

Tomatoes



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- Affect of conventional and ACLF fertility products on the yield of fresh market Beefsteak tomatoes. (2009)
- Affect of conventional and ACLF fertility products on the yield of Roma tomatoes (2009)

Experiment: Evaluation of Difference in Fertilizer Sources
For Field Production Tomatoes

Year: 2004 (04-32)

Date of Planting/Harvest: transplant 5-12-04/9-2-04

Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)

pH ~ 6.4 P1 ~ 52
CEC ~ 5 K ~ 121
OM ~ 1.5% (6.2% K)

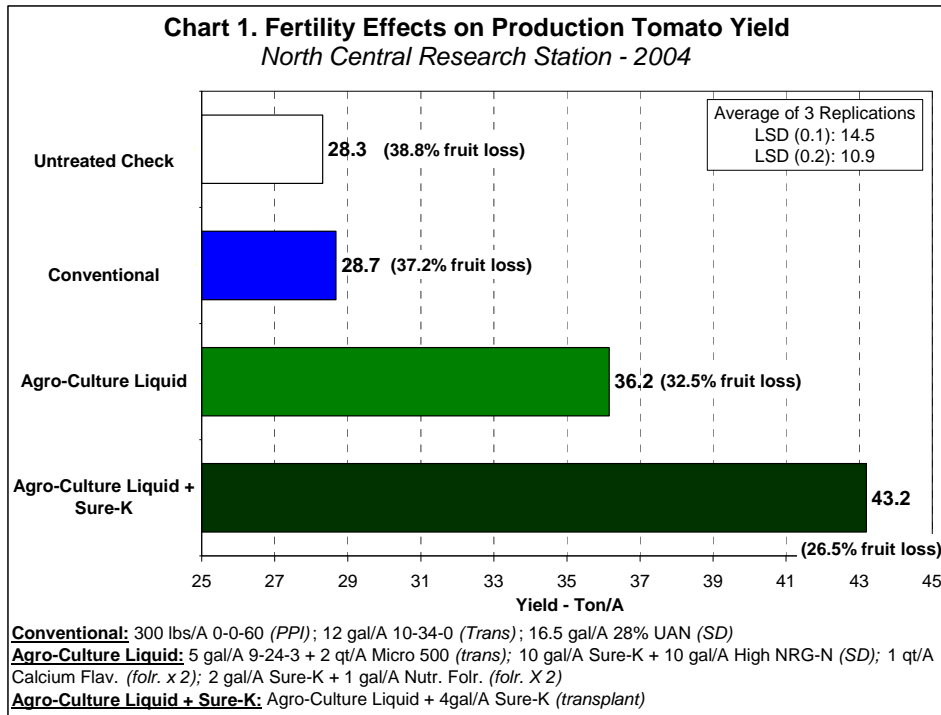


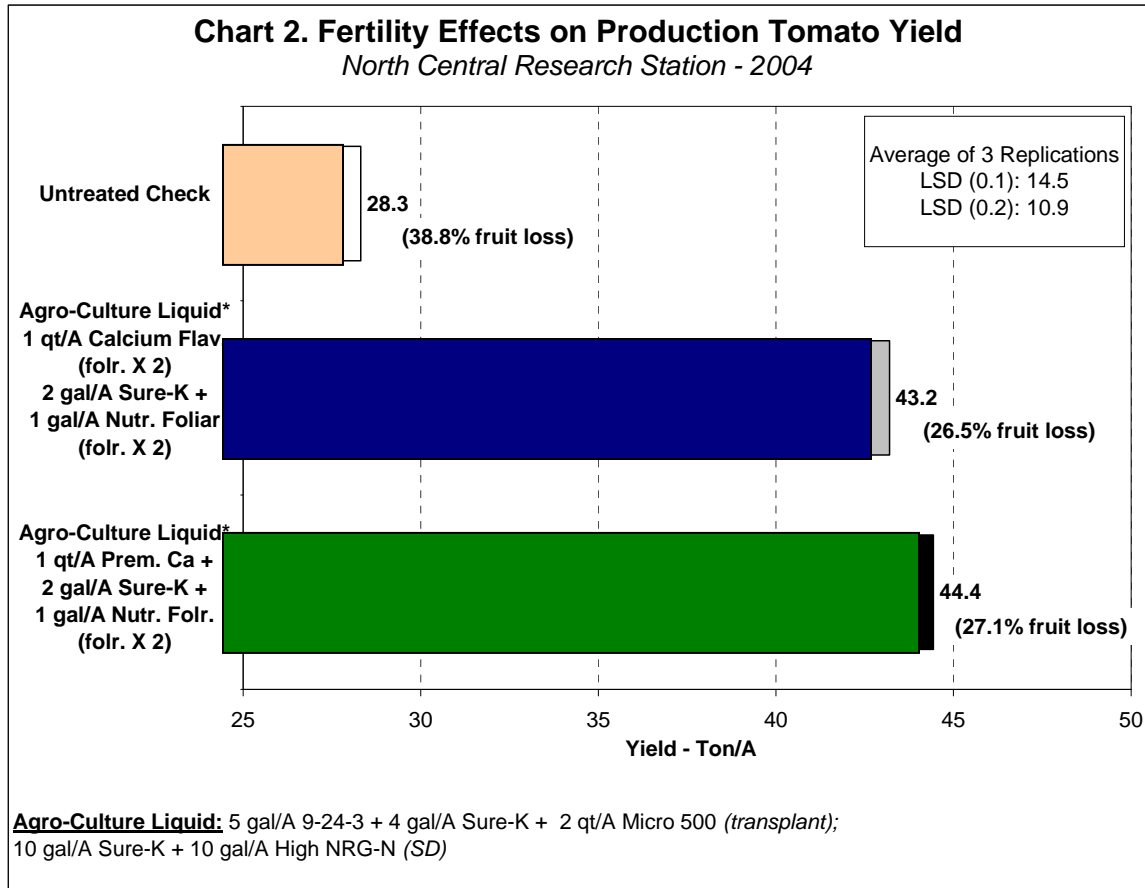
Table 1. Fertilizer Effects on Average Tomato Fruit Size
North Central Research Station – 2004

Fertilizer Program	Average Size – pounds
Agro-Culture Liquid Fertilizers + Sure-K	0.44
Agro-Culture Liquid Fertilizers	0.43
Conventional	0.40
Untreated Check	0.40
LSD (0.1)	0.04

- Harvest was completed by hand; tomatoes were sorted, counted and weighed to calculate yield and percent damage. All fertilizer application increased tomato yields and size and decreased fruit loss over the untreated check.
- The Agro-Culture Liquid Fertilizers program significantly increased tomato yields (almost 8 Ton/A) and size (0.03 lbs) over the conventional fertilizer program.
- Fruit loss due to tomato damage such as blossom end rot and over ripening was nearly 5% lower with the Agro-Culture Liquid Fertilizers program compared to the conventional fertilizer source.
- Addition of 4 gal/A of Sure-K at transplant increased tomato yields 7 ton/A and decreased fruit loss by 6% as compared to the normal Agro-Culture Liquid Fertilizers program.

Experiment: Calcium Source Comparison on Tomatoes
Year: 2004 (04-32)
Date of Planting/Harvest: transplant 5-12-04/9-2-04
Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)	
pH ~ 6.4	P1 ~ 52
CEC ~ 5	K ~ 121
OM ~ 1.5%	(6.2% K)



- Premium Calcium is Agro-Culture Liquid Fertilizers' new calcium source that can be mixed with phosphorus products and applied without problems of incompatibility.
- Both foliar applications significantly decreased the percent fruit loss compared to the untreated check.
- Over a 1-ton/A yield increase was achieved with the Premium Calcium application compared to the Calcium Flavonol.
- There was no significant difference in percent fruit loss (damage such as blossom end rot and over ripening) when comparing the two calcium sources.
- Although there was no significant difference in yield or quality, the advantage of having a calcium source that can be mixed with other fertilizers can greatly increase a growers overall profit. Reducing applications (trips across the field) saves the grower time and expenses related to the application along with reducing soil compaction.

