

# Using Stimplex and CaSi in tomato for increased yields and quality

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**Objective:** Evaluate Stimplex and silicon in a reduced N program on yield and heat tolerance of tomatoes.

**Material and Methods:** Study was conducted at the Central Maryland Research and Education Center-CMREC (located just north of Upper Marlboro, Maryland). Factor 1 treatments were: Grower standard N rate applied at planting at the rate of 150 pounds/acre and a 30% reduction of N applied at 105 lbs/A. Factor 2 treatments were: 1. Grower standard (Grower St) no Stimplex, 2. Grower Standard plus 2 qts/A of Stimplex applied to soil at planting followed by foliar applications every 2 weeks, 3. Grower Standard plus CaSi at 2 qts/A applied to soil at planting followed by foliar applications every 2 weeks until harvest and 4. Grower Standard plus treatments 2 and 3; this was also repeated using the 30% reduced N rate instead of the Grower Standard. Dates of CaSi and Stimplex applications were: 4, 18 of June; 2, 15 and 28 of July and 12 August). Tissue tests and soil samples were taken at first flowering (25 June) and 30 days later (25 July). There were 8 rows of plastic 125 feet long with drip irrigation in each rep. There were 5 reps. Each plot was 25 ft long. Seven week old transplants of *Mountain Fresh+* went to the field on June 3, 2014 at 2 ft spacing, ~12 plants/plot. Nitrate-N petiole-sap readings (taken with a Cardy meter) and SPAD readings were taken 30 (July 3) and 60 (Aug. 4) days after transplanting. Weekly fungicide (chlorothalonil rotated with Cabrio) and bactericide (ManKocide) applications were started at flowering and continued every 7 days until 2<sup>nd</sup> harvest. First harvest was on August 25, 2014, second harvest was on 4 September and the third harvest was 12 September. Yields consisted of weight and number of tomato fruit from the center 8 plants of each plot. Yields were separated into culls by weight and further separated by either blossom end rot or other fruit ripening problems (uneven ripening, yellow shoulders, rain check, puffiness, etc.). Data were analyzed using ANOVA and means were separated using Orthogonal Contrasts.

**Results:** Over all there were no significant differences between the Grower standard fertility program vs the 30% reduction in fertility program. There were no significant differences in soil samples. For the tissue tests only the 25 June samples had some significant differences. The potassium levels were greater in the Stimplex treated plots (these are any treatments in which Stimplex was applied) vs all other treatments while Magnesium levels were greater in the Stimplex treated plots vs all other treatments except the control (Table 1). The 4 August SPAD readings showed a significant 18.6% increase in Stimplex treatments vs the Control treatments (Table 2). Nitrate readings in Stimplex treated plots were significantly greater for 4 August readings than in the CaSi or Control treated plots (Table 2). There were no significant differences among any of the treatments for any of the three harvest dates for weight or number of tomatoes (Table 3). There were significant differences for the weight of culls (for fruit ripening problems other than blossom end rot) among treatments for the first and second harvest dates, but not for the third date (Table 4). The Stimplex treated plots had significantly fewer culls vs the control or the CaSi treated plots. All treatments had some level of foliar disease (early blight *Alternaria solani*, septoria, *Septoria lycopersici* and bacterial spot, *Xanthomonas campestris* pv. *vesicatoria*) that started at low levels and then increased throughout the growing season to high levels (Table 5). Only on the last reading date of 25 August were there any significant differences. Stimplex treated plots by this date had significantly lower disease percentages than the Control and the CaSi with 30% reduction in N plots.

**Discussion:** The growing season of 2014 was unusual for the mid-Atlantic region. Temperatures were below normal for most of the summer (J, J, A), while rainfall was above normal for the same time period. Rainfall

was not only greater than normal, but it was also much more consistent, being spread out evenly over the entire summer rather than a few large downpours. For the months of July and August temperatures were on average for Maryland 2-4° F below normal and 125-150% above normal for precipitation (NOAA 2014). This kept leaf-tissue wet most of the time. It also kept soil moisture levels very even and for us if that happens we rarely see any problems with blossom end rot and that is what we saw in the results for 2014. Because leaf tissues remained wet for prolonged periods, foliar diseases were a significant problem in most of our vegetable crops this summer. Tomato fields had much greater levels of early blight, septoria and bacterial leaf spots than what is normally seen. This resulted in the last harvest being below what we would have expected as plants were weak and in pretty bad shape due to disease pressure. There were large variations in yield on a per plant basis, with some plants yielding poorly in plots while other plants in the same plot yielding well; overall there were few yield differences between treatments. There were some differences in nutrient levels between treatments with Stimplex treatments having greater levels of potassium (K), which is important in determining fruit ripening problems in tomato. It should be pointed out however, that K levels were above thresholds (3.5%) in all treatments.

Bottom line, there were not many differences among any of the treatments except for a few Stimplex factors. We simply did not have the high temperatures we usually have had the last 4-5 years and at the same time had greater levels of rainfall, which increased disease incidence. These factors produced a very unusual growing season.

