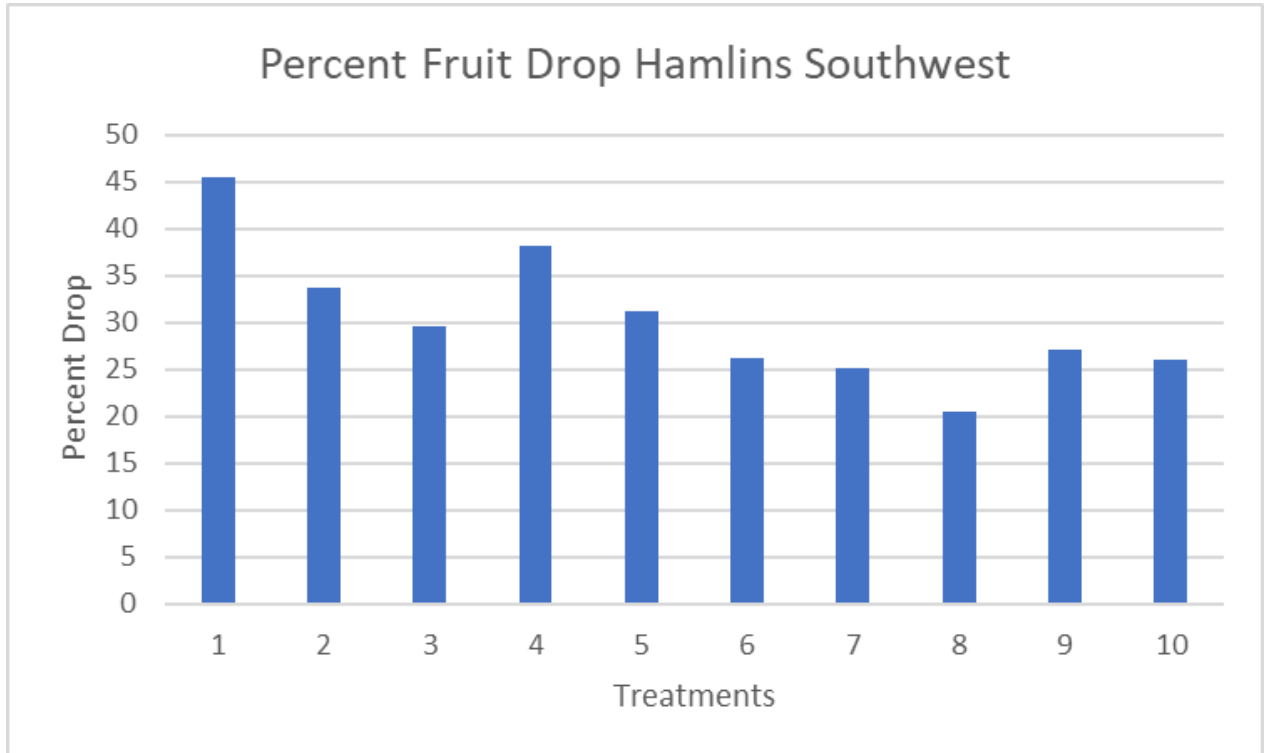
The data were analyzed by a CRDF contracted statistician using a mixed model analysis procedure - GLMMIX using SAS® software using the Tukey HSD multiple comparison procedure - to test for significant differences among treatment means. Significant differences are so at a p-value below 5%.

## Trial Results

### Hamlin Southwest

The Southwest Hamlin trial site is in Immokalee. The trees were planted in April 2007 and are 16 years old. They are grown on Swingle rootstock. The tree spacing is 22' x 12'. The planting density is 165 trees per acre. Harvesting of this trial was on November 30, 2022. Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on December 2, 2022.

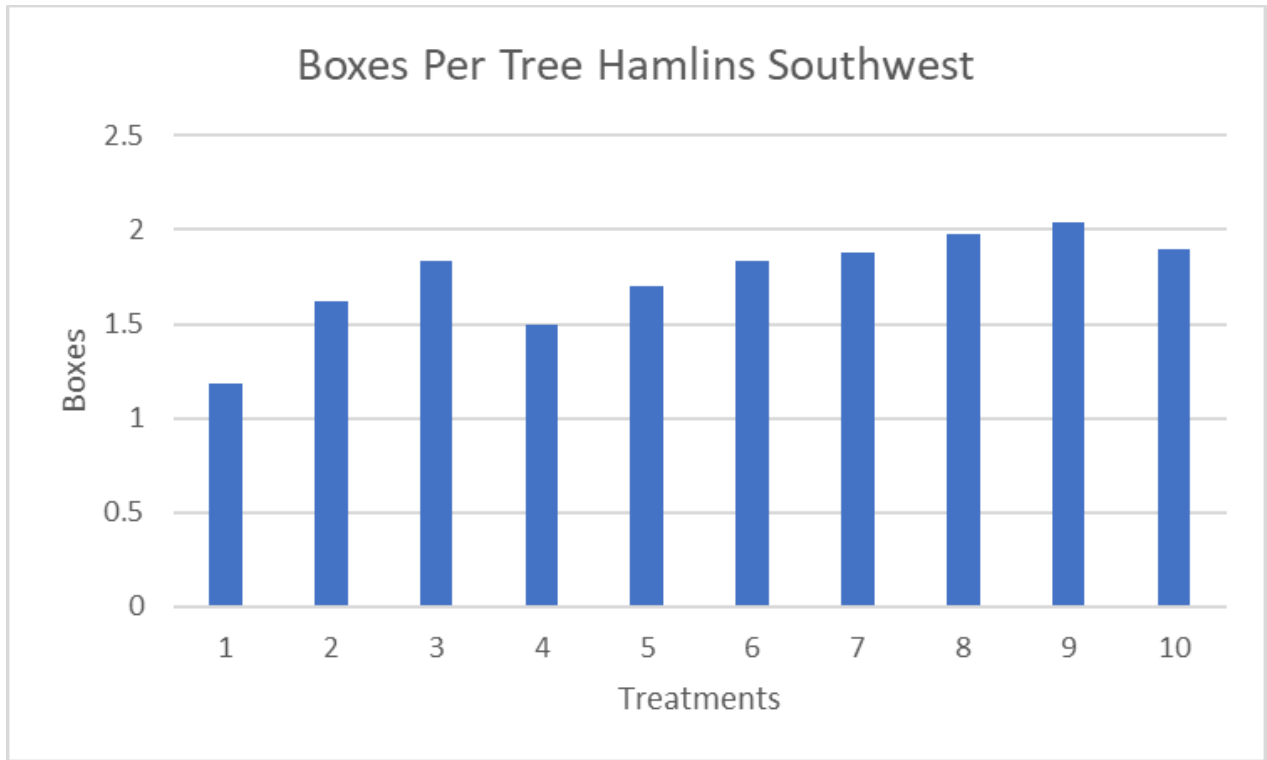
**Table 1. Percent Fruit Drop for Hamlin Southwest**



Treatment	Percent Drop	Significance
1	45.47598	A
2	33.64321	BC
3	29.53514	CD
4	38.10804	AB
5	31.16947	BCD
6	26.15626	CDE
7	25.08306	DE
8	20.47628	E
9	27.11096	CDE
10	26.07359	CDE

Significant differences were found in the percentage of fruit drop at the Southwest Hamlin site. The untreated control (Treatment 1) had the highest percentage of drop of all the treatments at 45.4%. However, the control was not significantly different from Treatment 4. The treatment the lowest percentage of fruit drop was Treatment 8, at 20.4% drop. Treatment 8 was not significantly different from Treatments 6, 7, 9, and 10. There was considerable non-significant overlap between the treatments.

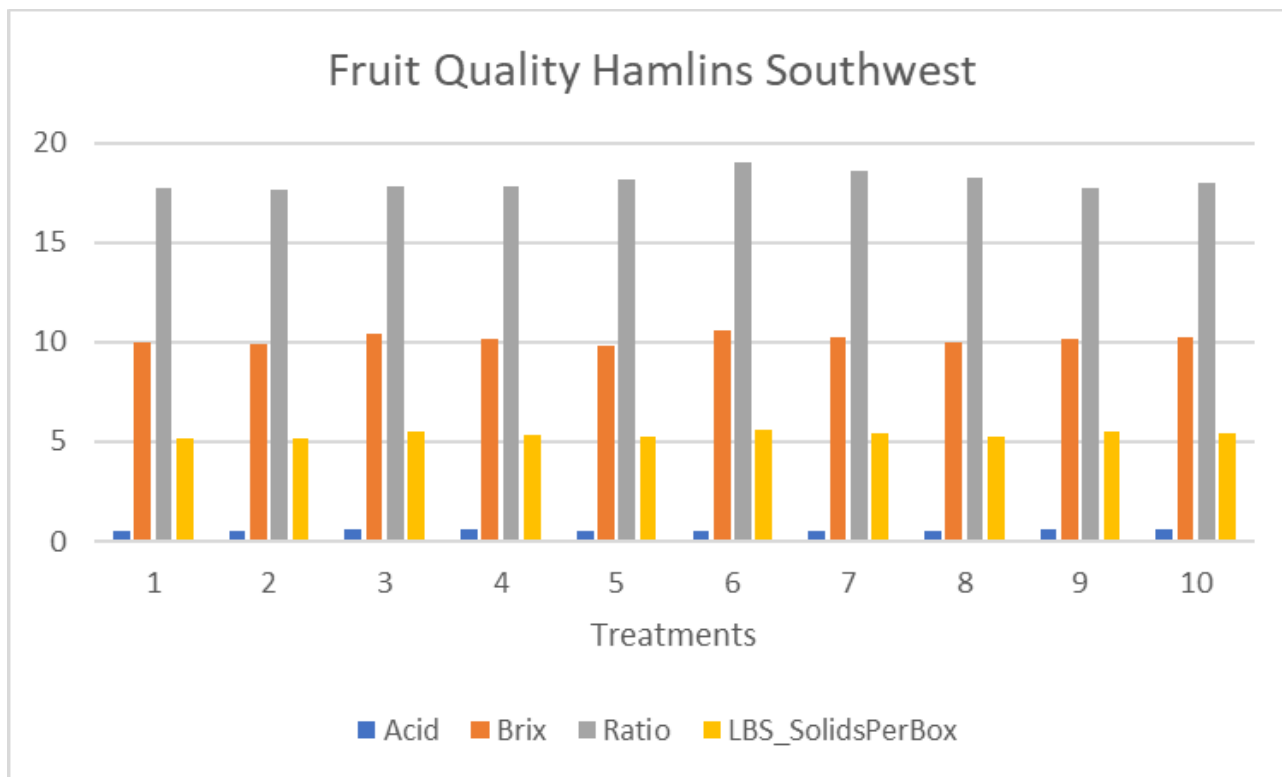
**Table 2. Boxes Per Tree Hamlin Southwest**



Treatment	Boxes per Tree	Significance
1	1.186023	D
2	1.617161	BC
3	1.834542	ABC
4	1.495164	CD
5	1.700132	ABC
6	1.836905	ABC
7	1.875139	ABC
8	1.978301	AB
9	2.035484	A
10	1.899104	ABC

Yield was collected on a per tree base. Yield values were reported as pounds of fruit per tree. A calculation of boxes per tree was performed by dividing the total weight of the fruit for one tree by 90 pounds. The values presented in the adjacent tables represent average boxes per tree for each treatment. The untreated control, Treatment 1, had the lowest per tree yield at 1.1 boxes per tree. Treatment 1 was not significantly different from Treatment 4 at 1.4 boxes per tree. The highest yield was seen in Treatment 9 at 2 boxes per tree. Treatment 9 was significantly higher than Treatments 1, 2, and 4.

**Table 3 Fruit Quality Hamlin Southwest**



Treatment	Brix	Acid	Ratio	Pound Solids/Box
1	9.964 BCD	0.562 DBC	17.75 B	5.16196 D
2	9.856 CD	0.562 DBC	17.608 B	5.20202 CD
3	10.402 AB	0.586 A	17.77 B	5.53736 AB
4	10.154 ABCD	0.572 ABC	17.794 B	5.3609 ABCD
5	9.806 D	0.542 E	18.114 AB	5.22434 CD
6	10.584 A	0.558 DBCE	18.988 A	5.57434 A
7	10.266 ABC	0.554 DCE	18.566 AB	5.45588 ABC
8	10.01 BCD	0.55 DE	18.214 AB	5.29286 BCD
9	10.178 ABCD	0.574 AB	17.722 B	5.5031 AB
10	10.222 ABCD	0.57 ABC	17.95 B	5.43358 ABCD

A single fruit quality sample was collected for each treatment plot (n=50). The quality samples were processed at CREC in the State House testing laboratory on December 2, 2022. The analysis of Brix

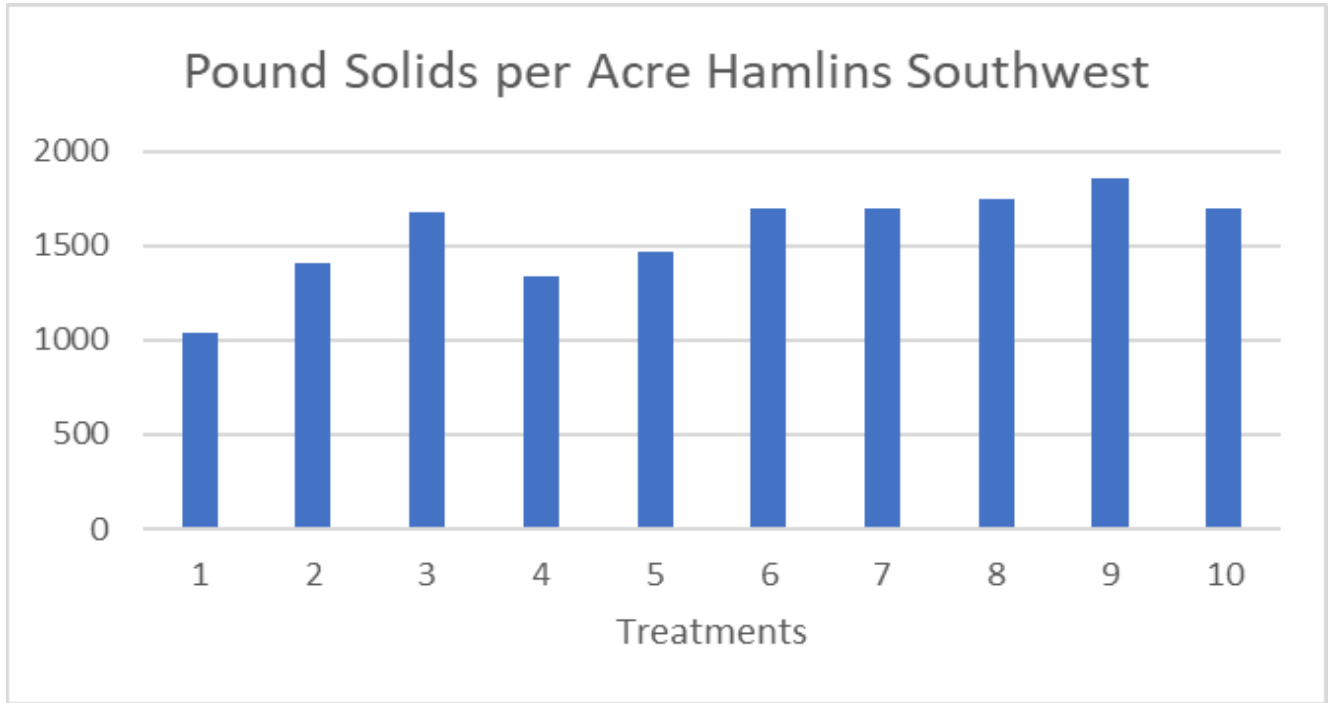
indicates Treatment 6 had the highest Brix content at 10.58°. Treatment 6 was not significantly different from Treatments 3, 4, 7, 9, and 10. The lowest Brix value, 9.8°, was found in Treatment 5. Treatment 5 was not significantly different from Treatments 1, 2, 4, 8, 9, and 10.