Experiment: Two-Year Evaluation of Difference Fertilizer Sources for Field Production Tomatoes

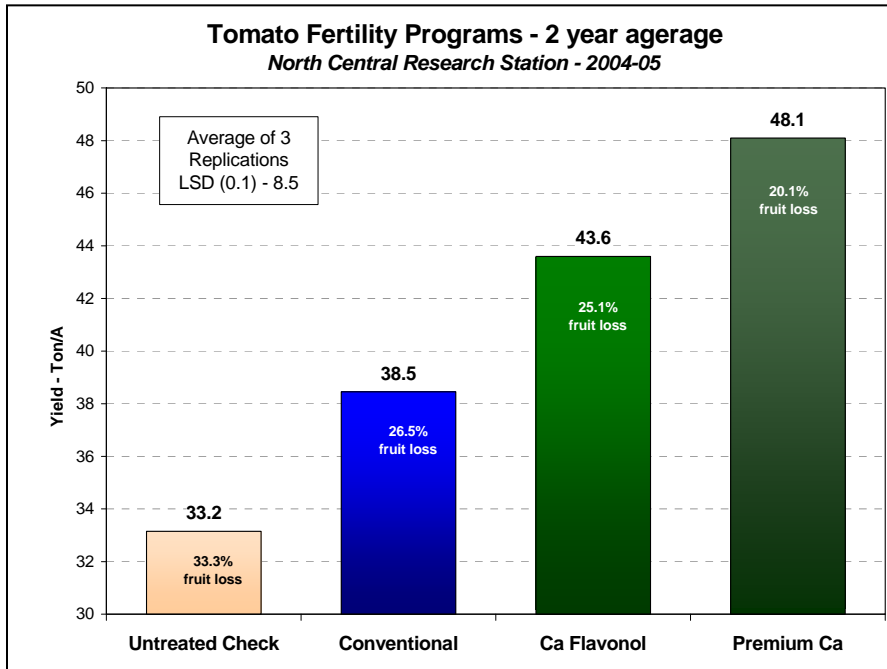
Year: 2004/2005 (04-32/05-32)

Date of Planting/Harvest: transplant 5-12-04/9-2-04
transplant 5-9-05/8-18-05

Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)

pH ~ 7.3 P1 ~ 61
CEC ~ 6.3 K ~ 87
OM ~ 1.8% (3.5% K)



Conventional:

460 lbs/A 0-0-60
Preplant Broadcast
10 gal/A 10-34-0
Transplant
25 gal/A 28% UAN
Sidedress

ACLF:

10 gal/A Sure-K
3 gal/A Pro-Germ.
2 qt/A Micro 500
Transplant
10 gal/A Sure-K
15 gal/A High NRG-N
Sidedress
2 gal/A Sure-K
1 gal/A Nutr. Foliar
Either: 1 qt/A Ca Flav. or 1 qt/A Prem. Ca
Foliar

- Harvest was completed by hand; tomatoes were sorted, counted and weighed to calculate yield and percent damage. All fertilizer application increased tomato yields and size and decreased fruit loss over the untreated check.
- Two-year average of the Agro-Culture Liquid Fertilizers program significantly increased tomato yields (over 5 Ton/A) over the conventional fertilizer program.
- Fruit loss due to tomato damage such as blossom end rot and over ripening was nearly 1.5% lower with the Agro-Culture Liquid Fertilizers program compared to the conventional fertilizer source.
- Premium Calcium is Agro-Culture Liquid Fertilizers' new calcium source that can be mixed with phosphorus products and applied without problems of incompatibility.
- Both foliar applications significantly decreased the percent fruit loss compared to the untreated check.
- Over a 4-ton/A yield increase was achieved with the Premium Calcium application compared to the Calcium Flavonol.
- Premium Calcium decreased the percent fruit loss (damage such as blossom end rot and over ripening) compared to Calcium Flavonol.
- The advantage of having a calcium source that can be mixed with other fertilizers can greatly increase a growers overall profit. Reducing applications (trips across the field) saves the grower time and expenses related to the application along with reducing soil compaction.

Experiment: Garden Fertilizer Comparison
Year: 2003 (03-34&35)
Date of Planting/Harvest: May / July-September
Plot Size: 5' x 5'

Soil Test Levels (ppm)

pH ~ 6.4 P1 ~ 52
 CEC ~ 5 K ~ 121
 OM ~ 1.5% (6.2% K)

Table 1. Tomato Fertility Programs

North Central Research Station - 2002-03

Product applied 2x month	2002 Yield Tomatoes/plant	2003 Yield Tomatoes/plant	Average Yield Tomatoes/plant	Avg. Fruit Size lb/tomato
Garden Grow	25.3	22.5	23.9	0.31
Miracle Gro	21.1	20.0	20.6	0.28
Untreated	21.0	14.8	17.9	0.28

Table 2. Bell Pepper Fertility Programs

North Central Research Station - 2002-03

Product applied 2x month	2002 Yield Peppers/plant	2003 Yield Peppers/plant	Yield/Plant Peppers/plant	Avg. Fruit Size lb/tomato
Garden Grow	5.9	9.3	7.6	0.27
Miracle Gro	5.0	8.0	6.5	0.23
Untreated	3.1	5.0	4.1	0.23

- This experiment was complete to determine the best fertilizer source for home garden vegetables. Comparisons were made between Agro-Culture Liquid Fertilizers' Garden Grow and the conventional fertilizer Miracle Gro.
- Garden Grow was mixed at a rate of 1 oz per gallon of water and Miracle Gro was mixed at 1 tsb. per gallon of water. Each plant was watered bi-weekly with 4 oz of fertilizer solution.
- Plants were transplanted in mid-May and harvest was done by hand from early July thru a killing frost in September. Fruit was sorted, weighed, and counted to calculate yield.
- In both 2002 and 2003 tomato and bell pepper yields were increased with either fertilizer application as compared to the untreated check.
- Amongst the two years, highest yield was achieved with applications of Agro-Culture Liquid Fertilizers Garden Grow for both the tomatoes and bell peppers.
- Garden Grow significantly increased the fruit size of both bell peppers and tomatoes in both 2002 and 2003.

Experiment: Tomatoes

Year (Experiment Number): 2006 (06-202)

Date of Planting/Harvest:

Hybrid: Celebrity

Plot Size (replications): 7.5' x 5', 3 reps

Soil Test Levels (ppm)

pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

The objective for this trial was to possibly expand this successful fertility program with two different Agro-Culture Liquid Fertilizer foliar fertilizers, PTS and Experimental Foliar #2. Additionally, a comparison with conventional dry fertilizer products was made. Tomato research trials at the North Central Research Station have previously demonstrated the yield benefit of Premium Calcium as a foliar application on tomatoes.



- “Celebrity” variety tomatoes were transplanted into the plot area on May 24, 2006. Each plot was 7.5' x 5' and consisted of ten tomato plants (two rows with 18" spacing between rows and between plants within rows).
- The entire plot area received the equivalent of 20 tons/Acre of dairy manure prior to being plowed to a depth of 6" during fall tillage. In the spring, a tractor mounted rotor-tiller was used to prepare the plots for planting.
- Granular fertilizers for the conventional treatment were broadcast across selected plots and incorporated into the soil prior to trans-planting. Transplant solutions containing the described Agro-Culture Liquid fertilizers or 10-34-0 were applied in a total water volume of 4 oz per plant (~150 gallons per acre) at the time of transplanting. On June 13th sidedress applications were made to apply additional fertilizer into all the plots as described. A custom built sidedress applicator equipped with a fertilizer knife placed the treatments 2" deep and mid-way between the two tomato rows for each plot. On June 20th, a second sidedress application was made 14 days later in the same manner.
- Foliar fertilizer applications started at initial fruit set on July 14th. A second application of these foliar treatments was re-applied to selected plots on July 28th. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. Fungicides and insecticides were applied separately, but in a similar manner as needed through out the season.
- PTS in treatment #2&3 is Protrastim, a protein cell carrier with a tri-alcohol growth stimulant that boosts the crops ability to store energy for the photosynthetic process.
- The earliest tomatoes to mature were hand harvested from each plot on Aug 14, 2006. On August 25th, the entire plot area was treated with Ethrel[®] (Ethephon) to advance maturity of all remaining green fruit. On August 30th, all tomatoes were harvested, sorted according to color, and the yield by color was determined for fully

red, partially red (breaks) & green tomatoes. Rotten tomatoes and green tomatoes smaller than 2" in diameter were left in the plots and not included in the harvest evaluations.

Table T1. Tomato Fertility Programs utilized in 2006 research trial.

