Poinsettia Trial with Sustane Fertilizers, Fall 2012
FINAL REPORT
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Objective: Compare performance of Sustane fertilizers to two conventional standard fertilizers for poinsettia production, including combination Sustane plus liquid fertility programs. The study allows evaluation of the slow-release organic fertilizers on a high fertility crop with a 100-day production cycle. Comparative nutrient response curves are provided.

Executive Summary, Sustane Perspective: The Sustane fertilizers performed well compared to the inorganic standards, though growth with Sustane fertilizers did not match that from treatments that include conventional liquid feed (20-10-20). This may have been due to slightly inadequate micronutrient levels in the non-soluble feed treatments, as the soluble feed did include trace levels of micronutrients, and/or the strikingly lower amounts of soluble N provided by the organic nutrient sources. In other words, growth was excellent considering the decreased nitrogen levels observed in the root medium. Top-dressing with Sustane does not appear to be a viable means of applying additional nutrients. The controlled-release fertilizer product 'A' is the best of the three unnamed sources evaluated.

Treatment Details:
Granular Organic Fertilizers Pre-Plant + Supplemental Top-Dress:

2 trts: **#1** Sustane 8-4-4 medium grade, split application of N at 1 N rate: 16 lbs/yd^3
16 lb rate: 8 lbs mixed in pre-plant plus 8 lbs top-dressed at Wk 7

#2 Verdanta GM-2 7-6-12 organic fertilizer applied at equal N loading rate incorporated and equal N applied as topdress at 45 days: 18.24 lbs/yd^3: 9.12 lbs mixed in pre-plant plus 9.12 lbs top-dressed at Wk 7

Granular Pre-Plant + Liquid Feed Treatments:

2 trts: **#3** Sustane 8-4-4 medium grade pre-plant (8 lbs/yd^3) + liquid feed (200 ppm N from 20-10-20) beginning Week 5

#4 Sustane 8-4-4 medium grade pre-plant (8 lbs/yd^3) + liquid feed (200 ppm N from 20-10-20) beginning Week 9, related to observation of need and PourThru EC dropping below 1.0 dS/m threshold

Controlled Release Fertilizers:

3 trts: **#5** Sustane 16-4-8 (180 day A) with all N applied pre-plant at rate of 8 lbs/yd^3

#6 Sustane 16-4-8 (180 day B) with all N applied pre-plant at rate of 8 lbs/yd^3

#7 Sustane 16-4-8 (120 day C) with all N applied per-plant at rate of 8 lbs/yd^3

Controls, Represents Typical Current Production Practice:

#8 Osmocote (Osmocote Plus 15-9-12 3-4 month) with N all applied pre-plant at rate of 8 lbs/yd^3

1 trt: **#9** Liquid fertilization supplied as constant feed at 200 ppm N from 20-10-20

1 trt: **#10** Osmocote (Osmocote Plus 15-9-12 5-6 month) with all N applied pre-plant at rate of 8 lbs/yd^3

Extra treatment

1 trt: **#11** Sustane 4-6-4+ Humates pre-plant (10 lbs/yd^3) + liquid feed (200 ppm N from 20-10-20) weekly (No MicroMax or other CLF added to this treatment)

Experimental Design:
Randomized Complete Block Design with 11 experimental treatments x 5 blocks (reps) reps per trt = 55 pots of one poinsettia cultivar. Plants grown in Block 1 were routinely smallest; this is most easily evident in the photos.

Experiment was conducted in a glass greenhouse in Manhattan, KS; blocks occur across bench length with block 1 nearest exhaust fans and block 5 nearest cooling pads.

Poinsettia variety: Ecke 'Prestige Maroon' at KSU, received as rooted cuttings

Root medium: 70 Canadian sphagnum peat : 30 perlite; made from scratch and amended pre-plant with MicroMax at 1.5 lbs/yd^3 (except for treatment 11, which received no MicroMax), dolomitic lime (Kelly's Dolomitic Lime, 18% Ca and 10% Mg at a rate of 10 lbs/yd^3), gypsum at a rate of 1.5 lbs/yd^3, Epsom salt at a rate of 0.5 lbs/yd^3, and Suffusion granular wetting agent at a rate of 1.5 lbs/yd^3.

Irrigation: Open system with 20% +/- 5% leaching fraction maintained. Used drip irrigation system starting production week 4 (Oct. 5) on all treatments that received tap water; hand-applied soluble feed of 200 ppm N from Peter's 20-10-20 as per treatment protocol, typically 600 ml/pot to maintain LF.