Titrateable acid levels were all within 44 one hundredths of each other. The highest titrateable acid levels were found in Treatment 3, 0.586. The lowest titrateable acid level was seen in Treatment 5 at 0.542. The values for Treatment 3 and Treatment 5 were significantly different.

The Brix/Acid ratio for all treatments was above standard for the industry. The highest ratio value was 18.988 in Treatment 6. Treatment 6 was significantly higher than Treatments 1, 2, 3, 4, 9, and 10. The lowest ratio for the Southwest Hamlin site was Treatment 2 at 17.608. Treatment 2 was significantly lower than Treatment 6.

Pound Solids per Box values for this site were higher than current standards. All treatments produced values greater than 5-pound solids per box. Treatment 6 had the highest pound solids per box at 5.57. Treatment 6 was significantly higher than Treatments 1, 2, 5, and 8. The lowest pound solids per box was found in the untreated control, Treatment 1, at 5.16. Treatment 1 was significantly lower than Treatments 3, 6, 7, and 9.

**Table 4 Pound Solids per Acre Hamlin Southwest**



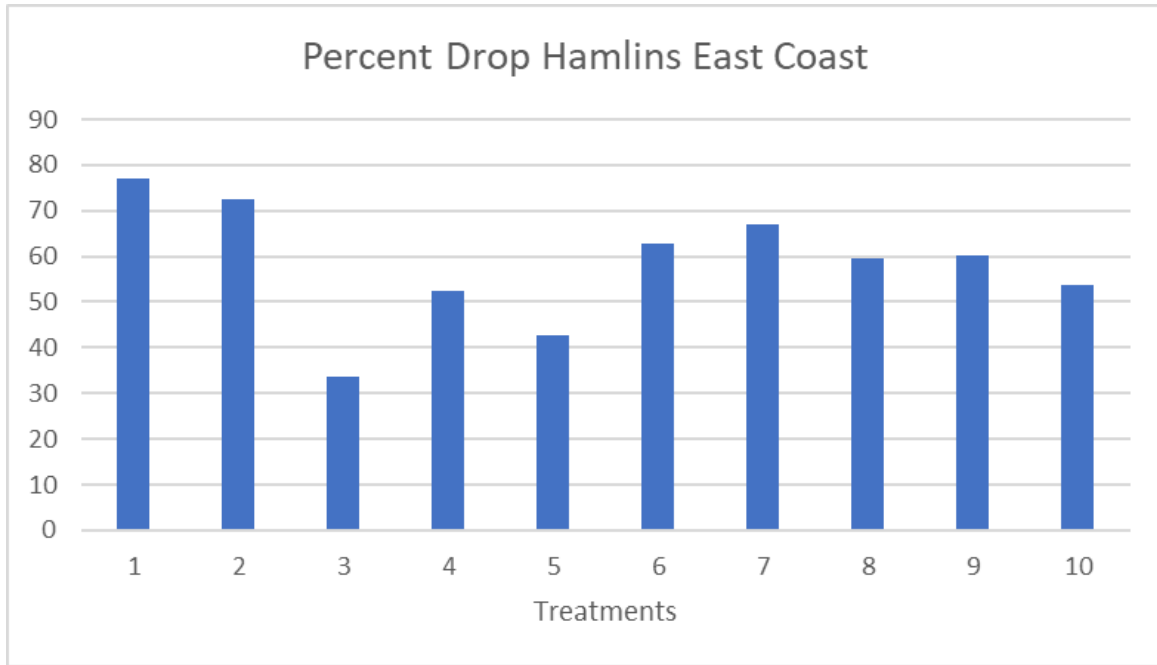
Treatment	Pound Solids per Acre		Treatment	Pound Solids per Acre	
1	1033.6	C	6	1699.6	AB
2	1405.8	BC	7	1699.8	AB
3	1678.2	AB	8	1746.3	AB
4	1338.7	BC	9	1852.4	A
5	1468.3	AB	10	1692.3	AB

Pound Solids/Acre was calculated by combining the pound solids/box data with the calculation of boxes per acre. The data values ranged from 1852-pound solids per acre down to 1033. Treatment 9 had the highest value and was significantly higher than Treatments 1, 2, and 4. The untreated control was the lowest value presented at 1033.6-pound solids per acre. Treatment 1 was significantly lower than Treatments 3, 5, 6, 7, 8, 9, and 10.

**Hamlin East Coast**

The east coast Hamlin trial site is in Okeechobee. The trees used in this trial were planted in October of 2016, making these trees 6 years old. All trees are grown on Sour Orange rootstock. The tree spacing is 23' x 10'. The planting density is 189 trees per acre. Harvesting of this trial was on December 8, 2022. Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on December 12, 2022. This trial site was heavily affected by Hurricane Ian in September 2022. Due to the significant effects of the hurricane, the confidence in the reported data for this site is low.

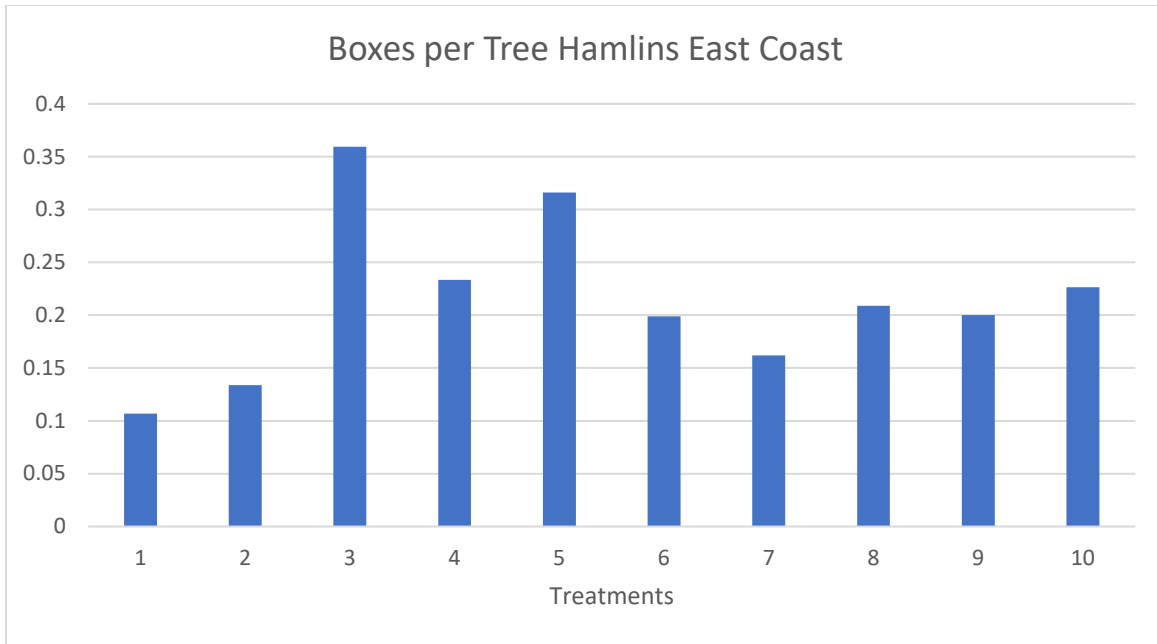
**Table 5 Percent Drop Hamlin East Coast**



Treatment	% Drop	
1	77.05195	A
2	72.62003	AB
3	33.76468	F
4	52.563	DE
5	42.85757	EF
6	62.7882	BCD
7	67.04417	ABC
8	59.60824	CD
9	60.15752	CD
10	53.62122	CD

Fruit drop at the East Coast site was greatly impacted by the hurricane. Two of the 10 treatments returned a mean percentage of fruit drop less than 50%. Treatment 3 had the lowest percentage of fruit drop at 33.7%. Treatment 3 was significantly lower than Treatments 1, 2, 4, 6, 7, 8, 9, and 10. The worst performing treatment was the untreated control (Treatment 1). The mean percentage of fruit drop for the untreated control was 77%. Treatment 1 is significantly higher than Treatments 3, 4, 5, 6, 8, 9, and 10.

**Table 6 Boxes per Tree Hamlin East Coast**

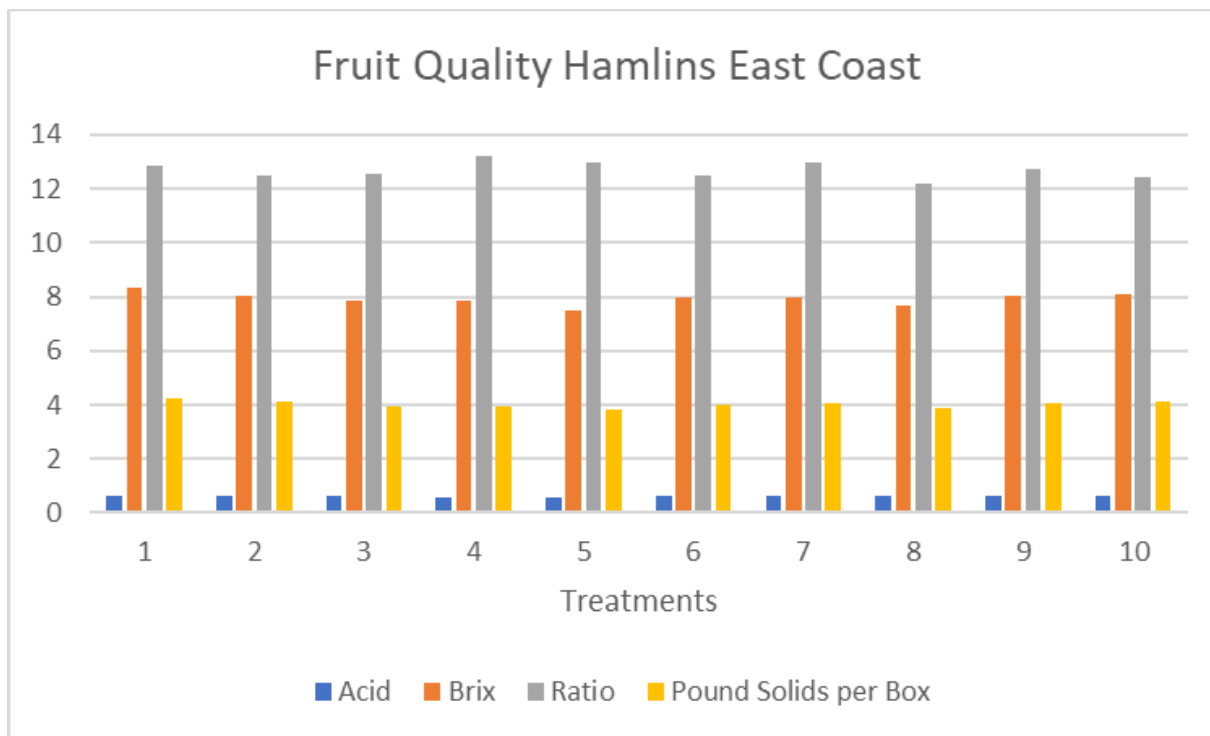


Treatment	Boxes Per Tree	
1	0.10688	D
2	0.13368	CD
3	0.35944	A
4	0.23352	BC
5	0.3162	AB
6	0.19884	CD
7	0.16196	CD
8	0.20888	C
9	0.2002	CD
10	0.2266	BC

Yield on a per tree basis was negatively affected by Hurricane Ian. The highest yield was observed in Treatment 3 at 0.35 boxes per tree. Treatment 3 was significantly higher than Treatments 1, 2, 4, 6, 7, 8, 9, and 10. The untreated control provided the lowest per tree yield of all the treatments at 0.1 boxes per tree. Acknowledging the poor yield at this site due to the hurricane, several of the treatments did produce a per tree yield that was significantly better than the untreated control. The yield values presented here are not acceptable for commercial citrus production, but this trial site did generate significant treatment effects.



**Table 7 Fruit Quality Hamlin East Coast**



Treatment	Acid		Brix		Ratio		Pound Solids per Box	
1	0.652	A	8.342	A	12.838	ABCD	4.26434	A
2	0.642	AB	8.006	BC	12.482	ECD	4.10034	AB
3	0.626	BC	7.834	CD	12.53	EBCD	3.94902	BCD
4	0.596	DE	7.858	BCD	13.194	A	3.95282	BCD
5	0.58	E	7.514	E	12.964	ABC	3.81552	D
6	0.642	AB	7.996	BC	12.476	ED	4.0157	BC
7	0.614	CD	7.964	BC	12.978	AB	4.04826	B
8	0.63	ABC	7.69	DE	12.212	E	3.86468	CD
9	0.632	ABC	8.04	BC	12.744	ABCD	4.08096	B
10	0.652	A	8.098	AB	12.418	ED	4.09472	B

A single-fruit quality sample was collected for each treatment plot (n=50). The quality samples were processed at CREC in the State House testing laboratory on December 12, 2022.

The untreated control had the highest titratable acid level at 0.652. The untreated control was not significantly different from Treatments 2, 6, 8, 9, and 10. The lowest acid level was seen in Treatment 5 at 0.58. Treatment 5 was not significantly different from Treatment 4.