Treatment		Rate/ A (gal.)	Method of Application
1	Sure-K + Pro-Germ + Micro 500	10 + 2.5 + 2 qt	transplant
	Sure-K + High NRG-N	10 + 16	Sidedress #1
	High NRG-N	16	Sidedress #2
	Premium Ca + SK + NF	(1 qt + 2 + 1) x 2	foliar x 2
2	Sure-K + Pro-Germ + Micro 500	10 + 2.5 + 2 qt	transplant
	Sure-K + High NRG-N	10 + 16	Sidedress #1
	High NRG-N	16	Sidedress #2
	Premium Ca + SK + NF + PTS	(1 qt + 2 + 1 + 2 oz) x 2	foliar x 2
3	Sure-K + Pro-Germ + Micro 500	10 + 2.5 + 2 qt	transplant
	Sure-K + High NRG-N	10 + 16	Sidedress #1
	High NRG-N	16	Sidedress #2
	Premium Ca + SK + PTS + Exp #2	(1 qt + 2 + 2 oz + 1) x 2	foliar x 2
4	0-0-60	520#	broadcast
	10-34-0	9 gal	transplant
	28% UAN	26.5 & 26.5	sidedress 1&2

SK = Sure-K, NF= Nutritional Foliar, PTS= Protristim, Exp #2 = Experimental Foliar #2

RESULTS:

- Marketable tomato yields (early, reds, & breaks) for all Agro-Culture Liquid Fertilizer treatments (treatment 1-3) were significantly greater than the conventional fertilizer program. However, there were no statistical differences among the three Agro-Culture Liquid foliar treatments for marketable yield.
- All three Agro-Culture Liquid Fertilizer treatments had significantly more red fruit than was produced for the conventional fertilizer treatment.
- Total yield from the various Agro-Culture Liquid fertility programs was approximately 35% greater than the conventional fertility program.

Table T2. Effect of various foliar fertilizer programs on the yield and quality of tomatoes.

Treatments	Early	Reds	Breaks	Greens	Total Marketable
	Tons/Acre*				
1 Nutritional foliar & Premium Ca	6.4 abc	23.9 b	29.0 ab	17.9 a	59.4 b
2 Nutritional foliar, Prem-Ca &PTS	7.5 bc	24.3 b	28.3 ab	17.9 a	60.0 b
3 Nutritional foliar, Prem-Ca, PTS & EXP Foliar #2	9.0 c	26.3 b	27.3 ab	22.6 a	61.0 b
4 Conventional Fertilizers	6.0 ab	17.1 a	21.3 a	18.3 a	44.5 a

* Values followed by different letters are significantly different within each column according to Duncan's Multiple Range Test (P< 0.10) Ethrel® is a product of Bayer Crop Science, Research Triangle Park, NC

- The program utilizing Experimental Foliar#2 had numerically the highest marketable yield of all treatments and significantly greater yield of early tomatoes than the conventional fertilizer treatment. This program also had the highest yield of red and green fruits. Delaying harvest or the use of a higher rate of Ethrel may have produced an even greater marketable yield with this treatment.

- PTS and Experimental foliar #2 each advanced the maturity, promoted numerically greater yields, increased the quantity of red fruit produced by the tomatoes treated with these products.

Conclusions:

All Agro-Culture Liquid fertilizer products utilized in this trial promoted yield and the quality of the tomatoes produced. PTS and the Experimental foliar #2 each added to the early yield and red tomato yields. Therefore, these products promoted the overall yield and quality of the tomatoes in this trial beyond the use of the base liquid foliar program.

Conventional fertilizers were applied according to published guidelines from Michigan State University's Nutrient Recommendations for Vegetable Crops in Michigan. Ext Bulletin E2934, 2004

Experiment: Three-Year Evaluation of Different Fertilizer Sources for Field Production Tomatoes

Year: 2004-2006

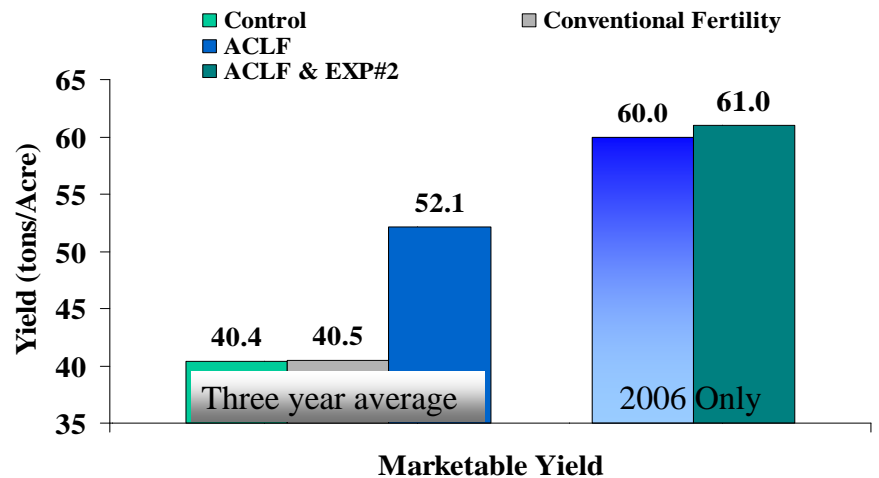
Date of Planting/Harvest: transplant 5-12-04/ 9-2-04
transplant 5-9-05/ 8-18-05
transplant 5-23-06/ 8-29-06

Plot Size: 5 ft. x 5 ft. (2005) & 5 ft x 7.5 ft. (2006)



The objective for this trial was to validate prior successes for tomato yield enhancement with fertility programs from Agro-Culture Liquid Fertilizer foliar fertilizer treatments.

- Dry fertilizer was broadcast and incorporated prior to planting. Agro-Culture Liquid Fertilizers (ACLF) were placed in a band two inches to the side and two inches below transplant placement. Sidedress applications were applied in a band along the side of the row
- Harvest was completed by hand; tomatoes were sorted by color and weighed to calculate yield and percent damage.
- Ethrel® (Ethephon) was used in 2006 to advance maturity of all green fruit prior to harvest.



Treatment	Rate/ A (gal.)	Method of Application
1 Sure-K + Pro-Germ + Micro 500 Sure-K + High NRG-N High NRG-N Premium Ca + SK + NF	10 + 2.5 + 2 qt 10 + 16 16 (1 qt + 2 + 1) x 2	transplant Sidedress #1 Sidedress #2 foliar x 2
2 Sure-K + Pro-Germ + Micro 500 Sure-K + High NRG-N High NRG-N Premium Ca + SK +Exp #2	10 + 2.5 + 2 qt 10 + 16 16 (1 qt + 2 + 1) x 2	transplant Sidedress #1 Sidedress #2 foliar x 2
4 0-0-60 10-34-0 28% UAN	520# 9 gal 25 & 25	broadcast transplant sidedress 1&2

RESULTS:

- All fertilizer application increased tomato yields and decreased fruit loss over the untreated check.
- Three-year average of the Agro-Culture Liquid Fertilizer program significantly increased tomato yields (11⁺ Ton/Acre average increases) over the conventional fertilizer program.

- The addition of Premium Calcium to the ACLF program was a very dramatic improvement in terms of yield and fruit quality. Fruit loss due to tomato damage such as blossom end rot and over ripening was nearly 1.5% lower with the Agro-Culture Liquid Fertilizers program compared to the conventional fertilizer source. (2004 & 2005 data only)
- In 2006, Experimental Foliar #2 was added to the Agro-Culture Liquid Fertilizer program and yields were increased above all other treatments evaluated. In addition to greater yields, maturity of the fruit was also enhanced compared to all other treatments.

Conclusions:

All Agro-Culture Liquid fertilizer products utilized in these trials promoted yield and the quality of the tomatoes produced. The use of premium calcium and other Agro-Culture Liquid fertilizer foliar products promoted the overall yield and quality of the tomatoes in these trials well above the conventional fertilizer program.

Experiment: Tomatoes - Foliar

Year (Experiment Number): 2007 (07-109)

Date of Planting/Harvest: May 21 – October 15, 2007

Hybrid: Mariana (*Seedway*)

Plot Size (replications): 15' x 5', 3 reps

Tomato research trials at the North Central Research Station have previously demonstrated the yield benefit of foliar calcium fertilizer applications on tomatoes. The objective for this trial was to expand this successful fertility program and evaluate several additional Agro-Culture Liquid Foliar Fertilizers including an experimental foliar product for yield enhancement. Additionally, a comparison with without any foliar fertilizer and with conventional dry fertilizer products was made.



- The entire plot area was planted to soybeans in the season prior to this trial. The stubble was lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 35 tons/acre along with Michigan State University's Vegetable Fertility Guide (E2934) was used as the basis for fertility levels.

Table TF1. Tomato Fertility Programs & Foliar Fertilizers utilized in 2007 research trial.