Summary of Data Collected: *Growth:* Plant height, width, fresh weight and dry weight, and photos of all plants and representative root systems per treatment, at end-crop; non-destructive growth data measures at week 7

(mid-crop) of production. *Substrate:* pH, EC, NH_4-N, and NO_3-N at weeks 1, 2, 4, 6, 8, 9, and 11. *Tissue:* chlorophyll content (greenness) with chlorophyll fluorescence meter at mid- and end-crop.

Timeline: The experiment was installed on August 31, 2012. After watering in, RootShield PLUS was applied (same day). Plants were pinched to leave about 7 nodes on Sept. 7. Supplemental HID lights were added on Sept. 21 from 8 a.m. to 4 p.m. Four oz. of Safari mixed at a rate of 2 tsp/gal was applied on Oct. 3.

Pour thru sample dates were as follows: Week 1 on 9/7/13; Week 2 on 9/14/13; Week 4 on 9/28/12; Week 6 on 10/12/12; Week 8 on 10/26/12; Week 9 on 11/2/12; and Week 11 on 11/16/12.

Mid-harvest data was collected on 10/19/12; this was also the date of top dress for treatments 1 and 2. End-harvest data was collected on 12/7/12, 13 weeks after transplant.

Results and Discussion

Growth Data, Mid-harvest. By mid-crop, the control treats of 8 and 10 (Osmocote) and 9 (constant liquid feed) were larger than the organic fertilized treatments based on width, but not based on height. These control treatments were statistically slightly greener based on SPAD readings, but not noticeably so. The only treatment that was significantly smaller was Trt 11, which should have been combined with Osmocote to evaluate the potential of boosting micronutrients from the Sustane product in tandem with a traditional Osmocote product.

	Mid.....					
TRT	Height (cm)	SE	Width (cm)	SE	SPAD	SE
1	21.8	0.4	22.7	1.1	35.1	0.9
2	23.2	0.5	23.3	0.9	36.3	0.6
3	23	0.5	25.2	0.9	37.7	0.9
4	22.4	0.3	22.7	0.4	33.5	1.6
5	23.1	0.6	22.8	0.5	36.1	1.3
6	23.4	0.5	23.9	0.8	41.3	0.9
7	23.6	0.4	24.4	0.3	39.8	1.6
8	23.8	0.5	28.9	0.8	38.3	1
9	23	0.3	27.1	0.8	40.5	1.1
10	25	0.6	29.3	1.2	38.4	0.9
11	21.5	0.3	21	0.4	33.7	1.1

Growth Data, End-harvest. At end-crop, height was again comparable across treatments except treatment 11 which was significantly under-fertilized; this treatment response was confirmed based on all growth parameters.

In comparing Sustane 8-4-4 medium grade (Trt 1) and Verdanta GM-2 7-6-12 (Trt 2), the Verdanta-fertilized plants were a statistically a little larger based on all growth parameters except leaf greenness. To match N rates of the two fertilizers, a greater quantity per cubic yard of Verdanta fertilizer was applied, and the fertilizer inherently has greater amounts of P and K. The increased amounts of these other primary macronutrients, or other plant nutrients, may be responsible for this difference. Again, N rate was matched between these treatments, but not other nutrients.

In comparing the Sustane 8-4-4 treatments that received supplemental soluble feed several weeks into the experiment (Trts 3 and 4) and the constant liquid feed (CLF) control (Trt 9), especially Trt 3 performed well in matching or exceeding growth of from the control. This is especially interesting because this treatment received less soluble feed than Trt 9, beginning applications on Week 5 of the 13-week production cycle.

Trts 8 and 10 allows comparison of growth from the same rates of Osmocote 15-9-12 3-4 month release (Trt 9) compared to the same product at a 5-6 month release (Trt 10). Growth was very close between the two products.