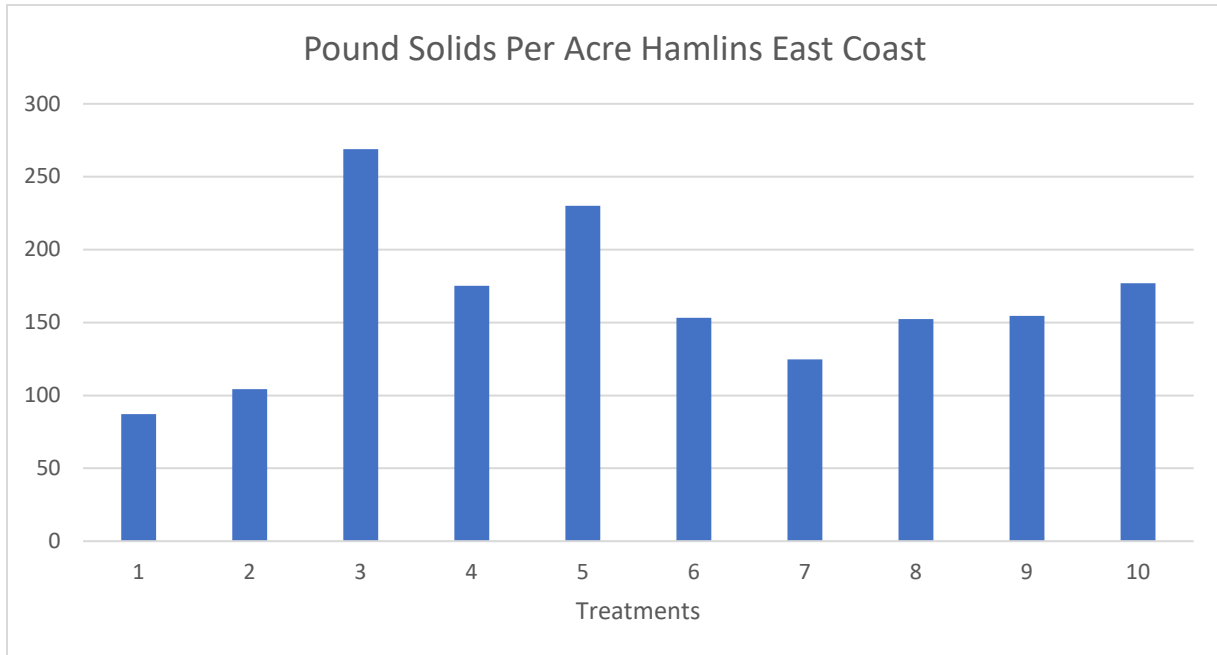
Brix content for the entire group of treatments was not uncommon for Hamlin this season. Brix content was highest in the untreated control at 8.34°. The untreated control (Treatment 1) was significantly

higher than Treatments 1 – 9. The lowest Brix content was found in Treatment 5. Treatment 5 was significantly lower than Treatments 1, 2, 3, 4, 6, 7, 9, and 10.

The Brix to Acid ratio was highest in Treatment 4. The ratio found for Treatment 4 was 13.19, and this value was significantly higher than the values for Treatments 2, 3, 6, 8, and 10. The lowest ratio was seen in Treatment 8 at 12.21. Treatment 8 was significantly lower than Treatments 1, 4, 5, 7, and 9.

Pound Solids per Box were below industry standards. The highest pound solids per box for the Okeechobee trial site was the untreated control (Treatment 1). Treatment 1 had 4.26-pound solids per box. Treatment 1 was significantly higher than all other treatments except Treatment 2. The lowest pound solids per box was Treatment 5 at 3.81. Treatment 5 is significantly lower than Treatments 1, 2, 6, 7, 9, and 10.

**Table 8 Pound Solids per Acre Hamlin East Coast**



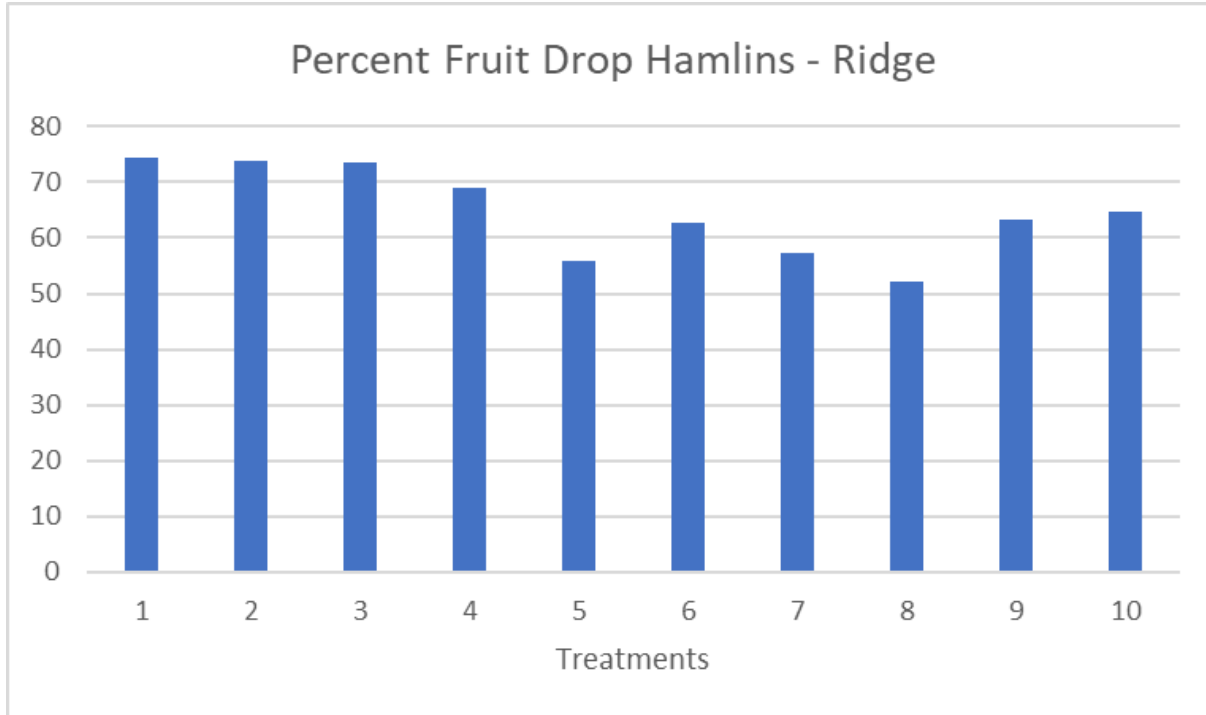
Treatment	Pound Solids per Acre	
1	87.1213	D
2	104.1746	CD
3	268.8622	A
4	175.08	BC
5	229.9997	AB
6	153.1445	BCD
7	124.6607	CD
8	152.3843	CD
9	154.6179	BCD
10	176.9536	BC

Pound Solids per Acre were low for this site. This is understandable considering the hurricane damage sustained 3 months prior to harvest. Treatment 3 is the best performing treatment at 268-pound solids per acre. Treatment 3 is significantly higher than all other treatments except for Treatment 5. The worst performing treatment was the untreated control which produced 87-pound solids per acre. The untreated control (Treatment 1) was significantly lower than Treatments 3, 4, 5, and 10.

**Hamlin Ridge**

The central Ridge Hamlin trial site is in Lake Wales, near Bok Tower. The trees were planted in October 2007, making the trees 15 years old. All trees are grown on Swingle rootstock. The tree spacing is 25' x 12'. The planting density is 145 trees per acre. Harvesting of this trial was on December 6, 2022. Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on December 8, 2022. This trial site was affected by Hurricane Ian in September 2022, but not as severely as the east coast Hamlin site.

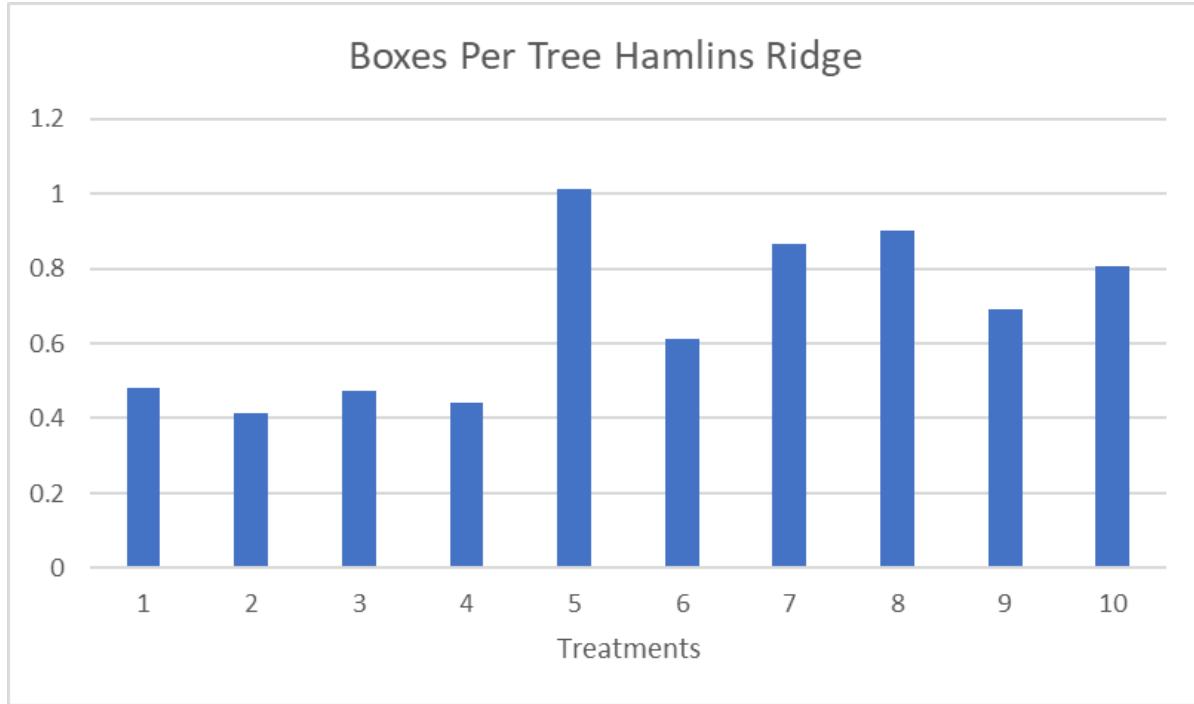
**Table 9 Percent Drop Hamlin Ridge**



Treatment	Percent Drop	
1	74.34957	A
2	73.88036	A
3	73.57116	A
4	69.0996	AB
5	55.98255	CD
6	62.61482	ABCD
7	57.2693	BCD
8	52.10423	D
9	63.26518	ABCD
10	64.56965	ABC

Fruit drop at the Ridge Hamlin site was greater than 50% for all treatments. The effect of Hurricane Ian was significant at this site. Treatment effects can be seen in the data set. Treatment 8 had the lowest percentage of fruit drop for this trial site. Treatment 8 is significantly higher than Treatment 1, 2, 3, 4, and 10. The treatment with the least effect on fruit drop was the untreated control at 74.3%. The untreated control was significantly lower than Treatments 5, 7, and 8.

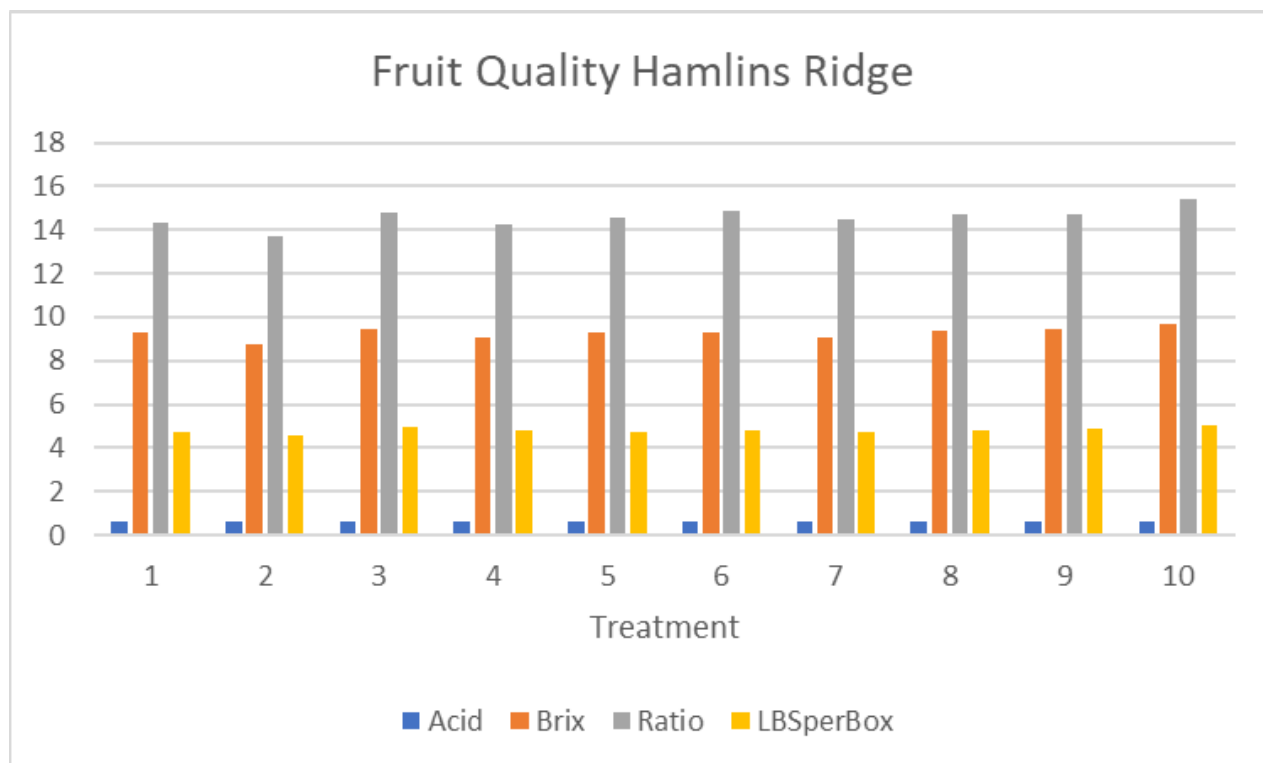
**Table 10 Boxes Per Tree Hamlin Ridge**



Treatment	Boxes Per Tree	Significance
1	0.48151111	BC
2	0.41506667	C
3	0.47173333	BC
4	0.44066667	C
5	1.01373333	A
6	0.61226667	ABC
7	0.86604444	AB
8	0.90293333	A
9	0.69088889	ABC
10	0.80528889	ABC

The range of treatment effect on yield is considerable. There is more than a 0.5 box difference between the highest and lowest yielding treatments. Treatment 5 had the highest yield with 1.01 boxes per tree. Treatment 5 is significantly higher than Treatments 1, 2, 3, and 4. The lowest yielding treatment is treatment 4 at 0.44 boxes per tree. Treatment 4 is significantly lower than Treatments 5, 7, and 8.