Treatment	(Yield goal = 35 tons/Acre)	Applications (GPA)	Timing/method
1	Untreated Control	0	na
2	0-0-60+18-46-0+Mn+Zn+10-34-0 28% UAN	450#,50# , 5#, 4# (6) 63	PPI/Transplant Band
3	PG + SK + Micro 500+ Mn HN + SK	3.6, 6, 2.3 qt, 1 pt 40+15.2	Transplant Band
4	PG + SK + Micro 500 + Mn 28% w/ eNhance	3.6, 6, 2.3 qt, 1 pt 54+15.2	Transplant Band
5	PG + SK + Micro 500 + Mn HN + SK Sure K + Nut. Foliar + Prem Ca	3.6, 6, 2.3 qt, 1 pt 40+15.2 2+1+1qt	Transplant Band Weekly
6	PG + SK + Micro 500+ Mn HN + SK Sure K + Nut. Foliar + Prem Ca + PTS	3.6, 6, 2.3 qt, 1 pt 40+15.2 2+1+1qt+2oz	Transplant Band Weekly
7	HN + PG + SK + Micro 500+ Mn HN + SK Sure K + G07	3.6, 6, 2.3 qt, 1 pt 40+15.2 2+1 qt	Transplant Band Weekly
8	HN + PG + SK + Micro 500+ Mn HN + SK Sure K + G07	3.6, 6, 2.3 qt, 1 pt 40+15.2 2+2 qt	Transplant Band Weekly
9	HN + PG + SK + Micro 500+ Mn HN + SK Sure- K + Green & Grow Write Prof.	3.6, 6, 2.3 qt, 1 pt 40+15.2 2+ 2 qt	Transplant Band Weekly
10	HN + PG + SK + Micro 500+ Mn HN + SK Sure-K + Woody Plants & Trees	3.6, 6, 2.3 qt, 1 pt 40+15.2 2 + 2 qt	Transplant Band Weekly

SK = Sure-K, PG=Pro-Germinator, HN = High HRG-N, Nut. Foliar= Nutritional Foliar, PTS= Protristim, G07 = Experimental Foliar

- The dry fertilizers were broadcast then lightly incorporated, liquid fertilizer materials were banded on the soil surface in the center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Forming the bed placed the liquid fertilizers approximately 3"-4" below the top-center of each bed.
- On May 21, 2007, "Mariana" variety tomatoes were transplanted into the plot area. Each plot was 15' long and consisted of ten tomato plants with 18" spacing between plants. A transplant solution of water or water and fertilizer, approximately 400 GPA, was used to aid in the establishment of these plants, exact fertilizer products and rates described previously.
- Admire and Ridomil pesticides were also applied as a soil drench at the recommended rates of application during transplant. Additional fungicides and insecticides were applied as necessary through out the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides.
- Foliar fertilizer applications started at initial fruit set (July 2nd) and continued on a weekly basis until Aug 28th, two weeks prior to the anticipated harvest date. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre.
- As with tomatoes for processing, all mature red tomatoes were harvested on Sept 11th. Rotten tomatoes and green tomatoes smaller than 2" in length were left in the plots and not included in the harvest evaluations. However, these plots were harvested by hand and some decisions to retain or leave tomatoes in the plot were somewhat subjective.



RESULTS:

- Use of Agro-Culture Liquid Fertilizer products (Trt. 3) enhanced the yields of the Roma type tomatoes by 1.2 tons over the conventional fertilizer materials (Trt. 2) as shown in Chart TF1.
- The ACLF fertility programs with nitrogen applied as **eNhanced** 28% UAN (Trt. 4) or **High NRG-N** (Trt. 3) were similar. Both yielded slightly more than a ton per acre over the conventional fertilizer program (Trt. #2).
- All foliar fertility programs began with the base ACLF fertility program (Trt. 3). Yields from five of the six foliar fertilizer treatments were similar or greater than the ACLF base fertility program. Among all the foliar programs, the applications containing “G07” (Trt. 7&8) were the best for enhancing yields. Yield values were 2.3 and 4.4 tons above the basic ACLF program for the 1 qt and 2 qt use rates, respectively. The 2 quart use rate of G07 combined with the other base ACLF products promoted a yield increase of 5.6 tons per acre over the conventional fertility products.
- The best treatment, ACLF fertility program with the G07 foliar @ 2qts/A, resulted in a 21.9% yield increase over the untreated tomato plots (Trt. #1) and a 11.8% increase over the conventional fertility program (Trt. #2).
- While numerical differences existed between the average yields for many treatments, there was noticeable variability between individual plot yields for each treatment and therefore no statistical differences between any of the fertility programs or foliar treatments in this study. This variability was most evident in treatment #6, a foliar program that utilized Sure-K, Nutritional foliar, Premium Calcium, and PTS. While the average yields for this treatment was the lowest among all fertilizer treatments, it was the top treatment option in the 2006 research trials. Fewer treatments and greater replication in the 2008 trials will be utilized to optimize chances for achieving statistical significance between treatments.

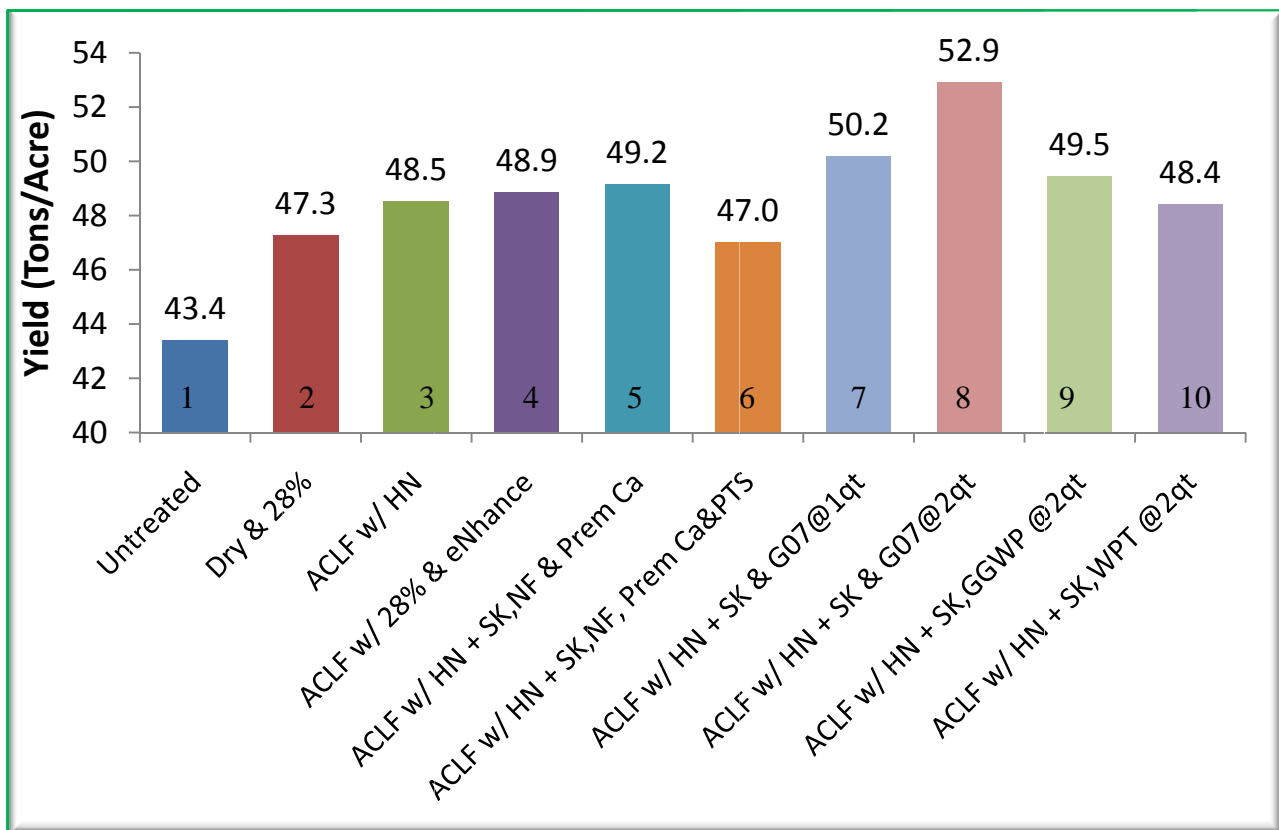


Chart TF1. Effect of various soil and foliar fertility programs on the yield of Roma type tomatoes.

Experiment: Tomatoes – Drip Irrigation Fertilizer Applications

Year (Experiment Number): 2007 (07-107)

Date of Planting/Harvest: May 17th – Sept 15 / October 15th

Hybrid: Mariana / Beefsteak (*Roma & Fresh Market types*)

Plot Size (replications): 30' x 5' (2 @ 15'x5'), 3 reps

cm)
61
7
, K)

Tomato research trials at the North Central Research Station have previously only utilized pre-plant, side dress, and foliar fertilizer applications. The objective for this trial was to expand these successful fertility programs and utilize drip-irrigation applications of Agro-Culture Liquid Fertilizers for tomato production. Additionally, a comparison with conventional fertilizer products was made.