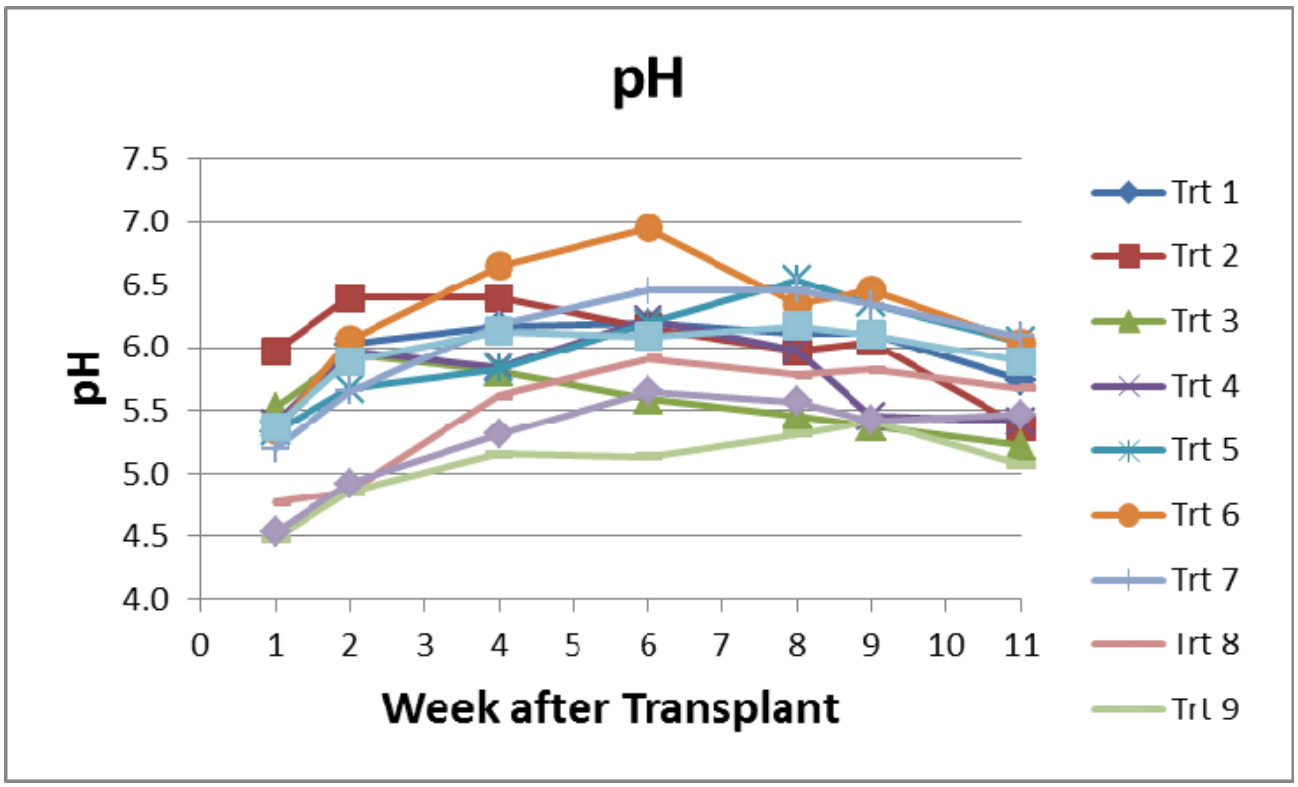
Trts 5, 6, 7, and 8 provide comparison of Sustane with three different sources of slow-release fertilizers (Trt 5, source A; Trt 6, source B; and Trt 7, source C) compared to Osmocote. Product 'C' resulted in somewhat smaller plants compared to the other two slow-release fertilizer sources. All of the treatments with Sustane were smaller compared to those produced with Osmocote.