**Table 11 Fruit Quality Hamlin Ridge**

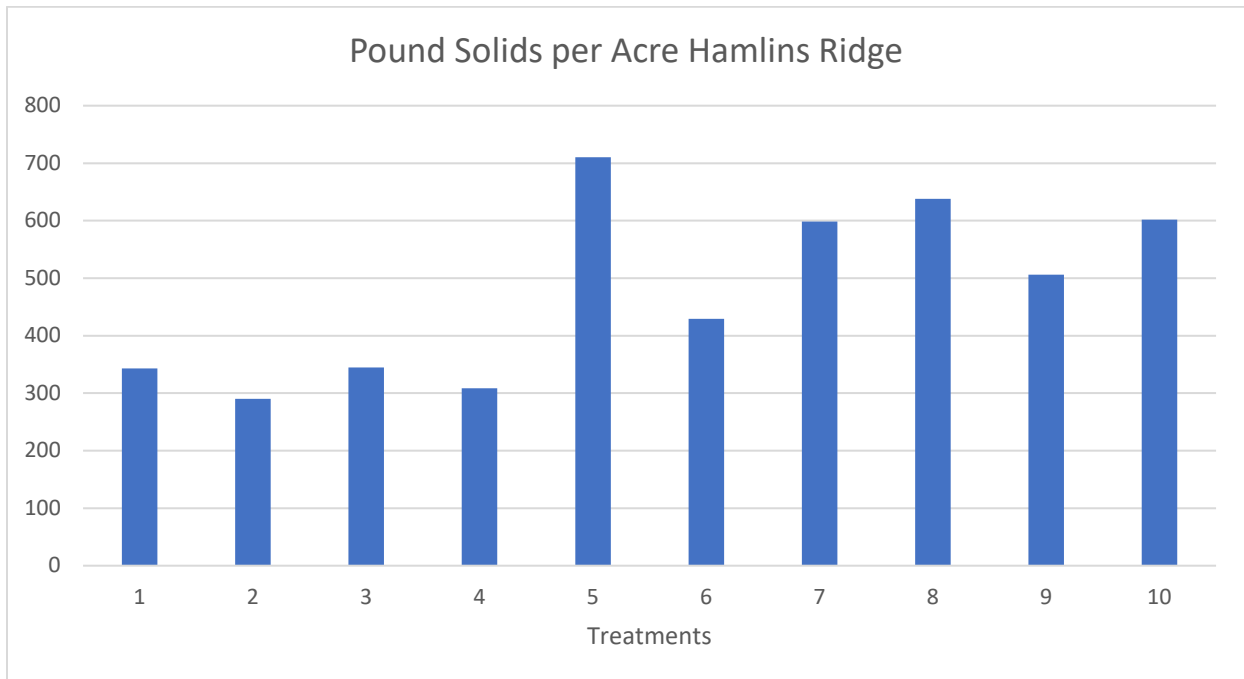


Treatment	Acid		Brix		Ratio		Pound Solids per Box	
1	0.646	A	9.264	B	14.358	BC	4.7302	BC
2	0.644	A	8.788	C	13.722	C	4.53914	C
3	0.638	A	9.442	AB	14.822	AB	4.94268	AB
4	0.636	A	9.064	BC	14.264	BC	4.80204	B
5	0.638	A	9.302	AB	14.588	ABC	4.76088	BC
6	0.628	A	9.322	AB	14.894	AB	4.82248	AB
7	0.628	A	9.062	BC	14.514	ABC	4.6943	BC
8	0.64	A	9.394	AB	14.678	AB	4.82288	AB
9	0.646	A	9.484	AB	14.706	AB	4.9129	AB
10	0.632	A	9.718	A	15.382	A	5.0679	A

Fruit Quality analysis revealed better uniformity across the entire suite of treatments as compared to the other Hamlin trial sites. There were no remarkable treatment effects for titratable acid content. Analysis of Brix shows Treatment 10 had the highest value at 9.7° brix. Treatment 10 is significantly

higher than Treatments 1, 2, 4, and 7. The lowest brix content was found in Treatment 2 at 8.7° Brix. Treatment 2 is significantly lower than all treatments except Treatments 4 and 7. The Brix to Acid ratio was highest in Treatment 10. Treatment 10 was significantly higher than Treatments 1, 2, and 4. The lowest ratio is seen in Treatment 2 at 13.7. Treatment 2 is significantly lower than Treatments 4, 6, 8, 9, and 10. Pound Solids per Box values were all below 5 except for Treatment 10 at 5.06. Treatment 10 was significantly higher than Treatments 1, 2, 4, 5, and 7. The lowest Pound Solids per Box value was in Treatment 2 at 4.5. Treatment 2 was significantly lower than Treatments 3, 4, 6, 8, 9, and 10.

**Table 12 Pound Solids Per Acre Hamlin Ridge**



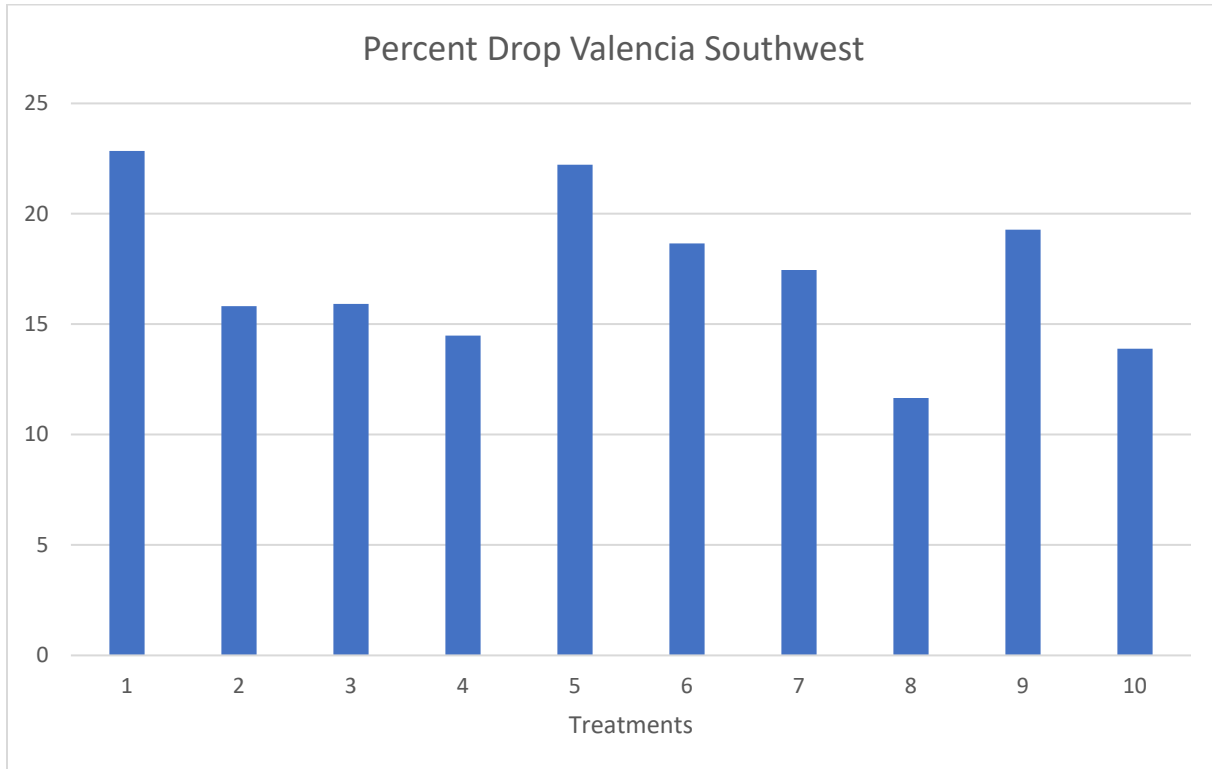
Treatment	Pound Solids per Acre	Significance
1	342.879	BCD
2	290.152	D
3	344.888	BCD
4	308.546	CD
5	710.281	A
6	429.129	ABCD
7	598.574	ABCD
8	637.943	AB
9	506.13	ABCD
10	601.835	ABC

Pound Solids per Acre for the Hamlin Ridge site ranged from 710 down to 290. The best performance was seen in Treatment 5 at 710. Treatment 5 is significantly higher than Treatments 1, 2, 3, and 4. The lowest Pound Solids per Acre is found in Treatment 2 at 290. Treatment 2 is significantly lower than Treatments 5, 8, and 10.

**Valencia Southwest**

The Southwest Valencia trial site is in Immokalee. The trees used in this trial were planted in November 2000, making these trees 23 years old. All trees are grown on Swingle rootstock. The tree spacing is 22' x 12'. The planting density is 165 trees per acre. Harvesting of this trial was on March 10, 2023. Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on March 14, 2023.

**Table 13 Percent Drop Valencia Southwest**

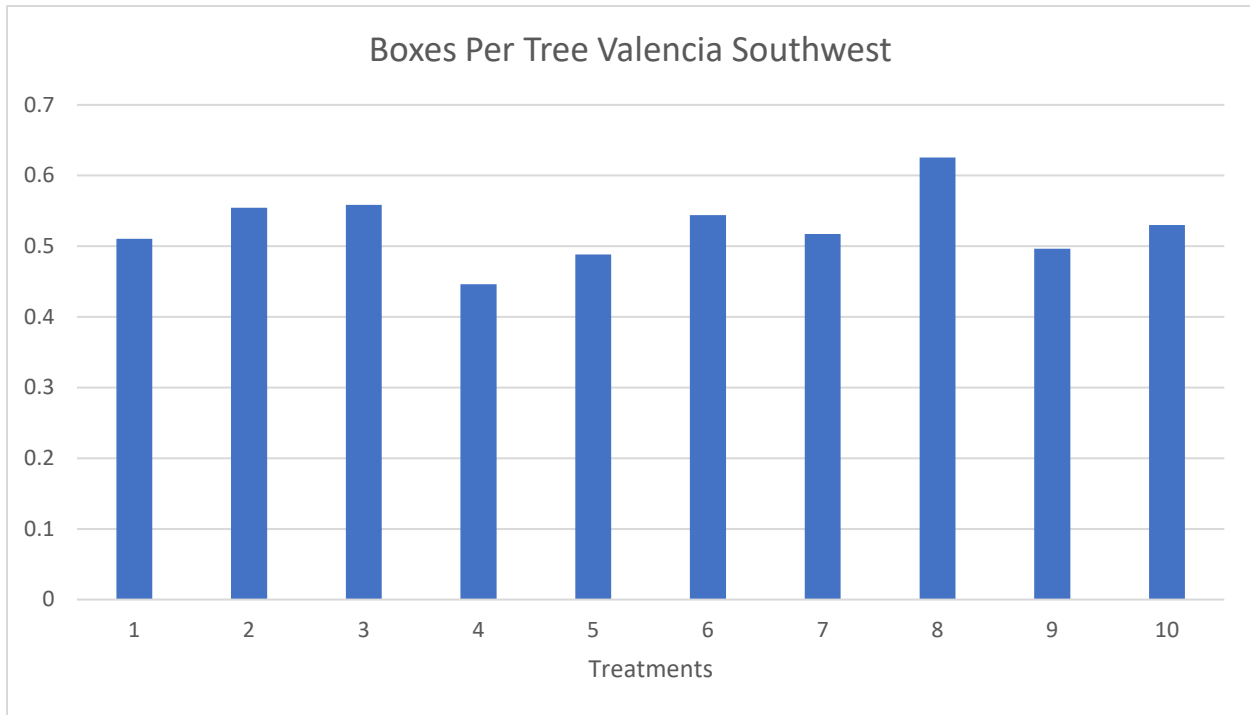


Treatment	Percent Drop	Significance
1	22.8501962	A
2	15.8182508	ABC
3	15.9122489	ABC
4	14.4819867	BC
5	22.2264047	AB
6	18.6648859	ABC
7	17.4536686	ABC
8	11.6626244	C
9	19.2812462	ABC
10	13.8859739	C

The range in the percentage of fruit drop at this site was 11.12%. The treatment with the highest percentage of fruit drop was the untreated control, Treatment 1, with 22.8% drop. Treatment 1 was significantly higher than Treatments 4, 8, and 10. The lowest percentage of fruit drop was seen in 8 with 11.6% drop. Treatment 8 is significantly lower than Treatments 1 and 5.



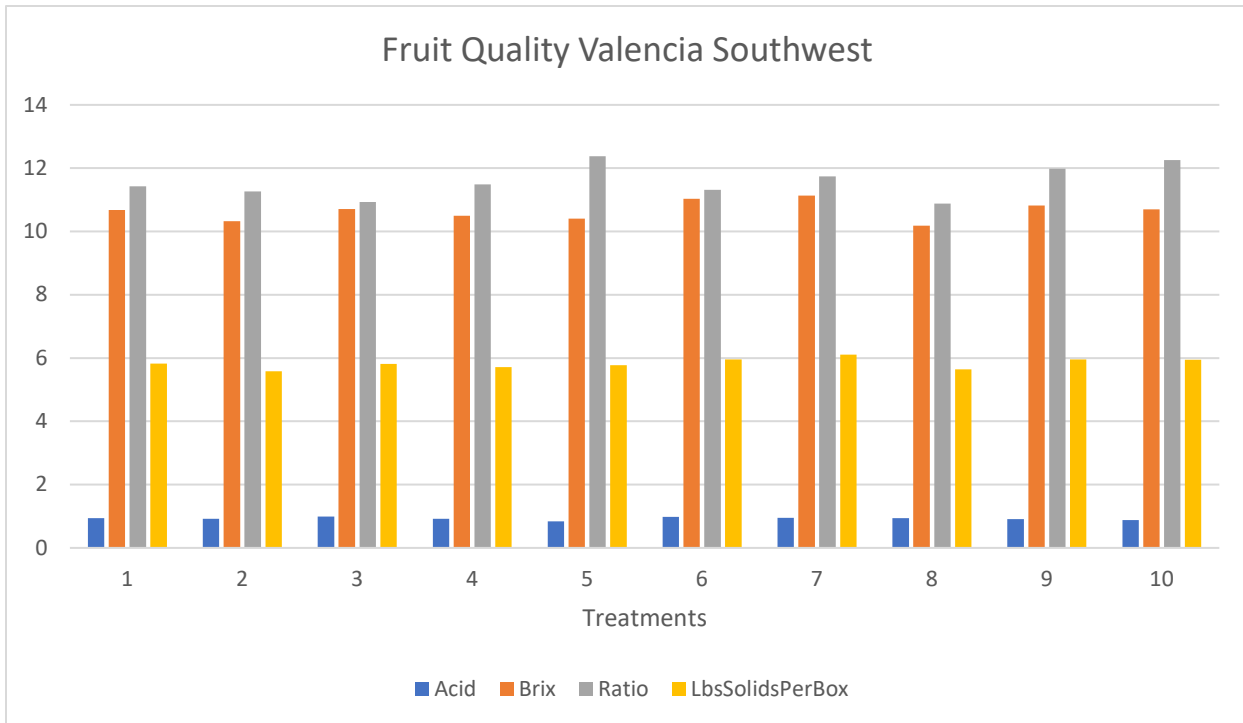
**Table 14 Boxes Per Tree Valencia Southwest**



Treatment	Boxes Per Tree	
1	0.51071414	A
2	0.55448954	A
3	0.55839771	A
4	0.4464	A
5	0.48813333	A
6	0.54417778	A
7	0.51751111	A
8	0.62546667	A
9	0.49653333	A
10	0.53013333	A

Per tree yield for this site not remarkable. There are no significant differences identified in the per tree yield values. The highest yield was seen in Treatment 8 with 0.62 boxes per tree. The lowest yield was seen in Treatment 4 with 0.44 boxes per tree.