Table 1. Mean tissue test analysis for four treatments at two levels per plot for *Mt Fresh+* on 25 June 2014

Treatment	Fertility level	N	P	K	Ca	Mg	S	B
CaSi	Low	3.02	0.27	6.71b	2.12	0.46b	0.22	27.1
Ca Si	Grower St	2.82	0.22	5.38b	2.14	0.47b	0.20	24.6
Stimplex	Low	3.00	0.23	7.57a	2.51	0.56a	0.25	30.2
Stimplex	Grower St	2.96	0.20	7.61a	2.23	0.61a	0.21	24.7
Both	Low	2.94	0.20	6.61b	1.72	0.41b	0.21	26.8
Both	Grower St	2.71	0.24	6.52b	2.02	0.46b	0.20	24.3
Control	Low	2.75	0.21	5.67b	2.00	0.48ab	0.21	25.1
Control	Grower St	2.89	0.19	6.56b	1.82	0.51ab	0.20	28.4

Means within a column with different letters are significantly different at the  $P < 0.05$  level. Not all nutrients are shown in this figure

Table 2. Mean SPAD and Cardy-NO<sub>3</sub>-N Readings per plot taken on 4 August 2014.

Treatment	Fertility level	SPAD Reading	Cardy Nitrate Reading
CaSi	Low	53.7bc	542.3b
Ca Si	Grower St	51.5bc	535.6b
Stimplex	Low	58.2a	610.2a
Stimplex	Grower St	57.8a	637.7a
Both	Low	55.2ab	598.3a
Both	Grower St	57.4ab	607.4a
Control	Low	49.2c	543.7b
Control	Grower St	48.6c	530.8b

Means within a column with different letters are significantly different at the  $P < 0.05$  level.

Table 3. Mean weight (lbs) / number of tomato fruit harvested per plot-there were no sig. differences

Treatment	Fertility	1 <sup>st</sup> Harvest 8/25	2 <sup>nd</sup> Harvest 9/4	3 <sup>rd</sup> Harvest 9/12
CaSi	Low	42.8/ 62.3	60.8/ 84.4	52.6/ 89.5
Ca Si	Grower St	38.4/ 57.8	55.2/ 78.2	47.9/ 78.5
Stimplex	Low	46.1/ 55.9	68.4/ 83.2	54.6/ 82.8
Stimplex	Grower St	48.6/ 57.4	72.7/ 80.9	64.3/ 92.1
Both	Low	44.3/ 59.2	69.5/ 87.2	66.8/ 81.3
Both	Grower St	51.7/ 62.8	67.4/ 82.1	71.5/ 86.3
Control	Low	41.5/ 58.3	59.5/ 87.2	50.4/ 86.4
Control	Grower St	38.3/ 53.9	62.3/ 80.5	44.3/ 75.1

Means within a column with different letters are significantly different at the  $P \leq 0.05$  level.

Table 4. Mean weight (lbs) of culls due to blossom end rot (no differences) or / fruit ripening problems/plot

Treatment	Fertility	1 <sup>st</sup> Harvest 8/25	2 <sup>nd</sup> Harvest 9/4	3 <sup>rd</sup> Harvest 9/12
CaSi	Low	2.6/ 2.2bc	8.8/ 8.4ab	5.8/ 11.9
Ca Si	Grower St	3.3/ 2.4bc	6.9/ 10.1b	5.2/ 11.6
Stimplex	Low	1.6/ 1.0ab	5.8/ 5.2a	4.6/ 12.4
Stimplex	Grower St	1.4/ 0.83a	5.1/ 5.3a	6.2/ 13.0
Both	Low	1.95/ 1.1ab	4.8/ 4.3a	5.7/ 14.3
Both	Grower St	1.5/ 0.9a	4.5/ 3.9a	5.4/ 12.6
Control	Low	2.6/ 2.6c	6.2/ 12.2b	9.8/ 15.9
Control	Grower St	2.8/ 1.8bc	7.7/ 8.9b	8.2/ 16.2

Means within a column with different letters are significantly different at the  $P \leq 0.05$  level

Table 5. Mean percent foliar diseases (early blight, septoria and bacterial spot) on tomato plants/plot

Treatment	Fertility	July 3	August 4	August 25
CaSi	Low	6.8	18.4	38.3bc
Ca Si	Grower St	7.3	21.6	43.8cd
Stimplex	Low	10.1	19.3	31.2a
Stimplex	Grower St	6.4	22.1	37.6ab
Both	Low	5.3	16.4	29.5a
Both	Grower St	8.2	19.5	33.3ab
Control	Low	8.3	19.4	52.4d
Control	Grower St	9.1	25.3	46.2cd

Means within a column with different letters are significantly different at the  $P \leq 0.05$  level.

### References

NOAA National Oceanic and Atmospheric Administration. 2014. <http://www.noaa.gov/index.html>