End……

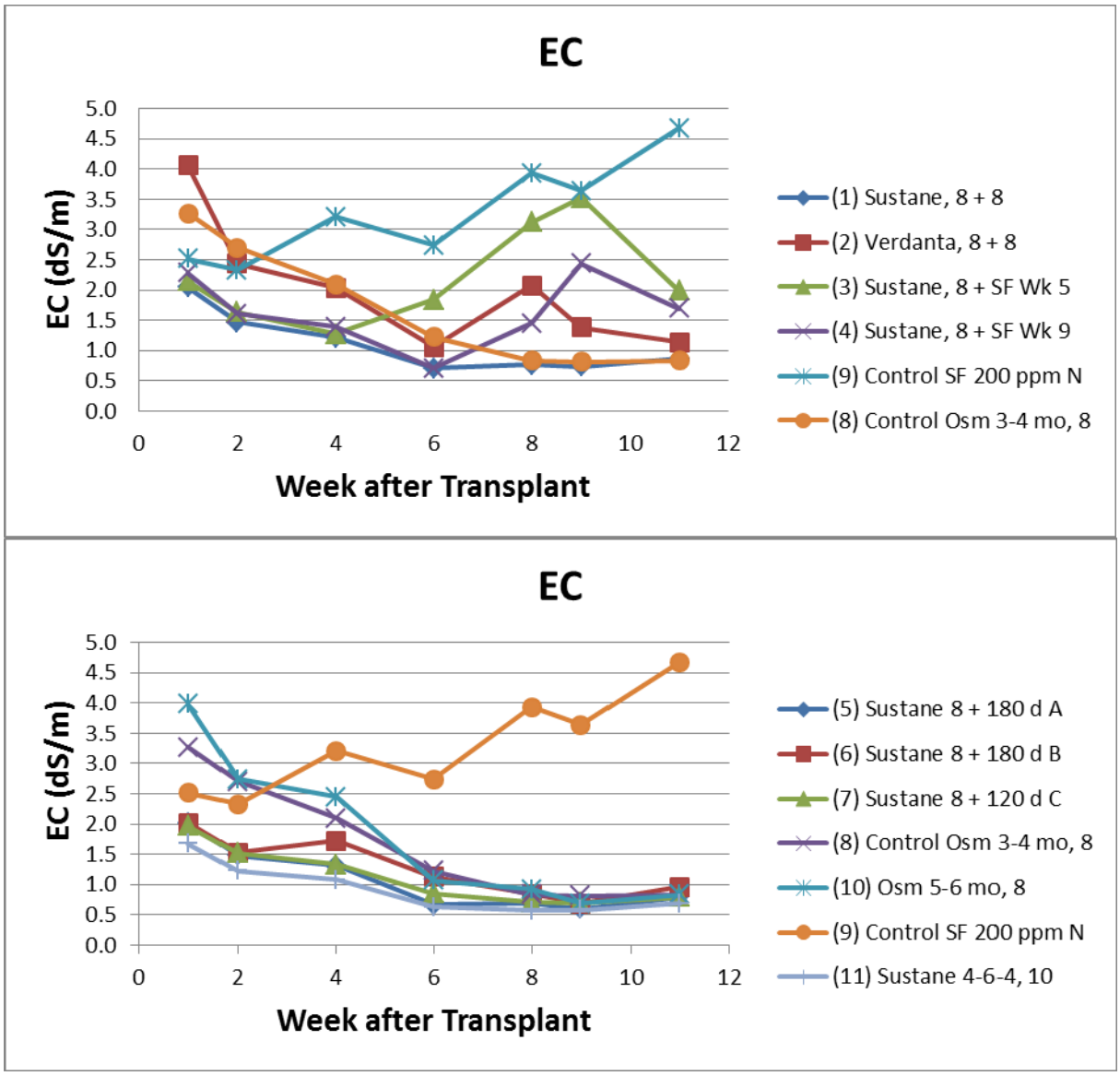
TRT	Height	SE	Width	SE	Infl Diam	SE	SPAD	SE	Fresh Wt	SE	Dry Wt	SE
1	21.8	1.3	28.6	1	26.3	1.4	46.1	1.2	63.6	3.1	10.6	0.3
2	24.2	0.5	34.5	0.9	30.2	1	48.5	2.4	98.2	4.8	14.5	0.4
3	24	0.6	43.2	1.8	34.6	0.9	62.3	2	126.6	5.2	18.4	1
4	23.8	1	41.6	1	32.6	1.4	57.2	0.5	95.2	4.4	14	0.6
5	21.8	0.4	28.1	0.3	24.9	0.6	47.7	0.9	73.2	3.8	13.8	1
6	21.4	0.6	29.4	1.3	24.8	0.6	54.5	2	68.8	2.3	12.3	0.5
7	19.2	0.8	28.7	1.3	22.4	1.4	50.1	1.9	62.6	3.4	11.8	1
8	22.5	0.4	37	1.2	29.3	0.7	49.6	2.1	104.6	5.6	17.3	1.2
9	22.5	0.9	40.2	1.1	31.2	0.6	57.2	1.7	118.4	9.4	16.8	1.3
10	24	1	35.5	1.6	26.7	1.9	45.6	1.1	101.2	2.5	17.3	0.6
11	15.5	0.6	21.1	0.5	11.5	1.1	34.9	1.4	32.8	1.4	7.6	0.1

Height, Width, and Inflorescence diameter are reported in cm. Fresh Weight and Dry Weight are reported in g.

Results of Solution Analyses: Nutrient release curves were generated for pH, EC, NH4-N, NO3-N, and total N as ammonium plus nitrate measured from pour-thru extraction.



There were not significant issues with pH resulting from use of any of the products or combinations of nutrient sources with pH generally remaining between 5.0 and 6.5 after two weeks of production. It did rise higher in pot fertilized with Trt 6, Sustane + product 'B', by weeks 4 to 6, but then declined. pH is a non-issue in this evaluation.