- The entire plot area was planted to soybeans in the season prior to this trial. The stubble was lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 35 tons/acre along with Michigan State University's Vegetable Fertility Guide (E2934) was used as the basis for fertility levels.
- The dry fertilizers were broadcast then lightly incorporated, liquid fertilizer materials were banded on the soil surface in the center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Forming the bed placed the liquid fertilizers approximately 3"-4" below the top-center of each bed.

Table TD1. Tomato Fertility Programs utilized in 2007 Drip Irrigation Research Trial.

Treatment	(Yield goal = 35 tons/Acre)	Rate/A (gal/A)	Method of Application
1	18-46-0+0-0-60+ 46-0-0+ Mn + Zn 28% UAN via water	100#, 460#, 106#, 5#, 4# 3.75	PPI Drip
2	0-0-60+10-34-0+28% UAN,+ Mn + Zn 10-34-0 28% UAN+ Sure-K	170#, 4, 21.6, 5#, 1#, 4# 6 3.75 + 1.9	PPI/band transplant Drip
3	HN PG + Sure-K + Micro 500+ Mn HN + Sure K	13 3.6, 6, 2.3 qt, 1 pt 2.25+1.9	Band transplant Drip
4	28% w/ eNhance PG + Sure-K + Micro 500+ Mn 28% w/ eNhance + Sure K	21.6 (full rate) 3.6, 6, 2.3 qt, 1 pt 3.75+1.9	Band transplant Drip
5	NR PG + Sure-K + Micro 500+ Mn NR + Sure K	16.3 3.6, 6, 2.3 qt, 1 pt 2.8+1.9	Band transplant Drip

PG=Pro-Germinator, HN = High HRG-N, NR= High NRG-NR

- On May 15, 2007, "Mariana" and "Big Beefsteak" variety tomatoes were both transplanted into ½ of each plot. Ten tomato plants of each variety were planted into 15' of the 30' plot area, utilizing 18" between plants and alternating sides of the drip tape and liquid fertilizer placement. A transplant solution and/or water only was applied at approximately 400 GPA to aid in the establishment of these plants, exact products and rates described above.
- Admire and Ridomil pesticides were also applied as a soil drench treatment at the labeled rates of application during transplant. Additional fungicides and insecticides were applied as necessary throughout the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides on a regular basis.



- Fertilizer application with the drip irrigation water started on June 11th (8-10" tall plants) and continued on a regular basis until August 28, two weeks prior to the anticipated harvest date (Mariana variety). The drip lines for each plot were equipped with a valve at the header line. This allowed water/fertilizer to be directed to selected plots during application. The fertilizer treatments were diluted into a total volume of 15 gallons of water. Fifteen additional gallons of additional water was used to flush the header lines and drip lines between treatments. Finally, all plots were irrigated for at least 4 additional hours following any fertilizer application to distribute the fertilizer within each plot.
- Starting on August 15th and weekly thereafter, all mature and marketable quality Beefsteak tomatoes were harvested by hand until the final harvest on October 15. Rotten and deformed tomatoes were removed from the plot area during the regular harvests, but neither were included in any harvest evaluations. The Roma type, "Mariana" tomatoes were harvested once by hand at the conclusion of this trial. All rotten tomatoes and green tomatoes that were less than 2" long were not included as part of the yield evaluations.

Drip irrigation Applications



RESULTS:

- The main treatments / applications in this trial were the form/type of Nitrogen (Table TD1) and tomato variety/type. Because tomatoes require relatively high levels of potassium, the decision was made to include Sure-K with four of the five nitrogen treatments. While the fertility treatments were the same for both tomato varieties, they were harvested differently due to differences in the end use for each type of tomato. Therefore, data are presented separately for each tomato variety.

Beefsteak tomatoes:

- With one exception, the form of nitrogen and/or the addition of Sure-K to the in-season fertility for the **Beefsteak tomatoes** made little or no difference in the marketable yields (Chart TD1). The nitrogen form that was the exception was **High NRG-NR**. Yields for this particular nitrogen product (with **Sure-K**) at an equivalent rate of nitrogen in the Beefsteak tomatoes was at least 10 tons per acre (21.9%) above all other treatments. The average fruit size was statistically similar, but numerically larger for tomatoes from the NR nitrogen program. Therefore, a portion of the yield increase was due to fruit size, but most of the yield increase was a result of greater fruit-set over the season.

Roma type tomatoes:

- The resulting yields for the four treatments that contained Sure-K were statistically similar (Chart TD2). Therefore, with the Roma type tomatoes all forms of nitrogen were statistically similar. However, all treatments with Sure-K significantly out-yielded the 28% UAN only applications where 100% of the potassium requirements had been applied as 0-0-60 prior to planting. For the two fertility programs that used 28% UAN (Trt. #1 & Trt. #2) there was a 10 ton per acre yield increase when liquid 10-34-0 and Sure-K replaced the dry fertilizers.

Conclusions:

- The indeterminate growth pattern of the beefsteak tomatoes and/or the multiple harvest practice utilized with this tomato type revealed a strong yield response to High-NRG-NR Nitrogen. Drip irrigation applications of this material in combination with Sure-K resulted in a significantly greater yield of these fresh market type tomatoes.
- The Roma type tomatoes exhibited no significant difference in yield response to the form of nitrogen utilized for their production. However, the addition of Sure-K to the nitrogen applications was observed to enhance yields for this determinate type tomato in this trial.
- Measured yields for both tomato types was well above projected yield goals for all programs in this trial. Border effects with these small plots and hand harvest would both contribute to overestimation of the actual yields. Still, all fertility programs benefited from these factors and therefore treatment differences should be considered valid.

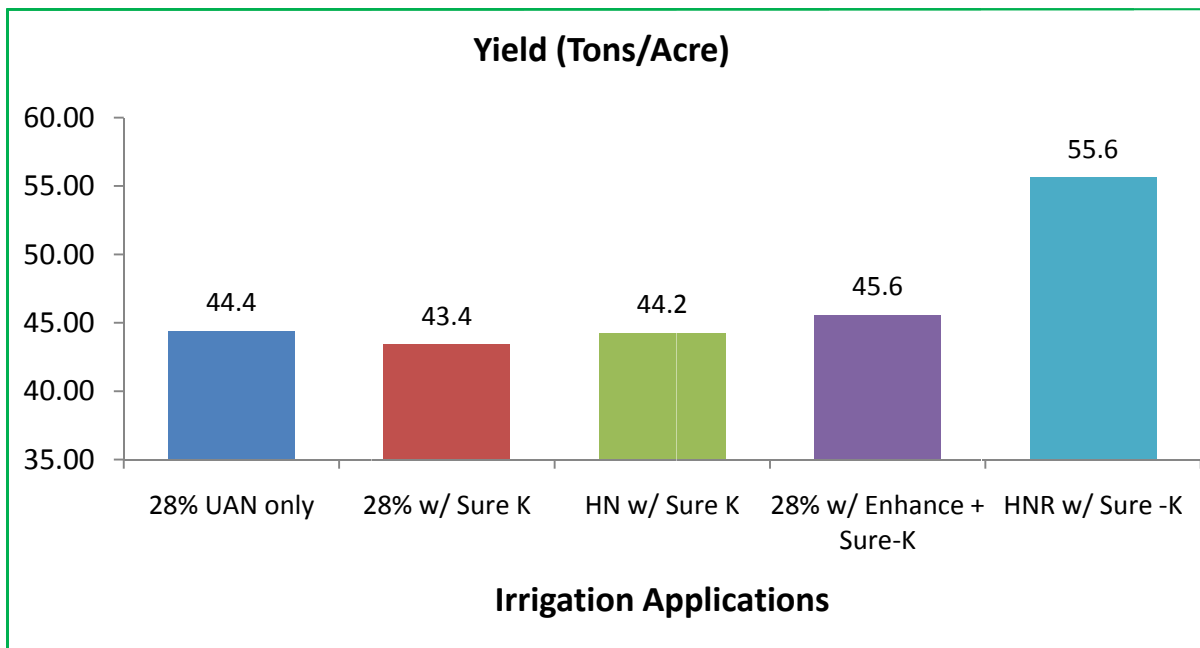


Chart TD1. Yield Response of **Beefsteak** Tomatoes to Various Sources of Nitrogen and/or the use of liquid potassium (Sure-K).