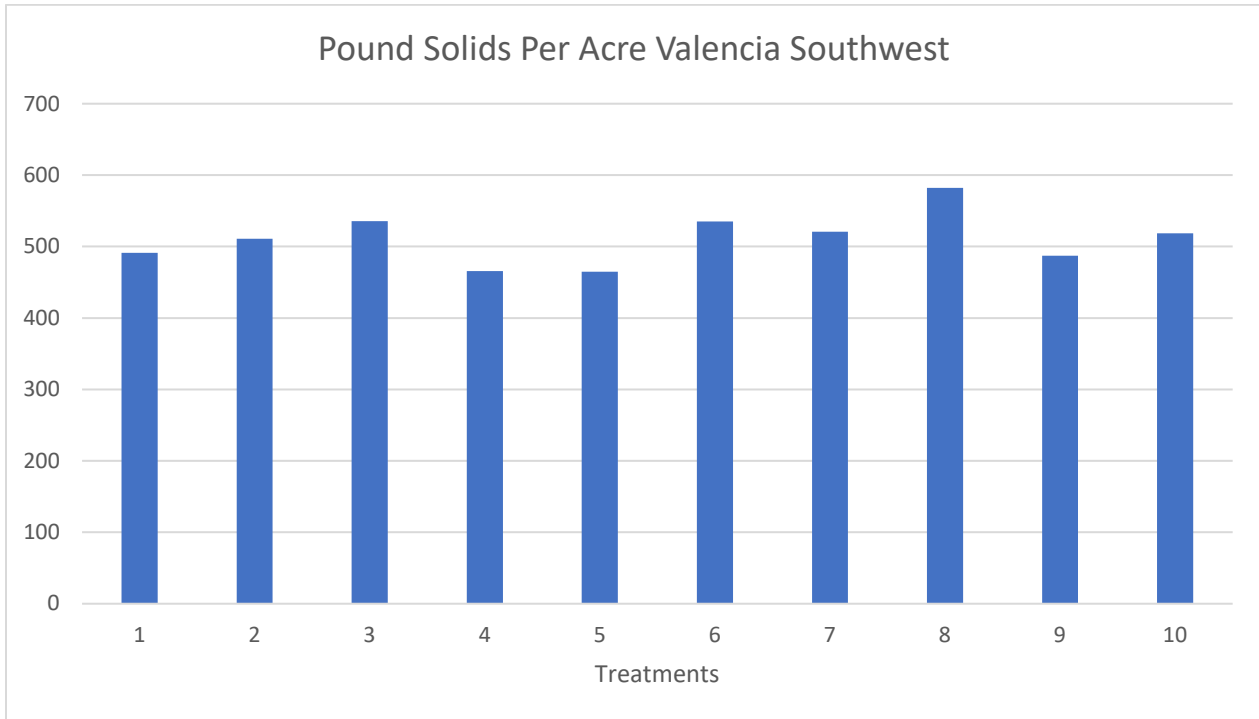
**Table 15 Fruit Quality Valencia Southwest**



Treatment	Acid		Brix		Ratio		Pound Solids per Box	
1	0.938	A	10.682	A	11.422	A	5.82832	AB
2	0.918	A	10.326	A	11.262	A	5.58026	B
3	0.99	A	10.71	A	10.928	A	5.81318	AB
4	0.92305556	A	10.49206	A	11.48233	A	5.71056722	AB
5	0.842	A	10.402	A	12.374	A	5.77104	AB
6	0.984	A	11.032	A	11.314	A	5.95872	AB
7	0.952	A	11.134	A	11.742	A	6.10658	A
8	0.944	A	10.184	A	10.884	A	5.64482	AB
9	0.906	A	10.816	A	11.982	A	5.95972	AB
10	0.876	A	10.7	A	12.258	A	5.94274	AB

Fruit Quality analysis identifies no significant differences for titratable acid, brix, or ratio for this site. Pound Solids per Box values were all above 5.5. The highest value was identified in Treatment 7 with 6.1-pound solids per box. The lowest value was seen in Treatment 2 with 5.5-pound solids per box. Treatments 7 and 2 are significantly different. No other significant differences were found.

**Table 16 Pound Solids Per Acre Valencia Southwest**



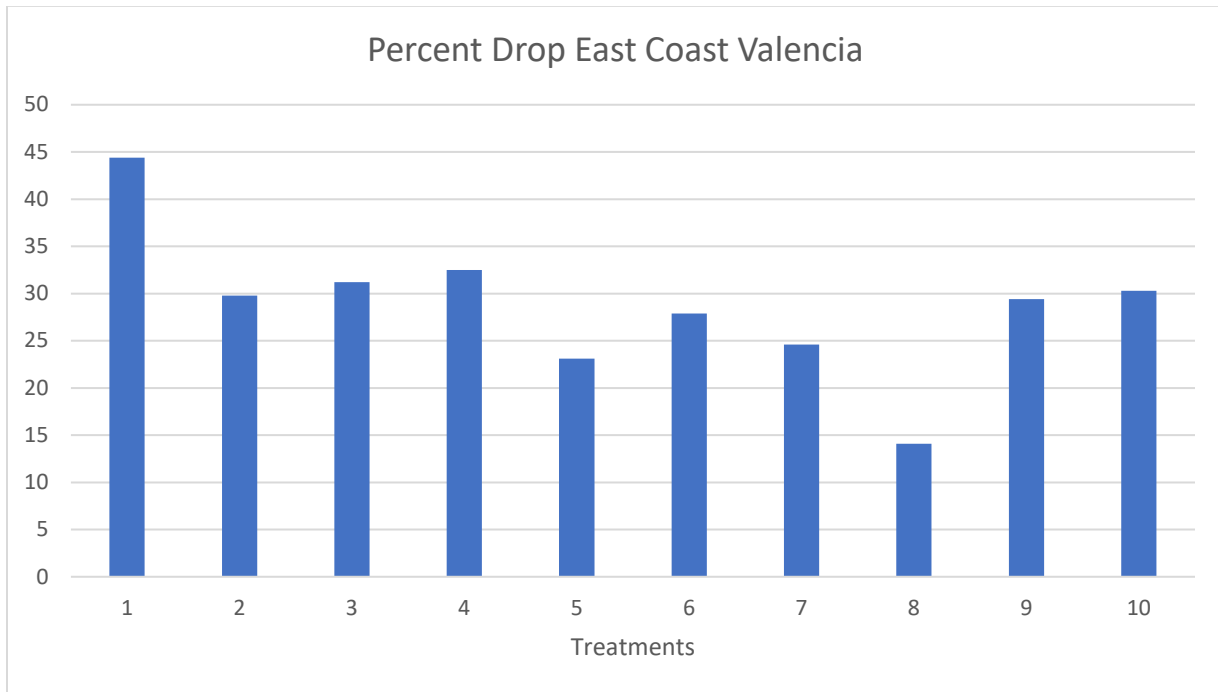
Treatment	Pound Solids Per Acre	
1	491.247772	A
2	511.013097	A
3	535.604972	A
4	465.738464	A
5	464.799276	A
6	535.137923	A
7	520.81861	A
8	581.967826	A
9	487.272532	A
10	518.51453	A

There were no significant differences found in the analysis of Pound Solids per Acre. The highest value was seen in Treatment 8 while the lowest value was identified in Treatment 5.

## Valencia East Coast

The east coast Valencia trial site is in Ft. Pierce. The trees used in this trial were planted in January 2019. All trees are grown on US 942 rootstock. The tree spacing is 19' x 8'. The planting density is 286 trees per acre. Harvesting of this trial was on March 1, 2023. Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on March 6, 2023.

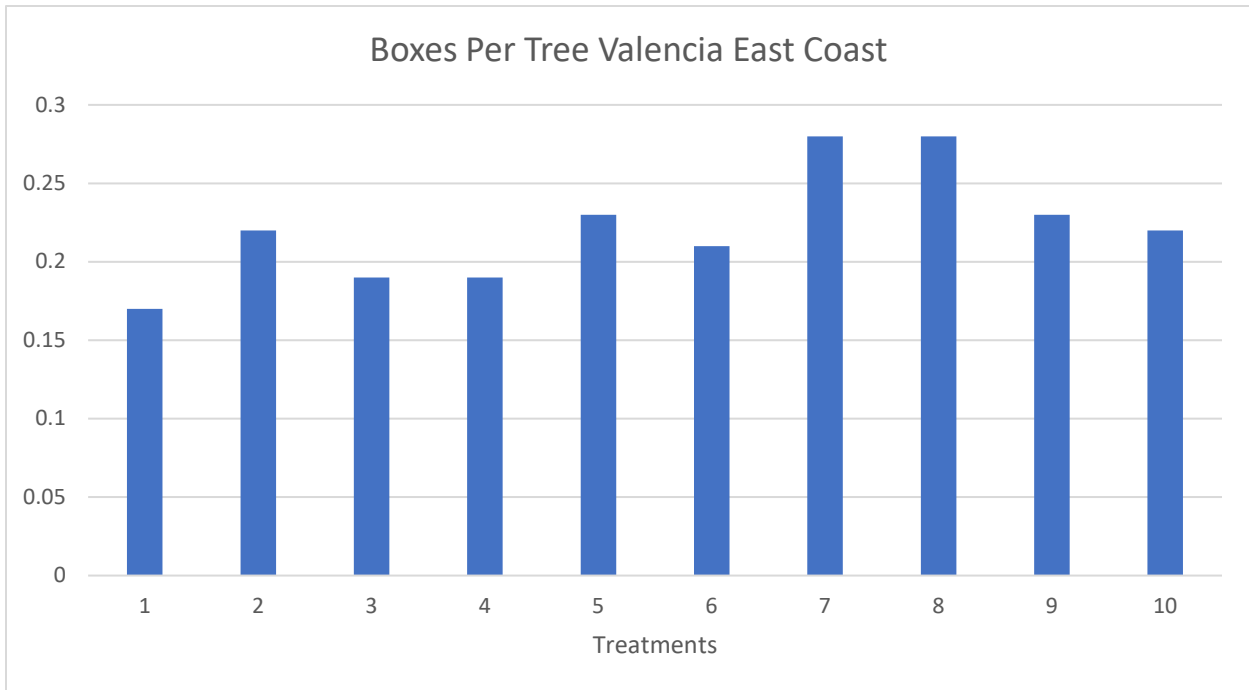
**Table 17 Percent Drop Valencia East Coast**



Treatment	Percent Drop	
1	44.4	A
2	29.8	B
3	31.2	AB
4	32.5	AB
5	23.1	CB
6	27.9	CB
7	24.6	CB
8	14.1	C
9	29.4	B
10	30.3	AB

The percentage of fruit drop at this site ranged from 44.04% down to 14.1%. Treatment 1, the untreated control, had the highest amount of fruit drop of all the treatments (44.4%). Treatment 1 is significantly higher than Treatments 2, 5, 6, 7, 8, 9, and 10. The lowest amount of fruit drop was found in Treatment 8 with 14.1% drop. Treatment 8 was significantly lower than Treatments 1, 2, 3, 4, 9, and 10.

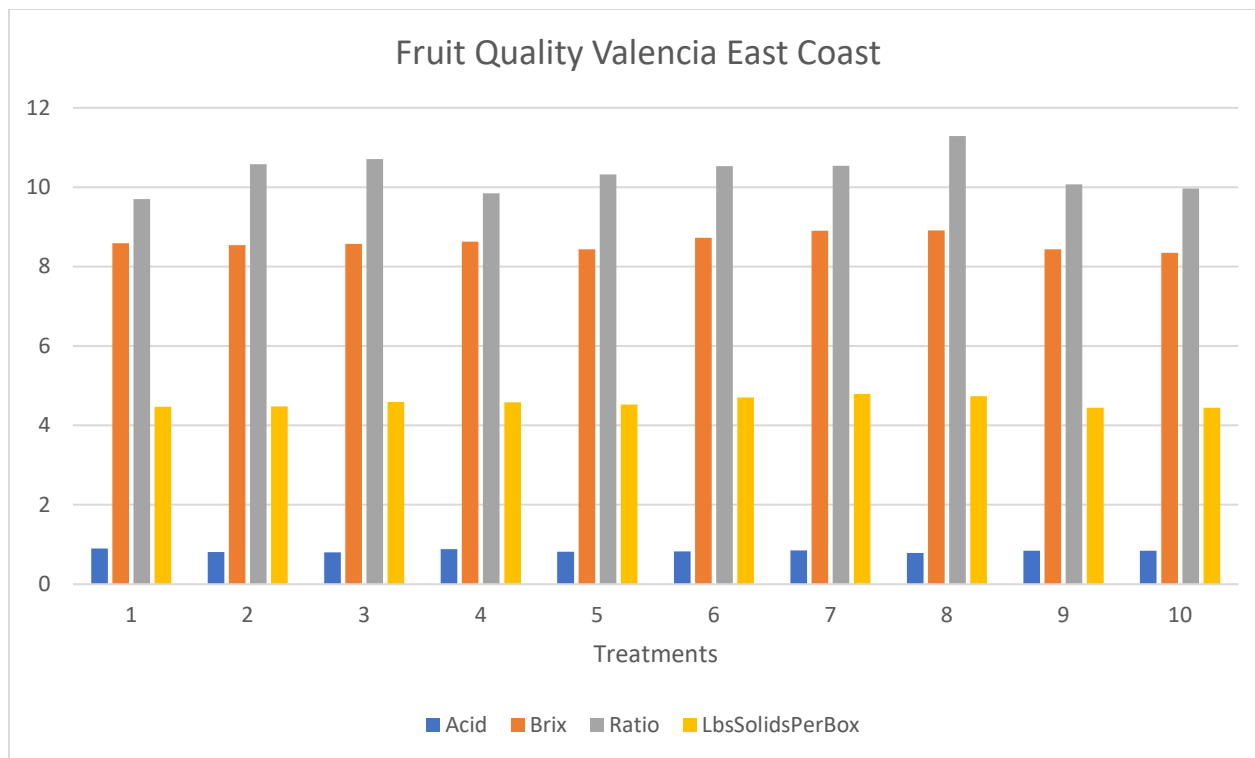
**Table 18 Boxes Per Tree Valencia East Coast**



Treatment	Boxes Per Tree	
1	0.17	B
2	0.22	AB
3	0.19	AB
4	0.19	AB
5	0.23	AB
6	0.21	AB
7	0.28	A
8	0.28	A
9	0.23	AB
10	0.22	AB

Yield at this site was in line with the industry average for a 4-year planting. The range of values for yield per tree was small. Treatments 7 and 8 presented the best yield at 0.28 boxes per tree. Treatments 7 and 8 are significantly higher than Treatment 1 which yielded 0.17 boxes per tree. No other significant differences were found in the analysis of yield.