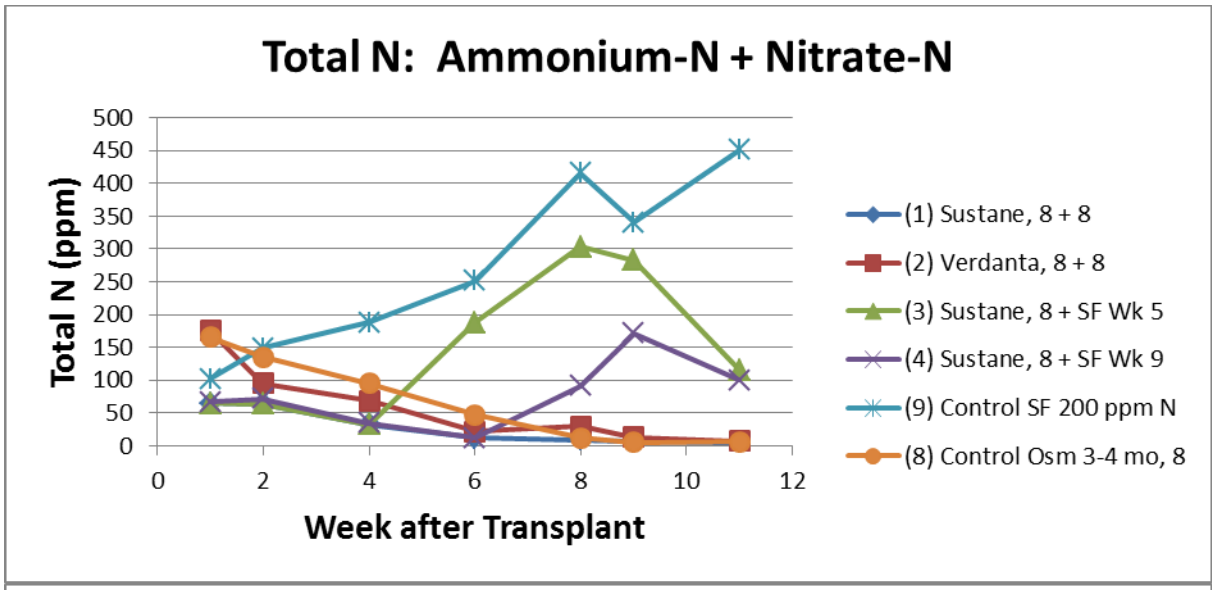
The number in parentheses represents treatment number.

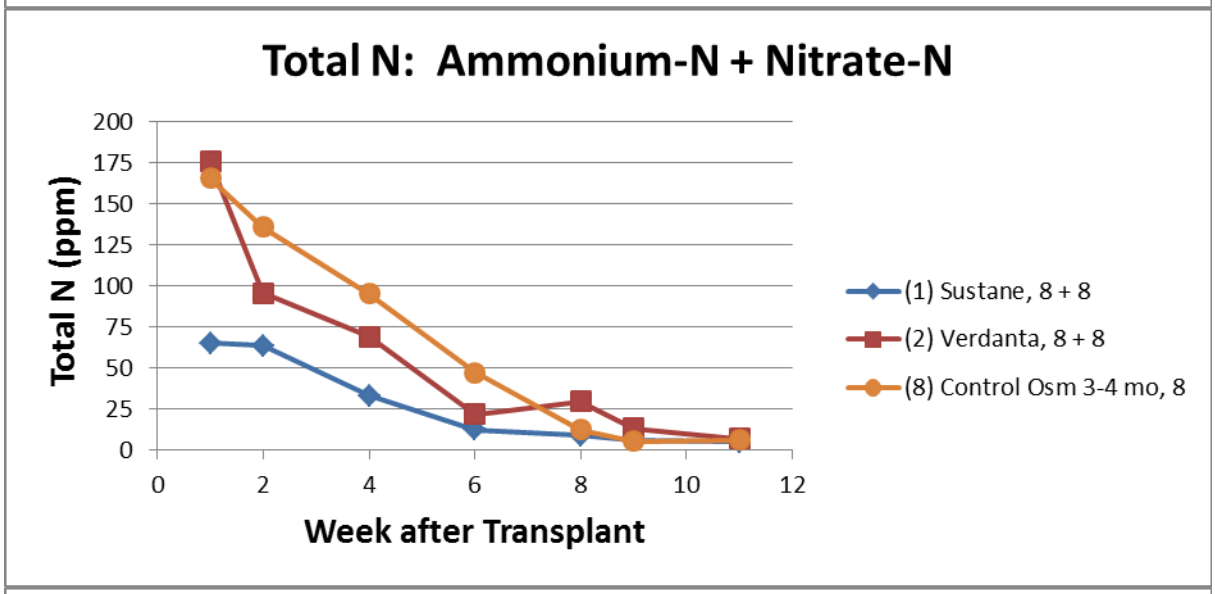
Electrical conductivity of the root medium solution provides an indication of over-all fertility levels. In comparing EC from Trt 1 (Sustane) to Trt 2 (Verdanta), it was higher in the Verdanta treatments. This could be attributed to the greater amount of fertilizer applied to match N-rates between the two products.