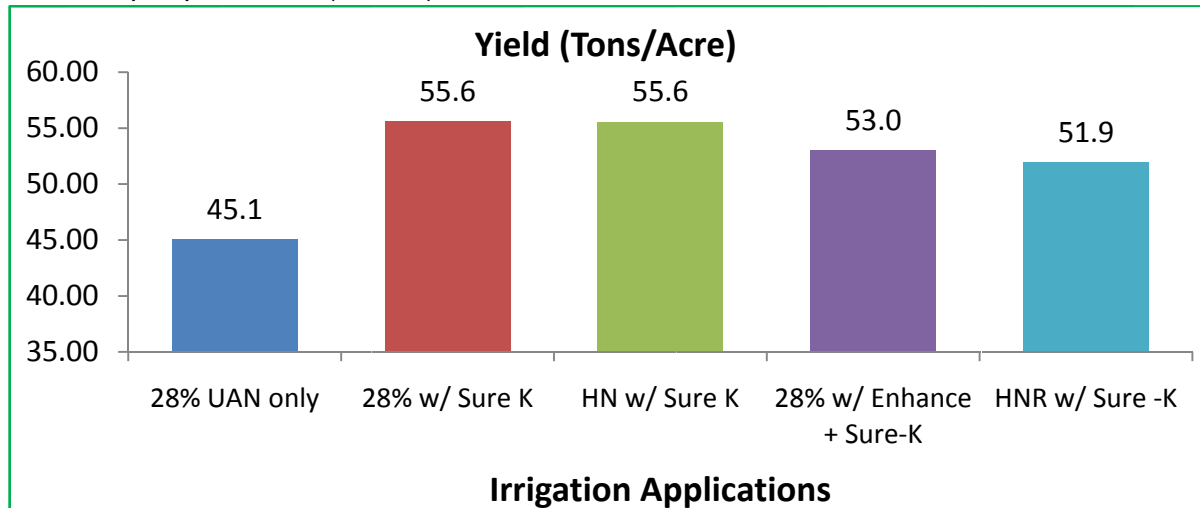


Chart TD2. Yield Response of **Roma Type** Tomatoes to Various Sources of Nitrogen and/or the use of liquid potassium (Sure-K).

Experiment: Tomatoes – Soil, Foliar and Drip Fertility Comparisons**Year** (Experiment Number): 2008 (08-107)**Date of Planting/Harvest:** May 21 – October 15, 2008**Hybrid:** Mariana and Big Beefsteak (*Seedway*)**Plot Size** (replications): 30' x 5', 3 reps**Soil Test Level (ppm)**

pH 7.3 P1 ~ 61

CEC ~ 6.3 K ~ 87

OM ~ 1.8% (3.5% K)

Tomato research trials at the North Central Research Station have previously demonstrated the yield benefit of foliar fertilizer applications on tomatoes. The objective for this trial was to confirm and expand this successful foliar fertility program, evaluating several Agro-Culture Liquid experimental foliar products for yield enhancement. Additionally, comparisons of ACLF products applied with drip irrigation in season were conducted. Will the timing of application for identical nutrient applications impact tomato yields?



- The entire plot area was planted to potatoes in the season prior to this trial. The residue was chisel plowed in the fall and lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 35 tons/acre along with Michigan State University's Vegetable Fertility Guide (E2934) was used as the basis for fertility levels. The base N: P₂O₅: K₂O rates used for all plots were 202, 46 and 276 pounds per acre respectively.

Table T1. Tomato Fertility Programs & Foliar Fertilizers utilized in 2008 research trial.

Treatment		Rate/A (gal/A)	Method of Application
1	Untreated Control	0	na
2	PG + SK + Micro 500+ Mn HN + SK (ACLF Base)	3.6+3+4 qt +1 pt 40+18.2	Transplant Band/PPI
3	PGK + SK + Micro 500+ Mn HN + SK	3.6+3+4 qt, 1 pt 40+18.2	Transplant Band/PPI
4	PG + SK + Micro 500+ Mn HN + SK Sure K + Nut. Foliar + Prem Ca + PTS	3.6+3+4 qt+1 pt 40+18.2 2+1+1qt+2oz	Transplant Band/PPI 2xFoliar
5	PG + SK + Micro 500+ Mn HN + SK F-07	3.6+3+4 qt+1 pt 40+18.2 3	Transplant Band/PPI Foliar
6	PG + SK + Micro 500+ Mn HN + SK Sure K + G-07	3.6+3+4 qt+1 pt 40+18.2 2+2 qt	Transplant Band/PPI Foliar
7	PG + SK + Micro 500+ Mn HN + Sure K	3.6+3+4 qt+1 pt 5 + 2.3	Transplant Drip/Week
8	PG + SK + Micro 500+ Mn NR + Sure-K	3.6+3+4 qt+1 pt 6.3 + 2.3	Transplant Drip/Week
9	PG + SK + Micro 500+ Mn HN + SK+ PG (ACLF Combo)	3.6+3+4 qt+1 pt 5 + 3 + 0.5	Transplant Drip/Week

SK = Sure-K, PG=Pro-Germinator, HN = High NRG-N, Nut. Foliar= Nutritional Foliar, PTS= Protristim, F07 & G07 = Two Different Experimental Foliar Materials, PGK = Experimental variation of Pro-Germinator.

- The liquid fertilizer materials were banded on the soil surface in the center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Forming the bed incorporated these banded liquid fertilizers (Band/PPI) into the soil approximately 3"-4" below the top-center of each bed.
- On May 21, 2008, "Mariana" variety tomatoes were transplanted into the plot area. Each plot was 30' long and consisted of thirty tomato plants with 12" spacing between plants on alternating sides of the bed. A transplant solution of water or water and fertilizer with a total volume of approximately 400 GPA (5.9 oz/plant), was used to aid in the establishment of these plants, exact fertilizer products and rates described previously (Table T1). While all the necessary phosphorus was able to be supplied in the transplant solution with ACLF products, additional phosphorus and potassium was applied in the irrigation water for treatment nine. All other treatments received identical rates of phosphorus, potassium and nitrogen.
- For Treatments 7 to 9 "Mariana" and "Big Beefsteak" variety tomatoes were both transplanted into ½ of each plot. Fifteen tomato plants of each variety were planted into 15' of the 30' plot area, utilizing 12" between plants and alternating sides of the drip tape and banded liquid fertilizer placement. Yield estimates were based on 15 ft instead of 30 feet in these plots.
- Admire® and Ridomil® pesticides were also applied as a soil drench at the recommended rates of application during transplant. Additionally, fungicides (14 day interval) and insecticides (as necessary) were applied throughout the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides for healthy growth of the plants.
- Fertilizer application with the drip irrigation water started on June 11th (8-10" tall plants) and continued on a regular basis until August 28. The drip lines for each plot were equipped with a valve at the header line. This allowed water/fertilizer to be directed to selected plots during application. The fertilizer treatments were diluted into a total volume of 15 gallons of water. Fifteen additional gallons of additional water was used to flush the header lines and drip lines between treatments. Finally, all plots were irrigated for at least 4 additional hours following any fertilizer application to distribute the fertilizer within each plot. A total of 8 fertilizer applications were made during the 2008 season.
- Foliar fertilizer applications started at initial fruit set (July 2nd) and continued on a bi-weekly basis until Aug 14th for a total of four applications. These foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. The fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. While these applications could have been combined with pesticide applications, they were sprayed separately and never on the same day as pesticide applications to prevent off-target application with the mist-blower.
- Starting on August 15th and weekly thereafter, all mature and marketable quality Beefsteak tomatoes (Trt # 7-9) were harvested by hand until the final harvest on October 4. Rotten and

Drip irrigation Applications



deformed tomatoes were removed from the plot area during the regular harvests, but neither was included in any harvest evaluations. A total of five harvests were completed this year. The sixth and final harvest was lost due to excessive rains in the days preceding this harvest.

- On August 26th, 13 days prior beginning Roma tomato harvest and the last Beefsteak harvests, all tomato plants were treated with Ethephon™ 2L at 4 pt/Acre to enhance the maturity of most un-ripened fruit.
- Roma Tomatoes were harvested on Sept 8th & 9th. Overly rotten tomatoes and smaller green tomatoes (under 1.5" in length) were left in the plots and not included in the harvest evaluations. Because these plots were harvested by hand, the decisions to retain or leave some tomatoes in the plot were subjective, but the harvest efficiency was nearly 100%.