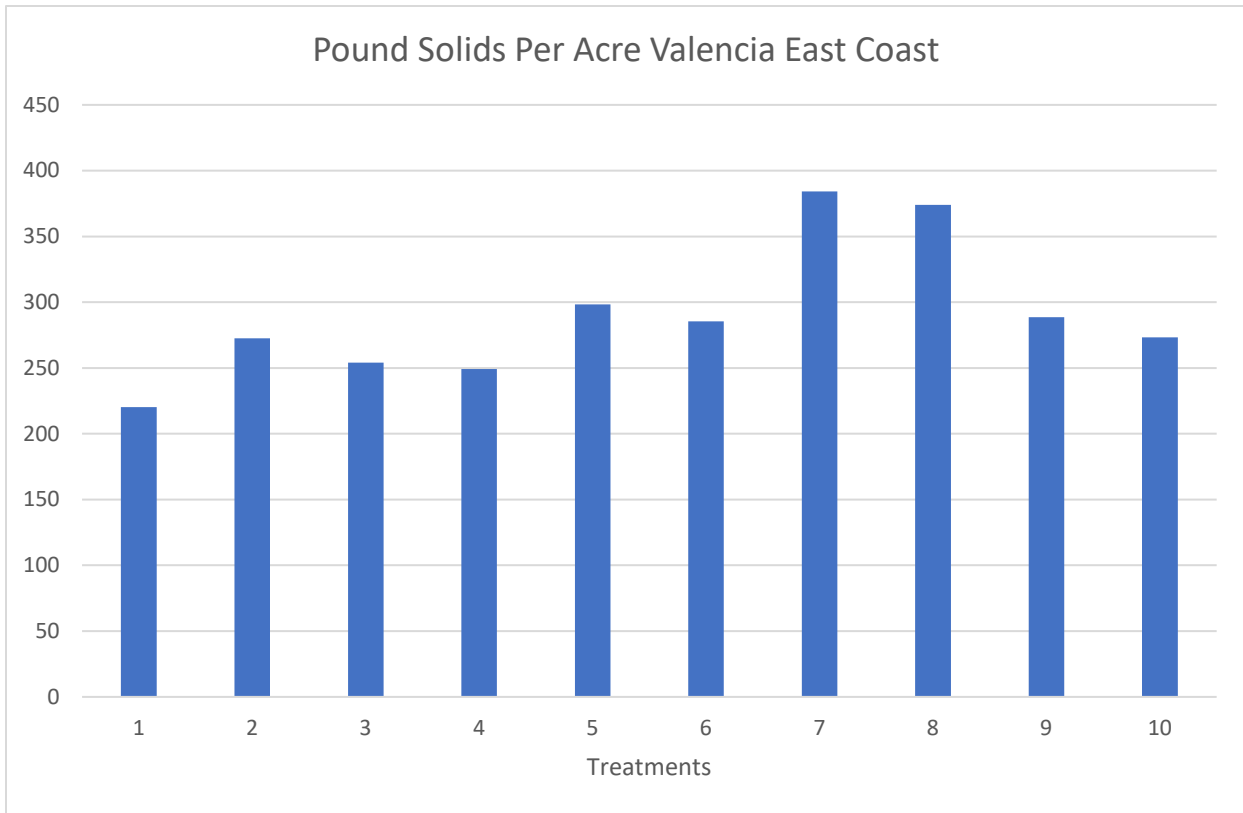
**Table 19 Fruit Quality Valencia East Coast**



Treatment	Acid		Brix		Ratio		Pound Solids per Box	
1	0.9	A	8.59	A	9.7	A	4.47	A
2	0.81	A	8.54	A	10.58	A	4.48	A
3	0.8	A	8.57	A	10.71	A	4.59	A
4	0.88	A	8.63	A	9.85	A	4.58	A
5	0.82	A	8.44	A	10.32	A	4.53	A
6	0.83	A	8.73	A	10.53	A	4.7	A
7	0.85	A	8.9	A	10.54	A	4.79	A
8	0.79	A	8.91	A	11.29	A	4.74	A
9	0.84	A	8.44	A	10.07	A	4.45	A
10	0.84	A	8.35	A	9.97	A	4.45	A

No significant differences were found in the juice quality analysis for titratable acid, brix, ratio, or pound solids per box.

**Table 20 Pound Solids Per Acre Valencia East Coast**



Treatment	Pound Solids Per Acre	
1	220.19	B
2	272.55	AB
3	254.13	B
4	249.29	B
5	298.36	AB
6	285.51	AB
7	384.26	A
8	373.87	A
9	288.53	AB
10	273.17	AB

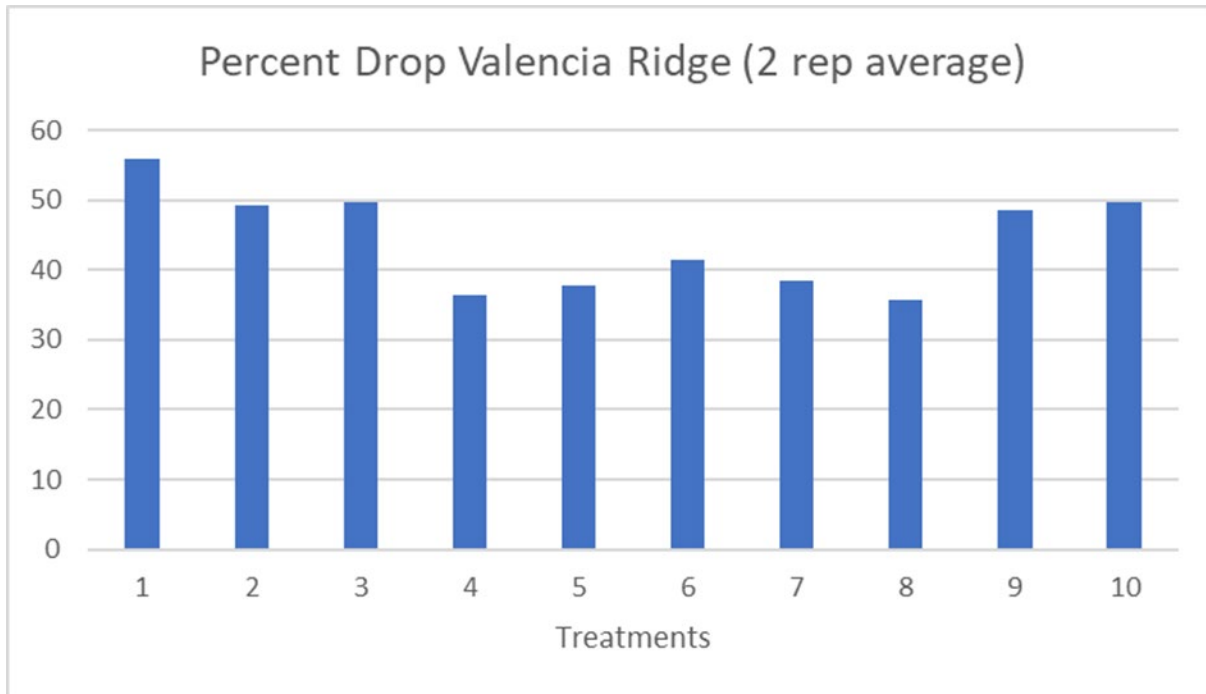
Pound Solids per Acre were all within the acceptable range for a 4-year-old block. The difference between the highest and lowest value is 164.07. The highest value was identified in Treatment 7 with 384.26-pound solids per acre. Treatment 8 produced slightly lower pound solids per acre at 373.87. Treatments 8 and 7 are significantly higher than Treatments 1, 3, and 4. The lowest value identified was the untreated control, Treatment 1, with 220.19-pound solids per acre. Treatment 1 is not significantly different than Treatments 2, 3, 4, 5, 6, 9, and 10.

## Valencia Ridge

The Ridge Valencia trial site is in Frostproof. The trees used in this trial were planted in 2007, making the trees 15 years old at the time of this project. All trees are grown on Swingle rootstock. The tree spacing is 25' x 12'. The planting density is 145 trees per acre. Harvesting of this trial was on March 20, 2023.

Fruit Quality Samples were processed at the Citrus Research and Education Center in Lake Alfred, FL on March 24, 2023. Yield data at this site was compromised due a harvesting error. Three of the five replications were harvested by mistake when a harvesting crew unknowingly entered the trial area. Data was collected on the remaining two replications of each treatment. With only two replications of data for each treatment, statistical analysis is of no benefit. The data presented for this site is the average of the two salvaged replications for each treatment. As such, there is no confidence in this data set and is presented solely for information.

**Table 21 Percent Drop Valencia Ridge**

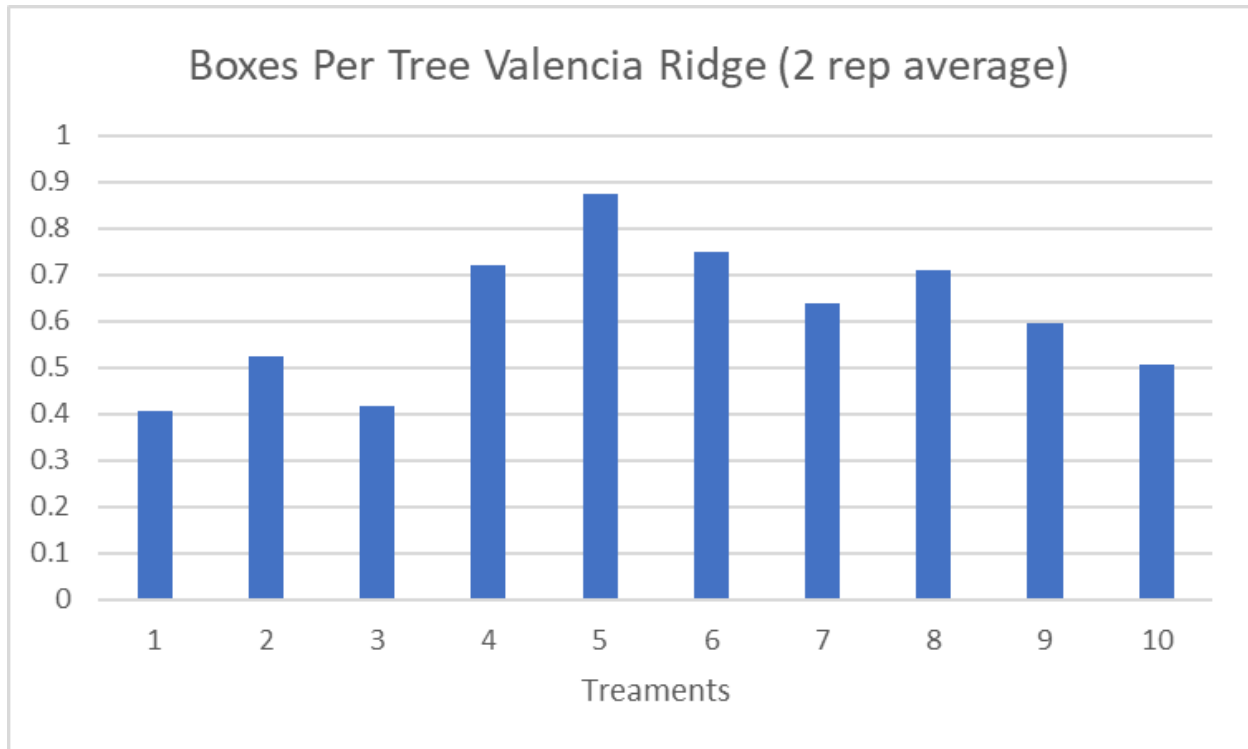


Treatment	Percent Drop
1	55.98744511
2	49.18236713
3	49.76121342
4	36.32015991
5	37.76760215
6	41.42472327
7	38.33035142
8	35.7172637
9	48.51162537
10	49.62676613

The 2-rep average showing the percentage of fruit drop indicates Treatment 8 had the least fruit drop. The untreated control had the highest fruit drop with 55.9%.