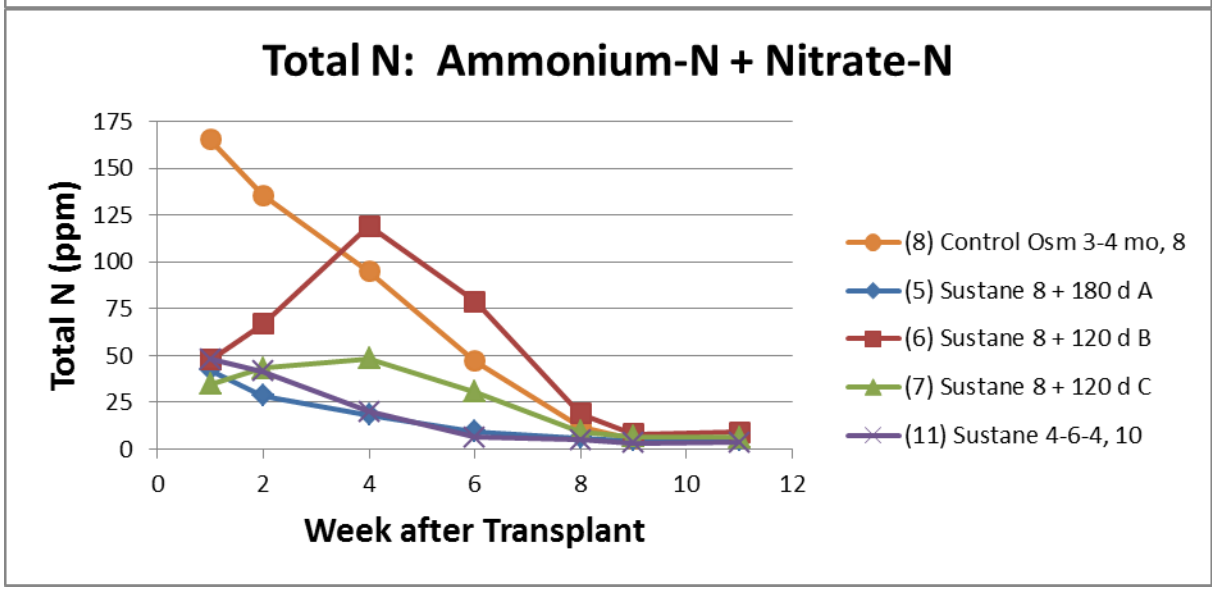
The soluble feed control (Trt 9) resulted in excessive EC as early as 4 weeks into the production cycle when it exceeded 3 dS/m. EC levels greater than 4 dS/m could contribute to salt stress and growth reduction. Trt 3 resulted in similar growth as the SF control, and—except at week 9—has substantially lower EC.

In comparing TRT 5, 6, and 7, it is interesting that slow-release product 'C' resulted in poorer growth but generated virtually the same EC release as slow-release product 'A', both used in conjunction with Sustane.

Similarly, Osmocote products of different release periods (Trt 8 and 10) mirrored each others' EC after Wk 1 when the 5-6 month release product had a larger nutrient dump than the 3-4 month release counterpart.