RESULTS: Roma Tomatoes

- ACLF based soil and foliar fertility programs (Trt 2-6) were statistically similar to each other for total yield and marketable yield (reds + breaks) (Figure T1). The observed yields for all fertility treatments were well above their yield goal of 35 tons /Acre.
- The experimental formulation of Pro-Germinator named PGK didn't improve on the Pro-Germinator results. Total season yields were similar, but didn't surpass the level of Pro-Germinator. Experimental materials have a high standard to exceed when compared with Pro-Germinator.
- The three ACLF foliar fertility programs (Trt. 4-6) exhibited little or no difference in their marketable yields from the ACLF Base treatment over which they were applied. In prior years these foliar fertility programs have exhibited enhanced yields. While all treatments exceeded their yield goal, enhancement above the base program was anticipated for each of these foliar. Prior trial utilized a spray interval of seven days, this season the interval was changed to fourteen days. It is uncertain if this change in the interval was related to the reduced foliar response observed this season.
- The three ACLF drip irrigation based fertility programs (Trt. 7-9) had slightly lower Roma Tomato yields than the ACLF Base program. Based on the yields and the overall appearance for the tomatoes in these plots at the conclusion of this trial, it was determined that the drip nitrogen applications were initiated too late for the Roma tomato variety. While the same rate of nitrogen was applied via drip irrigation, it was applied too late for optimal vegetative growth of these tomatoes in the early season and yields were consequently reduced.

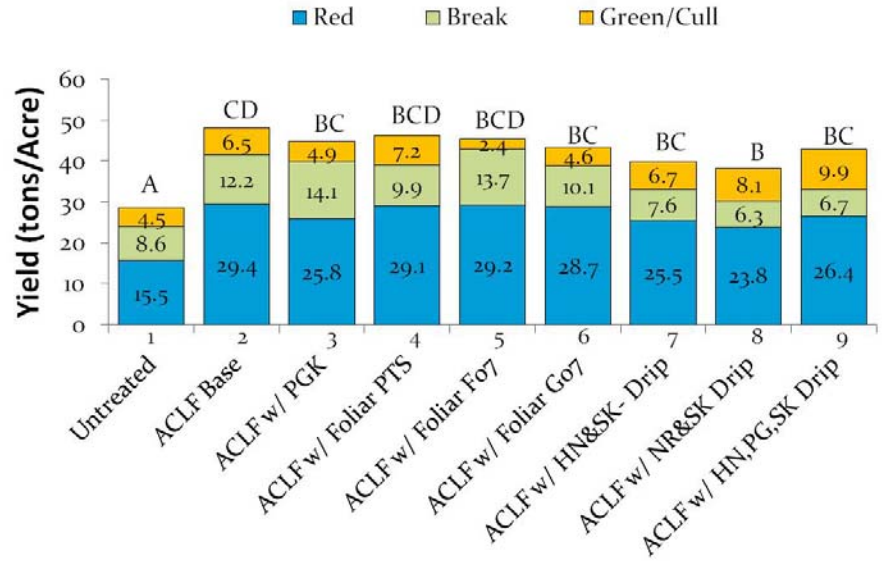
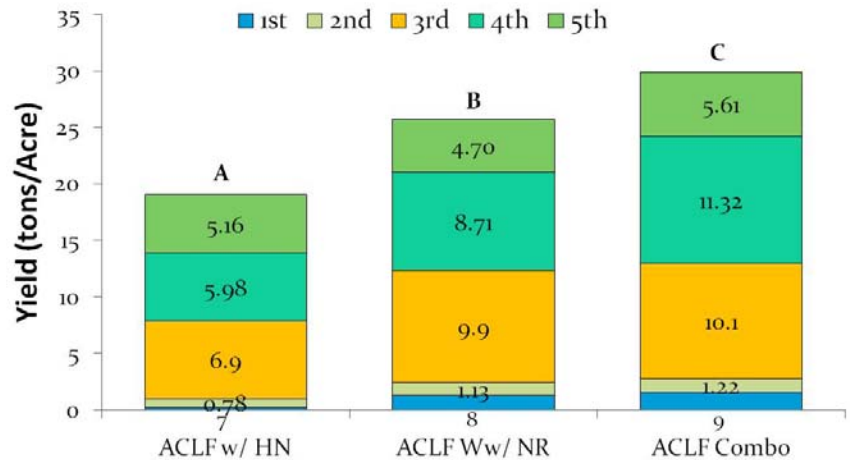


Figure T1 Roma Tomato Yields from Various Fertility Programs in 2008

Beefsteak Tomatoes:

- Total Beefsteak tomato yields for all fertility programs were below the anticipated yield goal of 35 tons per acre. However, excessive rain at the conclusion of this trial prevented an anticipated 6th harvest. (Figure T2)
- All ACLF fertility based drip programs were statistically different for beefsteak tomato yields. The use of High NRG-N as the nitrogen source was less than High NRG-NR (Trt #8) and/or when a portion of the phosphorus (Pro-Germinator) and potassium (Sure-K) was applied during the growing season with High NRG-N (Trt#9) in the irrigation water. For treatment #9, the N-P-K were all combined and applied simultaneously via the drip irrigation (Table T1). This total season rates for phosphorous and potassium in this treatment were above all other drip irrigation treatments. This fact and the in-season application are believed to be responsible for the enhanced yields.



2X = High NRG-N @ 40 GPA, Sure-K @ 18.2 GPA, Potash @ 460 lb, DAP @ 50 lb, 28% UAN Drip @ 7.9 GPA/wk
 Columns with different letters are significantly different for total yield – Duncan's MRT $P \leq 0.10$

Figure T2. Effect of Various Fertility Programs on the Yield of Beefsteak Type Tomatoes

CONCLUSIONS:

During the 2008 growing season, all ACLF fertilizer treatments produced Roma tomato yields well above the anticipated yield goal from the fertilizer application rates used in this trial. Even the unfertilized plots yielded nearly 30 tons per acre. Consequently, when all treatments yielded very well, little or no statistical differences were observed between the various soil/foliar applied fertility programs (Trt 2-6).

Application intervals for this year foliar fertility programs were extended from seven days used in 2007 to fourteen days this season. It is unknown if this change resulted in the general lack of foliar yield response previously observed or if other factors were involved. A timing trial may be required to clarify this question.

The timing for Nitrogen use and the demand curve was different for the two varieties of tomatoes used in this trial. Timing of in-season nitrogen application was critical to early season Roma tomato growth and ultimately tomato yields. Applying all or a portion of the nitrogen prior to planting would minimize this issue. However, this may lead to nitrogen loss in some soils and/or environments.

The Beefsteak variety tomato yields were significantly impacted by nitrogen type and/or applying additional phosphorus and potassium in the irrigation water during the plant growth. These factors promoted tomato yields without utilizing any additional nitrogen fertilizer per acre for the season. A combination of soil applied High NRG-N and the drip irrigation applied High NRG-NR fertilizer may optimize early growth and also yields for this type of tomato. Additionally, both varieties responded positively to additional phosphorus and potassium in the irrigation water during the growing season.

TOMATOES – POTASSIUM FERTILITY COMPARISONS

MATERIALS & METHODS:

Variety = Big Beefsteak

Trans-Planted on May 15th, 2008

Single row, 20 ft in length with 10 Beefsteak plants

Trans-Plant Fertilizer = 3.6 gal. Pro-Germinator + 4 qt. Micro 500 + 1 pt Mn / Acre

Two applications of High NRG-N were made during the growing season, both at 20 GPA. The initial application was made just prior bloom and a second of the same rate was applied three weeks later.

Trans-plants were treated with Admire® and Ridomil® at labeled rates during planting.

Plants were all irrigated and treated with pesticides as necessary during the growing season for optimal growth.

Stakes were placed between plants down the center of the row and new branches were tied up to a string between the stakes each week as they grew.

The mature fruit in each plot were collected and weighted weekly for five weeks starting on August 19th.

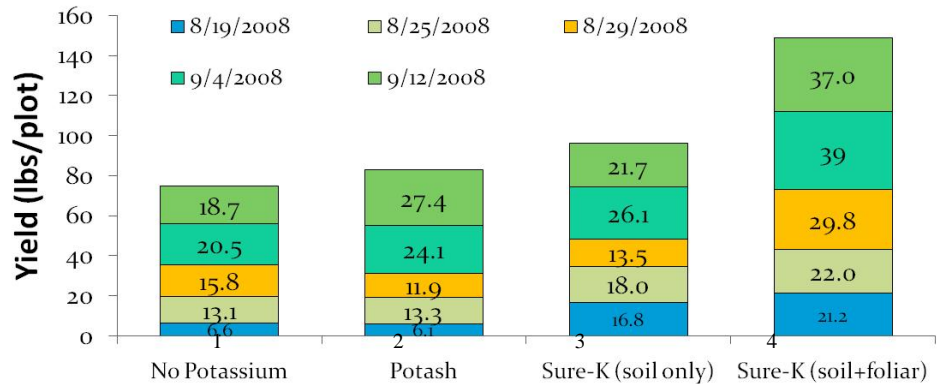
TREATMENTS:

1. Trans-plant fertilizer & Nitrogen (see rates listed above) – NO POTASSIUM
2. Trans-plant fertilizer, nitrogen, & 250 lbs. K₂O (460 lbs 0-0-60)
3. Trans-plant fertilizer with 3 Gal Sure-K, nitrogen with 18 Gal. Sure-K during 1st side dress
4. Same as Trt. #3 with four additional 2 gal/Acre foliar applications of Sure-K starting at full bloom and repeated every 14 days.