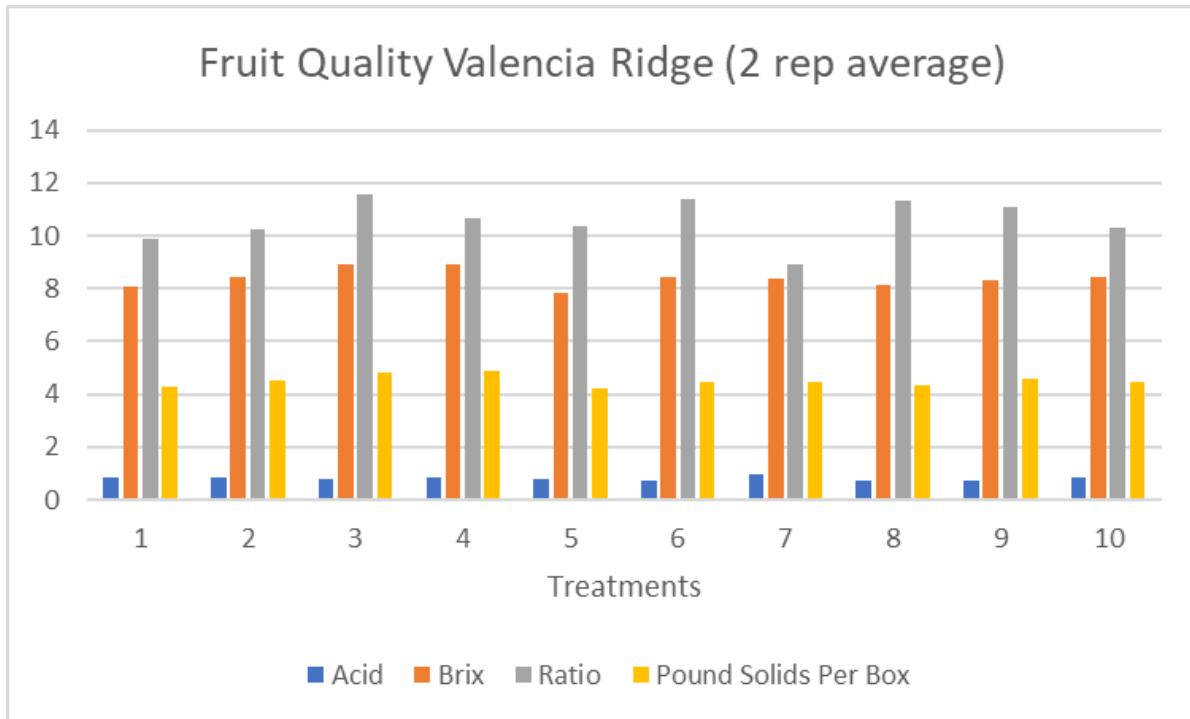
**Table 22 Boxes Per Acre Valencia Ridge**



Treatment	Boxes Per Tree
1	0.405744444
2	0.525722222
3	0.415877778
4	0.721155556
5	0.874644444
6	0.7478
7	0.637866667
8	0.709011111
9	0.595366667
10	0.507733333

Yield per tree was highest in Treatment 5 at 0.87 boxes per tree. The lowest yield was in the untreated control at 0.4 boxes per tree.

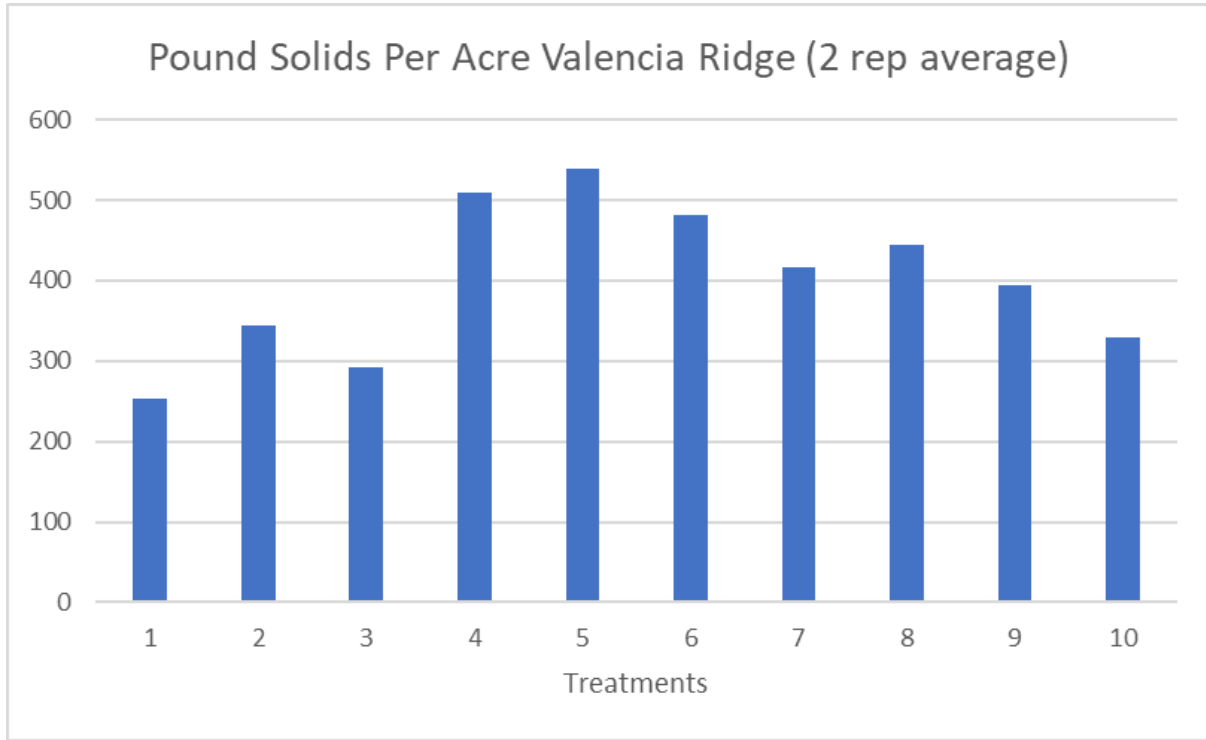
**Table 23 Fruit Quality Valencia Ridge**



Treatment	Acid (average of 2 reps)	Brix (average of 2 reps)	Ratio (average of 2 reps)	Pound Solids Per Box (average of 2 reps)
1	0.82	8.1	9.88	4.3017
2	0.825	8.455	10.255	4.52055
3	0.78	8.895	11.58	4.80135
4	0.835	8.89	10.64	4.8729
5	0.76	7.855	10.355	4.2431
6	0.745	8.42	11.355	4.4372
7	0.94	8.39	8.915	4.4491
8	0.72	8.135	11.3	4.3298
9	0.755	8.325	11.095	4.5701
10	0.82	8.415	10.31	4.4299

Fruit quality data at the Valencia Ridge site conformed to today's industry averages. The titratable acid levels were highest in Treatment 7 at 0.94 and lowest in Treatment 8 at 0.72. Brix content was above 8° except for Treatment 5. The highest brix value was seen in Treatments 3 and 4 at 8.89°. The lowest brix value was found in Treatment 5 at 7.85°. Brix to acid ratio values ranged between 11.5 in Treatment 3 down to 8.91 in Treatment 7. Pound solids per box values were consistent throughout the data set. The highest pound solids per box value was 4.87 in Treatment 4.

**Table 24 Pound Solids Per Acre Valencia Ridge**



Treatment	Pound Solids Per Acre
1	253.9106784
2	344.9470782
3	292.6753515
4	509.3051379
5	538.6325856
6	481.5759784
7	415.9678114
8	444.4319508
9	393.6866524
10	329.6858017

The highest pound solids per acre for the Valencia Ridge site was seen in Treatment 5 with 538.6-pound solids per acre. The lowest value was found in Treatment 1 with 253.9-pound solids per acre.

**Table 25 Decline Index Ratings – All Sites**

Southwest Hamlins			East Coast Hamlins			Ridge Hamlins		
Treatment	DI Rating July	DI Rating November	Treatment	DI Rating July	DI Rating December	Treatment	DI Rating July	DI Rating December
1	13.28	14.96	1	19.96	20.24	1	19.68	20.28
2	12.4	12.92	2	20.52	21.36	2	18.92	19.72
3	11.8	14.28	3	19.16	20.12	3	19.72	20.12
4	11.28	14.04	4	19.28	21.24	4	17.6	19.88
5	13.16	14.4	5	20.16	21.32	5	19.44	20.28
6	12.56	14.32	6	19.28	21.2	6	18.44	20
7	12.12	14.04	7	19.32	21.6	7	18.84	19.92
8	12.56	13.32	8	19.72	21.32	8	18.16	19.4
9	11.4	13.96	9	19.56	20.12	9	18.84	18.48
10	12.08	14.64	10	20.16	20.84	10	18.04	18.52

Southwest Valencia			East Coast Valencia			Ridge Valencia		
Treatment	DI Rating July	DI Rating March	Treatment	DI Rating July	DI Rating March	Treatment	DI Rating July	DI Rating March
1	18.88	21.08	1	8.16	10.64	1	18.08	20.28
2	19	21.52	2	7.72	10.32	2	18.2	19.56
3	19.88	21.16	3	7.92	10.6	3	19.12	20.28
4	19.4	21.72	4	7.52	9.88	4	19	20.44
5	19.72	21.44	5	7.96	10.08	5	17.88	19.72
6	19.08	21.12	6	7.76	9.2	6	18.32	19.24
7	20.08	21.6	7	8	9.8	7	17.64	19.52
8	19.04	21.08	8	7.72	9.84	8	17.2	18.92
9	19.2	19.04	9	7.48	7.6	9	18.56	18.28
10	19.6	19.68	10	8.08	8.04	10	16.44	17.28

Decline Index (DI) ratings were taken at the start of each trial and at the time of harvesting. DI ratings are a standardized visual rating of an individual tree’s appearance. The tree canopy is divided into 4 segments (upper right, upper left, lower right, and lower left) and each section is given a rating. The same process is conducted on the opposite side of the tree. This method yields 8 sections to be rated (4 sections on each side of the tree).

The ratings scale ranges from 0 – 40 for the whole tree. An individual section of the tree gets a score between 0 and 5. The ratings from the 8 sections are totaled to give the final DI rating for the tree. A tree with no HLB symptoms would receive a rating of 0. A tree with moderate HLB decline would have a rating of 15 – 25. A tree with severe HLB decline would have a rating above 30.

DI ratings are subjective and prone to human influence. DI ratings between different evaluators can vary by 1-3 points per tree. It is important to use the same evaluators each time a DI rating is taken. DI ratings help to ensure consistency in visual tree health when selecting trees to be a part of a trial. DI ratings also provide insights into a treatment’s effect on canopy health and appearance.

For this project, each tree designated to be a measurement tree at the time of trial initiation was given a DI rating in July 2022. In the 3 Hamlin sites, the ratings were in the low to moderate range. The Southwest site had the lowest DI ratings. The east coast and Ridge site had DI rating in the moderate range at trial initiation. The DI ratings increased slightly (the trees looked worse) at each site during harvesting. The Ridge site saw the smallest amount of DI rating increase at 0.89 points. The east coast site increased by 1.2 points and the southwest site increased by 1.8 points.

The Valencia sites were established in July 2022 and the trees selected for the trial were given an initial DI rating at that time. The east coast Valencia site had the lowest DI rating for the entire project. These

low ratings are understandable because this is a 4-year-old block that is well managed and HLB has been aggressively addressed since the time of planting. The southwest and Ridge Valencia sites scored in the moderate range. The smallest increase in the DI rating from July to March 2023 was seen at the Ridge site. The southwest and east coast sites increased as well but were within 0.5 points of the Ridge site increase.

The minor increase in DI rating from July 2022 to November/December 2022 or March 2023 was expected because we know HLB symptomology increases in the winter months through spring flush. There was no measurable effect of the treatments on DI ratings. There were a few occurrences where DI ratings decreased at harvest compared to the initial DI rating in July 2022. In each of these occurrences, the decrease in DI ratings was seen in the treatments using Gibberellic acid (Treatments 9 and 10). The DI rating decrease was small (less than 0.4 points). This difference is within the margin of error but does support the findings of some growers that GA<sub>3</sub> improves canopy health.

### **Discussion:**

At all sites there was a measurable PGR treatment effect on the percentage of fruit drop. The uniformity of the data from the Valencia trials was better compared to the Hamlin trials. Much of this can be explained by understanding the effect of Hurricane Ian. The Hamlin sites were much closer to maturity when the hurricane struck Florida in September of 2022. Consequently, the detachment force needed to remove a piece of fruit from the tree was lower in the Hamlin trial sites than in the Valencia trial sites.

The degree of hurricane damage varied throughout the state. The Hamlin sites in Lake Wales and Okeechobee were more affected than the site south of Immokalee. The Immokalee Hamlin data shows that each treatment, except for Treatment 4, significantly reduced fruit drop as compared to the untreated control. Treatment 8 had 15% less drop than the control. The Lake Wales and Okeechobee sites both had significant differences by treatment regarding the percentage of fruit drop. At each site, the untreated control had the highest numerical percentage of fruit drop. The data presents a lot of nonsignificant overlap at these two sites, likely due to Hurricane Ian. Recognizing the hurricane damage, there were significant treatment effects. For both sites, the treatments that utilized 435 spray oil (Treatments 5 and 8) in combination with 2,4-D did well compared to the untreated control. Because of the hurricane, it is difficult to attribute the difference in treatment performance exclusively to the PGRs.

The Valencia data was much more uniform and the differences between the highest and lowest performers were not as dramatic compared to the Hamlin sites severely impacted by the hurricane. At the Southwest and central Ridge locations, Treatment 8 was, numerically, the best spray regimen. Regarding Treatment 8, there are 6 treatments at the Immokalee site with nonsignificant overlap and 3 treatments at the east coast site with nonsignificant overlap to Treatment 8. In both sites there are 3 treatments that were not significantly different than the untreated control.

At most of the trial sites, the addition of 435 spray oil (2% v/v) improved the performance of 2,4-D when compared to either the untreated control (Treatment 8 vs Treatment 1) or a treatment of the same spray regimen but without 435 spray oil (Treatment 8 vs Treatment 6). Those differences were not always statistically significant but there is a trend to support the idea that 2 full rates of 2,4-D tank

mixed with 435 spray oil will provide better results than no treatment or treatment with 2,4-D without spray oil.

The evaluation of yield at the Hamlin sites varied greatly by region. The southwest site yielded well and ranged from 1.1 boxes per tree up to 2 boxes per tree. In general, the use of a surfactant or spray oil tank mixed with 2,4-D did not affect yield. In every case except for Treatment 4, the use of any combination of the PGRS and surfactants/spray oil had a significant impact on yield as compared to the untreated control. The single application of 20 oz/acre of Gibberellic acid with an organosilicon surfactant (0.05%) applied at night was numerically the best yielding treatment.

At the Ridge site in Lake Wales, significant differences were seen when using either an organosilicon surfactant or 435 spray oil mixed with 2,4-D. Treatments 5 and 8 both yielded significantly more than the untreated control and Treatment 2. Treatments 3, 4, and 5 compared a split rate application schedule of 2,4-D with Treatment 5 using 435 spray oil. Treatment 5 yielded significantly more fruit than Treatment 3 or 4. The same trend, although not significantly different, is seen in treatments 6, 7, and 8, with Treatment 8 using 435 spray oil.