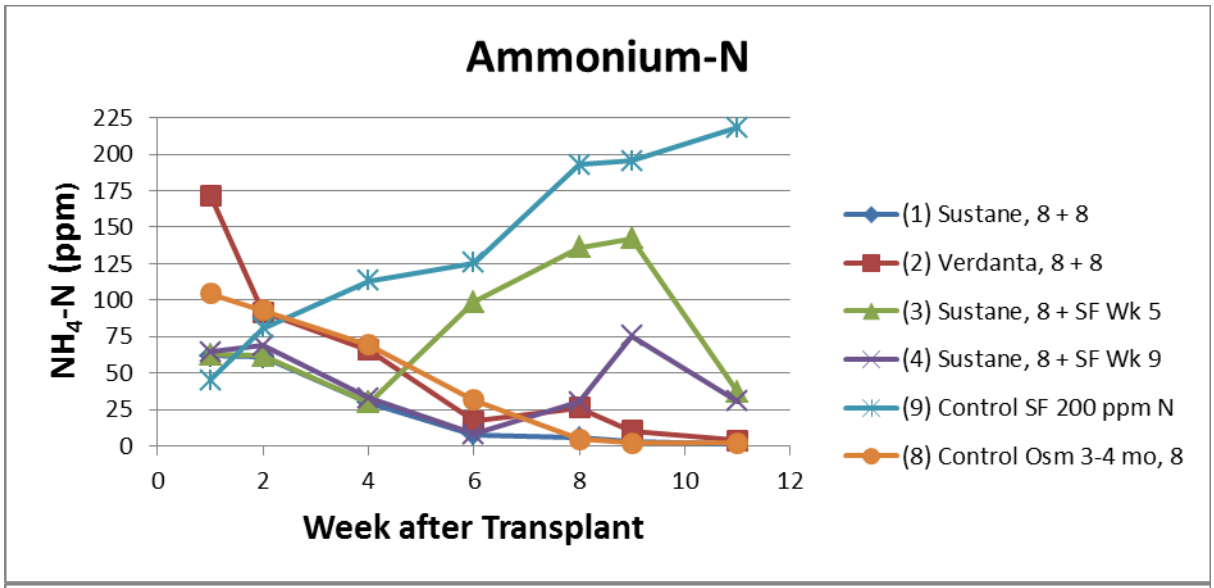


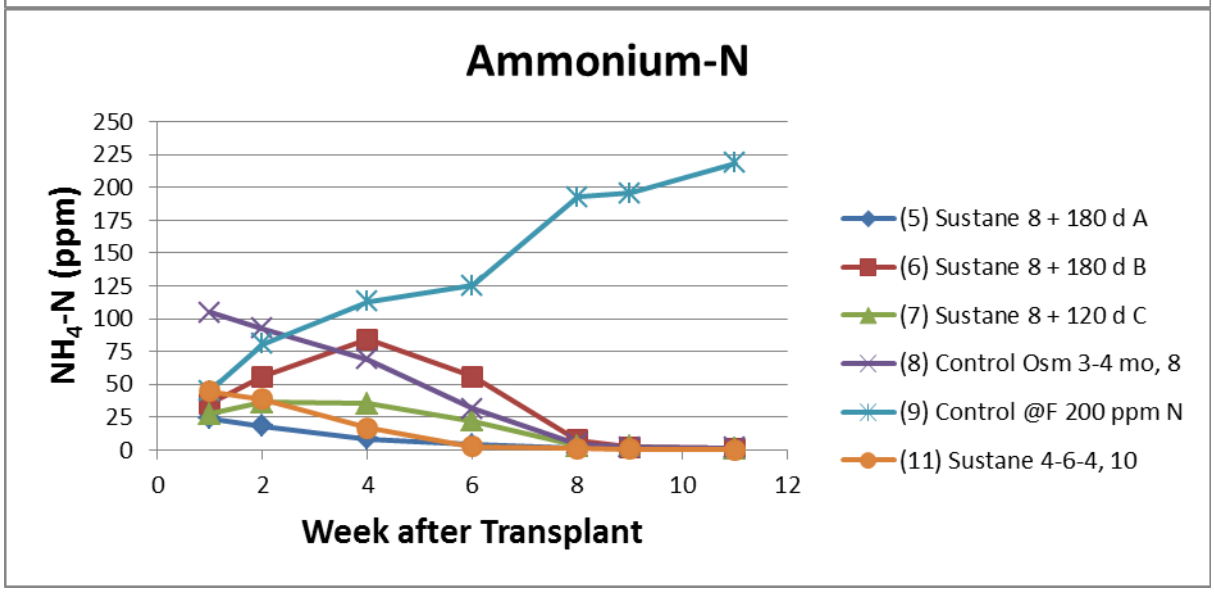
The number in parentheses represents the treatment number.

Evaluating Total Nitrogen released across treatments is interesting because this is the fertility parameter that was best matched in treatment design. The solube feed control built to excessive N levels in the root medium, and if a commercial grower was monitoring their EC or root meidum N-levels, would have likely gone to fertigating every-other irrigation, given the leaching fraction that was maintained in this study.

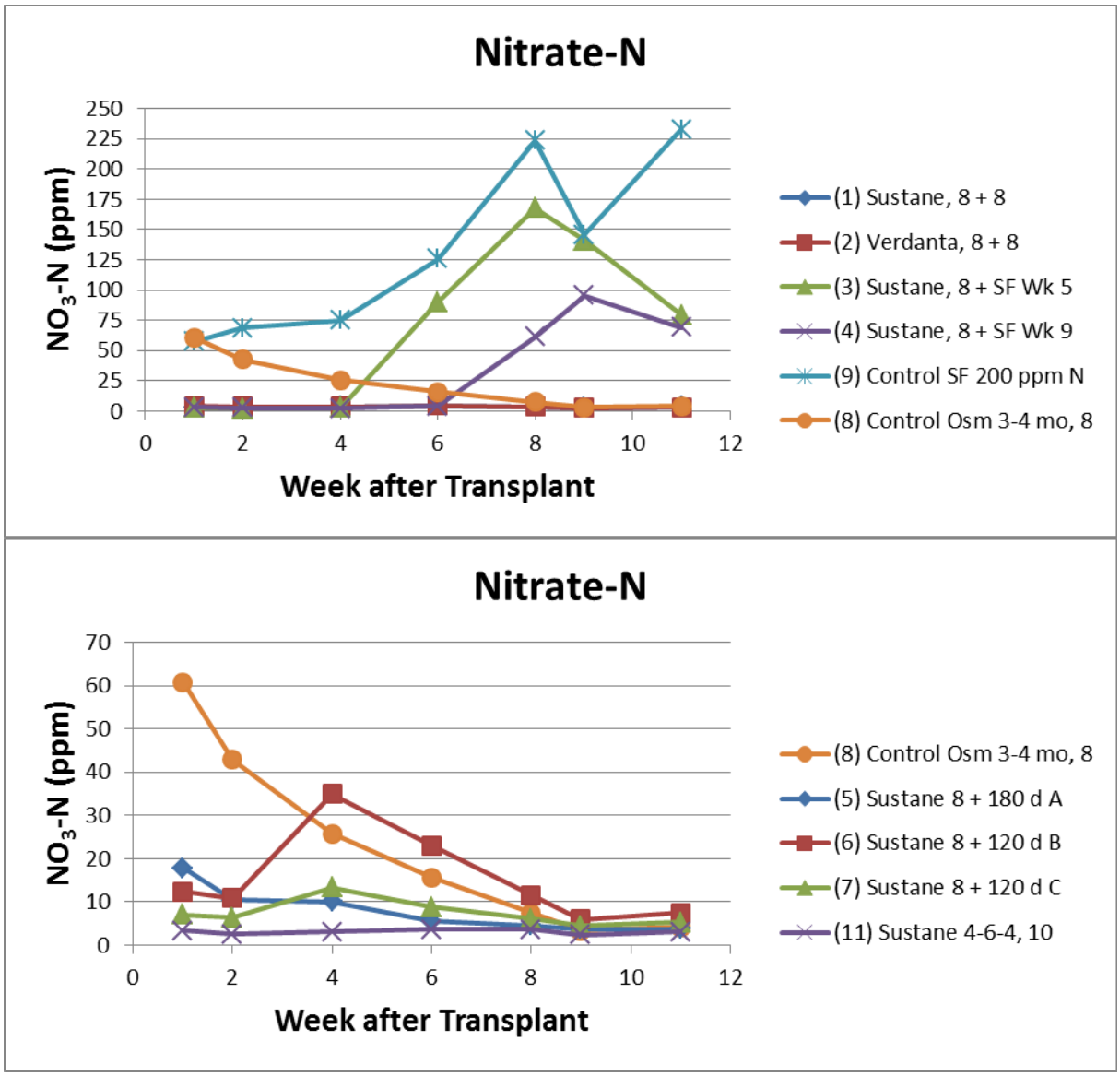
N-levels from Sustane (Trt 1) and Verdanta (Trt 2) declined over the course of production, similar to the 3-4 month Osmocote control, but—even though N-levels applied pre-plant were similar across treatments, the Verdanta generally released a bit more N through 5 weeks of production, and especially initially. While there was a bump in N from a Wk 7 top-dressing with Verdanta, the same was not observed with Sustane. These two observations lead me to offer that some of the N in the Verdanta product is readily soluble, but not so for the Sustane 8-4-4 product. Therefore, I do not believe that top-dressing is a good strategy for Sustane delivery with the goal of providing a nutrient boost mid-crop.

The Total Nitrogen release curves for Trt 5, 6, and 7 show that product 'A', which resulted in most plant growth, had greatest total N release that matched the Osmocote treatments by week 4.





Evaluating release of the N-forms begins with ammonium. Verdanta (Trt 2) released about 100 ppm more NH_4-N than Sustane during the first week of production. The 3-4 month release Osmocote (Trt 8) released about 50 ppm more NH_4-N than Sustane at any point during the first 6 weeks of production



Nitrate release from the organic-only fertilizer treatments was less than 20 ppm throughout the production cycle. The combination of Sustane with conventional fertilizers bring nitrate in the picture. Most plant species, including poinsettia, perform best when both N-forms are provided during production. The growth achieved with Sustane-only fertilizers was excellent in that it was visually very similar to the conventional, nitrate-containing control fertilizers, but much less N, and especially nitrate, was used in total to produce the crops.