The East Coast Hamlin site yield data was poor, reflecting the extensive damage caused by Hurricane Ian. This crop was a near total loss and the data presented should not be viewed with a high amount of confidence. The Valencia trials showed little effect of the treatments on yield. The data presented was more uniform than the Hamlin data. The southwest site had no significant differences for yield. Treatment 8 was the top yielding treatment, again establishing the trend of better results by mixing 435 spray oil with 2,4-D. The East Coast in Ft. Pierce produced yield values with very few significant differences. Treatments 7 and 8 were significantly different than the untreated control but not different from the other PGR treatments.

Fruit quality analysis for this project produced different results by site. The Hamlin fruit quality at the Southwest site was impressive. All treatments produced ratio values above 17 and pound solids per box values above 5. Understanding the decline in fruit quality for the past several years in the Florida citrus industry, a Hamlin block producing more than 5-pound solids per box is encouraging.

There were treatment effects for each variable of the fruit quality analysis, with the most variation showing up for pound solids per box. The Ridge site had no significant differences for acid levels. The Brix content was uniform, with all but one of the treatments returning values greater than 9° Brix. Brix/Acid ratio was evenly distributed with only a 1.66 difference between the highest and lowest values. Fruit quality in the Valencia trial sites was very uniform.

The only significant difference found from the trial sites was for pound solids per box at the southwest site. The southwest site had the highest values for Brix, Ratio, and Pound Solids per Box. Those values were above normal for most of the industry.

The Ridge site and East Coast site produced fruit quality data that was, on average, in line with current industry performance. It should be noted that the trees used at the east coast site were 4 years old, and fruit quality will most likely improve in the coming years. The data presented for the Ridge site were the average for 2 replicates of the original trial, presented without statistical analysis and for informational purposes only.

In trial sites less affected by Hurricane Ian, fruit quality was much more uniform. The treatments tended to have a minimal effect on trial sites where tree health was better.

Pound Solids per Acre is a calculation made by using the pound solids per box analysis combined with a calculation of boxes per acre. This is a reasonable approach for calculating the potential monetary output for each treatment in a research project.

At the southwest Hamlin site, Pound Solids per Acre ranged from 1033 up to 1852. There was much nonsignificant overlap for most of the treatments. The untreated control was significantly different (lower) than all other treatments except for Treatments 2 and 4, indicating that the use of a surfactant or spray oil improved efficacy of the PGRs in terms of monetary gains per acre.

The East Coast site produced pound solids per acre values well below industry standards because of the hurricane. There were significant differences between treatments at the east coast site, but none of the values presented were profitable.

The Hamlin site on the Ridge produced pound solids per acre values in line with industry averages, although Treatments 1-4 were on the lower end of the spectrum and certainly not acceptable for commercial citrus production. There was a great deal of nonsignificant overlap in the treatments, but the treatments using 435 spray oil were numerically higher than the other treatments.

The Valencia sites produced pound solids per acre values that were more uniform. The uniformity is seen within each site but also across the Valencia sites. At the southwest site there were no significant differences for pound solids per acre. The east coast site offered acceptable values for a 4-year-old planting. There was a difference of 112-pound solids per acre between Treatment 7 and Treatment 2, and while there was no statistical difference between these values, numerically the difference might be considered significant to a grower. Pound solids per acre is equal to a projection of cash flow per acre, so any difference between treatments amounts to a monetary difference.

## **Conclusions**

At each trial site there were significant differences identified with this prescribed set of treatments. There was a noticeable trend which indicated the addition of 435 spray oil amplified the effect of the 2,4-D. The combination of 2,4-D and Gibberellic acid (Treatment 10) did not produce phytotoxicity or abnormalities in tree performance/function. In most cases, the split rate applications of 2,4-D did not decrease fruit drop to the same level as two full rate applications of 2,4-D. The single spray of Gibberellic acid with an organosilicon surfactant sprayed at night (Treatment 9) did significantly reduce fruit drop, in most cases, compared to the untreated control.

The timing of the PGR applications should be further studied to optimize the demonstrated benefits of 2,4-D and Gibberellic acid for the control of HLB-induced fruit drop. There are many possible tank mix partners for the PGRs, and this study demonstrates PGR performance is impacted by tank mix partners and timing.

## Appendix A

1. Water treated control
2. Label Rate - 3.2 oz/acre 2,4-D single application
  - a. No surfactant or spray oil
  - b. Hamlin application in October
  - c. Valencia application end of December
3. 2.5 oz/acre 2,4-D divided into 3 applications + water
  - a. 0.5 oz/acre, 1.5 oz/acre, 0.5 oz/acre
4. 2.5 oz/acre 2,4-D divided into 3 applications + water + organosilicon surfactant
  - a. 0.5 oz/acre, 1.5 oz/acre, 0.5 oz/acre
5. 2.5 oz/acre 2,4-D divided into 3 applications + water + 435 spray oil
  - a. 0.5 oz/acre, 1.5 oz/acre, 0.5 oz/acre
6. 3.2 oz/acre 2,4-D + water (2 applications at full label rate)
7. 3.2 oz/acre 2,4-D + water + organosilicon surfactant (2 applications at full label rate)
8. 3.2 oz/acre 2,4-D + water + 435 spray oil (2 applications at full label rate)
9. 20 oz/acre Gibberellic acid + organosilicon surfactant (1 application at night)
10. 20 oz/acre Gibberellic acid + 1 oz/acre 2,4-D + organosilicon surfactant (1 application at night)



Hamlin – Southwest

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE	SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL				
2	BLUE	E	CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	OCT 6 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A	NONE	JULY	JULY 28 2022
		E	CITRUS FIX	1.5 FL OZ/A	NONE	SEPTEMBER	OCT 6 2022
		G	CITRUS FIX	0.5 FL OZ/A	NONE	NOVEMBER	NOV 17 2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	JULY	JULY 28 2022
		E	CITRUS FIX	1.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	OCT 6 2022
		G	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOV 17 2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	JULY	JULY 28 2022
		E	CITRUS FIX	1.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	SEPTEMBER	OCT 6 2022
		G	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	NOVEMBER	NOV 17 2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A	NONE	AUGUST	AUG 25 2022
		F	CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	OCT 27 2022
7	BLUE/WHITE STRIPE		CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	AUGUST	AUG 25 2022
		F	CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	OCTOBER	OCT 27 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	AUGUST	AUG 25 2022
		F	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	OCTOBER	OCT 27 2022
9	YELLOW/BLACK STRIPE	E	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	OCT 6 2022
10	RED/WHITE STRIPE	E	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	OCT 6 2022
			CITRUS FIX	1 FL OZ/A			

Hamlin – Ridge

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE	SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL				
2	BLUE	D	CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	OCT 13 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A	NONE	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	NONE	SEPTEMBER	SEP 26 2022
			CITRUS FIX	0.5 FL OZ/A	NONE	NOVEMBER	NOV-18-2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 26 2022
			CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOV-18-2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	SEPTEMBER	SEP 26 2022
			CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	NOVEMBER	NOV-18-2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A	NONE	AUGUST	AUG 19 2022
			CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	OCT 31 2022
7	BLUE/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	AUGUST	AUG 19 2022
			CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	OCTOBER	OCT 31 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	AUGUST	AUG 19 2022
			CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	OCTOBER	OCT 31 2022
9	YELLOW/BLACK STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 26 2022
10	RED/WHITE STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 26 2022
			CITRUS FIX	1 FL OZ/A			

Hamlin – East Coast

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE		SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL					
2	BLUE	D	CITRUS FIX	3.2 FL OZ/A		NONE	OCTOBER	OCT 12 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A		NONE	JULY	JULY 31 2022
		C	CITRUS FIX	1.5 FL OZ/A		NONE	SEPTEMBER	SEP 23 2022
			CITRUS FIX	0.5 FL OZ/A		NONE	NOVEMBER	11/15/2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	JULY	JULY 31 2022
		C	CITRUS FIX	1.5 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 23 2022
			CITRUS FIX	0.5 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	NOVEMBER	11/15/2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A		435 CITRUS OIL 2% (V/V)	JULY	JULY 31 2022
		C	CITRUS FIX	1.5 FL OZ/A		435 CITRUS OIL 2% (V/V)	SEPTEMBER	SEP 23 2022
			CITRUS FIX	0.5 FL OZ/A		435 CITRUS OIL 2% (V/V)	NOVEMBER	11/15/2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A		NONE	AUGUST	AUG 18 2022
			CITRUS FIX	3.2 FL OZ/A		NONE	OCTOBER	OCT 28 2022
7	BLUE/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	AUGUST	AUG 18 2022
			CITRUS FIX	3.2 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	OCTOBER	OCT 28 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A		435 CITRUS OIL 2% (V/V)	AUGUST	AUG 18 2022
			CITRUS FIX	3.2 FL OZ/A		435 CITRUS OIL 2% (V/V)	OCTOBER	OCT 28 2022
9	YELLOW/BLACK STRIPE	C	PROGIBB	20 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 23 2022
10	RED/WHITE STRIPE	C	PROGIBB	20 FL OZ/A		organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEP 23 2022
			CITRUS FIX	1 FL OZ/A				

Valencia – Southwest

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE	SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL				
2	BLUE	D	CITRUS FIX	3.2 FL OZ/A	NONE	END OF DECEMBER	DECEMBER 16 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A	NONE	JULY	JULY 28 2022
		C	CITRUS FIX	1.5 FL OZ/A	NONE	SEPTEMBER	OCTOER 6 2022
			CITRUS FIX	0.5 FL OZ/A	NONE	NOVEMBER	NOVEMBER 17 2022
			CITRUS FIX	0.7 FL OZ/A	NONE	DECEMBER	DECEMBER 16 2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	JULY	JULY 28 2022
		C	CITRUS FIX	1.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	OCTOER 6 2022
			CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 17 2022
			CITRUS FIX	0.7 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 16 2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	JULY	JULY 28 2022
		C	CITRUS FIX	1.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	SEPTEMBER	OCTOER 6 2022
			CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	NOVEMBER	NOVEMBER 17 2022
			CITRUS FIX	0.7 FL OZ/A	435 CITRUS OIL 2% (V/V)	DECEMBER	DECEMBER 16 2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A	NONE	AUGUST	AUGUST 25 2022
			CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	NOVEMBER 17 2022
7	BLUE/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	AUGUST	AUGUST 25 2022
			CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	OCTOBER	NOVEMBER 17 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	AUGUST	AUGUST 25 2022
			CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	OCTOBER	NOVEMBER 17 2022
9	YELLOW/BLACK STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 16 2022
10	RED/WHITE STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 17 2022
			CITRUS FIX	1 FL OZ/A			

Valencia – Ridge

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE	SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL				
2	BLUE	D	CITRUS FIX	3.2 FL OZ/A	NONE	END OF DECEMBER	DECEMBER 14 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A	NONE	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	NONE	SEPTEMBER	SEPTEMBER 23 2022
			CITRUS FIX	0.5 FL OZ/A	NONE	NOVEMBER	NOVEMBER 21 2022
			CITRUS FIX	0.7 FL OZ/A	NONE	DECEMBER	DECEMBER 14 2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEPTEMBER 23 2022
			CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 21 2022
			CITRUS FIX	0.7 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 14 2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	JULY	JULY 27 2022
		C	CITRUS FIX	1.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	SEPTEMBER	SEPTEMBER 23 2022
			CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	NOVEMBER	NOVEMBER 21 2022
			CITRUS FIX	0.7 FL OZ/A	435 CITRUS OIL 2% (V/V)	DECEMBER	DECEMBER 14 2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A	NONE	AUGUST	AUGUST 22 2022
			CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	NOVEMBER 21 2022
7	BLUE/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	AUGUST	AUGUST 22 2022
			CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	OCTOBER	NOVEMBER 21 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	AUGUST	AUGUST 22 2022
			CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	OCTOBER	NOVEMBER 21 2022
9	YELLOW/BLACK STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 14 2022
10	RED/WHITE STRIPE	C	PROGIBB CITRUS FIX	20 FL OZ/A 1 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 21 2022

Valencia – East Coast

TRT.	COLOR	APPLICATION CODE	COMPOUND.	RATE	SURFACTANT/SPRAY OIL	APPLICATION TIMING	EXACT APPLICATION.
1	WHITE		WATER CONTROL				
2	BLUE	D	CITRUS FIX	3.2 FL OZ/A	NONE	END OF DECEMBER	DECEMBER 13 2022
3	RED	A	CITRUS FIX	0.5 FL OZ/A	NONE	JULY	JULY 29 2022
		C	CITRUS FIX	1.5 FL OZ/A	NONE	SEPTEMBER	SEPTEMBER 24 2022
			CITRUS FIX	0.5 FL OZ/A	NONE	NOVEMBER	NOVEMBER 16 2022
			CITRUS FIX	0.7 FL OZ/A	NONE	DECEMBER	DECEMBER 13 2022
4	GREEN	A	CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	JULY	JULY 29 2022
		C	CITRUS FIX	1.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	SEPTEMBER	SEPTEMBER 24 2022
			CITRUS FIX	0.5 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 16 2022
			CITRUS FIX	0.7 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 13 2022
5	ORANGE	A	CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	JULY	JULY 29 2022
		C	CITRUS FIX	1.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	SEPTEMBER	SEPTEMBER 24 2022
			CITRUS FIX	0.5 FL OZ/A	435 CITRUS OIL 2% (V/V)	NOVEMBER	NOVEMBER 16 2022
			CITRUS FIX	0.7 FL OZ/A	435 CITRUS OIL 2% (V/V)	DECEMBER	DECEMBER 13 2022
6	YELLOW	B	CITRUS FIX	3.2 FL OZ/A	NONE	AUGUST	AUGUST 17 2022
			CITRUS FIX	3.2 FL OZ/A	NONE	OCTOBER	NOVEMBER 16 2022
7	BLUE/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	AUGUST	AUGUST 17 2022
			CITRUS FIX	3.2 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	OCTOBER	NOVEMBER 16 2022
8	GREEN/WHITE STRIPE	B	CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	AUGUST	AUGUST 17 2022
			CITRUS FIX	3.2 FL OZ/A	435 CITRUS OIL 2% (V/V)	OCTOBER	NOVEMBER 16 2022
9	YELLOW/BLACK STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	DECEMBER	DECEMBER 13 2022
10	RED/WHITE STRIPE	C	PROGIBB	20 FL OZ/A	organosilicon surfactant 0.05 % (V/V)	NOVEMBER	NOVEMBER 16 2022
			CITRUS FIX	1 FL OZ/A			