CONCLUSIONS:

The use of Sure-K as compared to potash (Trt. #2 vs. #3) as the main source of potassium resulted in a higher yield of tomatoes, especially with the initial harvests (Figure DT1). Regularly applying Sure-K as a foliar potassium to the beefsteak tomatoes resulted in a dramatic yield increase for all harvests compared to all other treatments.

Combining soil and foliar applications of Sure-K on the tomatoes in this trial dramatically increased the yields for every harvest when compared to all other potassium fertility programs in this demonstration trial.



Potassium levels were equivalent for the first three treatments, the foliar Sure-K applications provided additional potassium to these plants. In the last treatment, a total of four foliar treatments were made starting at full bloom and reapplied every two weeks. The last application occurred on August 26th.

Figure DT1. Impact of the Potassium Source on the Yield of Beefsteak Tomatoes over Five Weeks.



Experiment 09-107: Affect of conventional and ACLF fertility products on the yield of fresh market Beefsteak tomatoes. Tomato yield response to ferti-Rain applications as well as specialty fertilizer use.

Planted: May 21 st	Variety: Big Beefsteak	Population: 8700
Plot Size: 5' x 15'	Replications: Three	Harvested: Multiple
Side dress: None	Foliar: 7-Day interval	

Soil Test Values (ppm):													
pH	CEC	% OM	P1	K	S	% K	% Mg	% Ca	% H	% Na	Zn	Mn	B
6.9	4.5	0.7	59	57	9	3.2	23.5	72.0	-	1.3	1.0	5	0.4

Objectives: Determine the potential for ACLF fertilizers to enhance the yield and/or maturity of Fresh Market Beefsteak type tomatoes. Evaluate the effectiveness of foliar ferti-Rain for tomato yield enhancement.

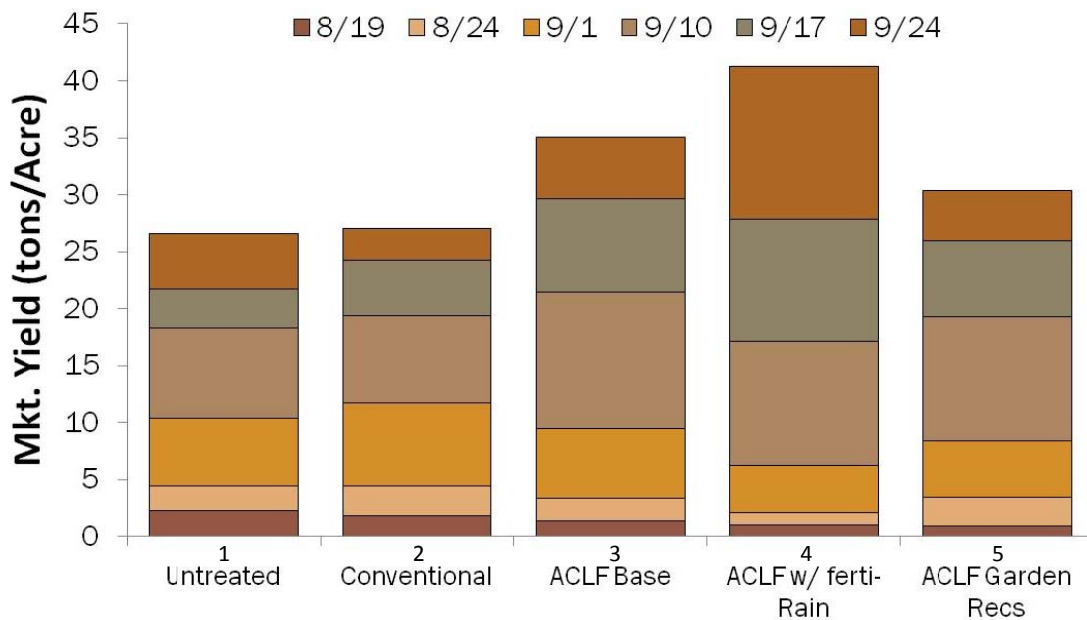


Figure BT1. Cumulative yields from six weekly harvests of fresh market Beefsteak tomatoes

Conclusions:

- The entire season was very cool and all plants struggled initially to get established. Therefore, development was delayed and initial harvests were unusually low this year. A significant portion of the yield for all treatments occurred in the later part of the season.
- Without any fertilizer applications in 2009, the untreated tomatoes yielded very well and the Conventional fertility program production was nearly identical. The mid-season yields were higher for the conventional fertility program, but the final harvest value was lower.
- The ACLF Base treatment (Trt. 3) initial yields were lower than the conventional fertility program (Trt 2), but the high yield from the later season harvest resulted in major increase in total yield per acre.
- Weekly use of ferti-Rain dramatically reduced first three harvests, but maximized later season harvests in this trial and ultimately creating the highest yielding treatment in this trial.
- ACLF Garden recommendations program yields were good, but not as high as the ACLF Base program. Still, it exceeded the conventional fertility program for total yields and should therefore allow a relatively high level of production for garden sized producers. (see next page)

*See Product Descriptions in the introduction for more information on ACLF products used.

- Nutrient use efficiency for the total fertility programs was dramatically greater for all ACLF based programs. Higher yields and lower rates of actual nutrient application are responsible nutrient management.

Table BT1. Fertility programs for Fresh Market Beefsteak tomato production, 2009

	Treatment	Rate/A (gal/A)	Method of Application
1	Untreated Control	0	na
2	0-0-60+Mn+B+Zn	423#, 5#, 1#, 4#	PPI
	10-34-0	6	Transplant
	28% UAN+10-34-0	63.4+5.9	band
3	PG + SK + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + SK	40+18.5	PPI/band
4	PG + SK + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + SK	40+18.5	PPI/band
	ferti-Rain (F-07)	1.5	weekly 6
5	Garden Recommendations		Total
	Green Grow Wright Professional Green Lawn	12 (Transplant) + 13 (drench) 10 x 2 apps	Trans/Soil soil drench

The plots were established on May 14 by banding the liquid fertilizers down the center of the plots and/or broadcasting the appropriate dry fertilizers into the plot areas. The center 2 ft of each 5 ft wide plot was then covered with plastic mulch. The following day Tomato transplants were then placed every 12" down the center of the plastic, 15 per plot. The soil around each transplant was doused with 4.2 oz of a transplant solution (~300 GPA) containing the fertilizers described in the above table or only water. However, the transplant volume was essentially doubled for each plant in the "Garden Recommendations" treatment. Every plant also received an application of Ridomil and Admire just after planting for early season disease and insect management. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. The foliar applications were started at early bloom and repeated every week up until mid- September. This resulted in approximately 10 foliar applications for the season. As the tomatoes began to mature, the plots were harvested once per week. The ripe fruit were removed from each plot, counted and weighted to determine yields. The initial harvest occurred on Aug. 19 and the last on September 24th, so six harvests were completed for the season.

#See Appendix "V" for additional information on equipment used, application methods, irrigation description and general plot maintenance.

Responsible Nutrient Management

Trt.	Yield (tons)	Nutr./A	NUE [#]
2	27.0	503.3	107.3
3	35.1	146.9	477.7
4	41.2	173.6	474.9
5	30.4	95.6	636.1

[#]Nutrient Use Efficiency
(Lb. Yield/ Total Lb Nutrients applied)



*See *Product Descriptions* in the introduction for more information on ACLF products used.

BCL 015210 NRG



Experiment 09-108: Affect of conventional and ACLF fertility products on the yield of Roma tomatoes. Tomato yield response to ferti-Rain applications as well as specialty fertilizer use.

Planted: May 21 st	Variety: Mariana	Population: 8700
Plot Size: 5' x 15'	Replications: Three	Harvested: Sept 30
Side dress: None	Foliar: 7-Day interval	

Soil Test Values (ppm):													
pH	CEC	% OM	P1	K	S	% K	% Mg	% Ca	% H	% Na	Zn	Mn	B
6.9	4.5	0.7	59	57	9	3.2	23.5	72.0	-	1.3	1.0	5	0.4

Objectives: Demonstrate the ability of ACLF fertilizers to enhance the yield an/or maturity of processing type tomatoes compared to conventional materials. Evaluate the effectiveness of foliar ferti-Rain applications for tomato yield enhancement.

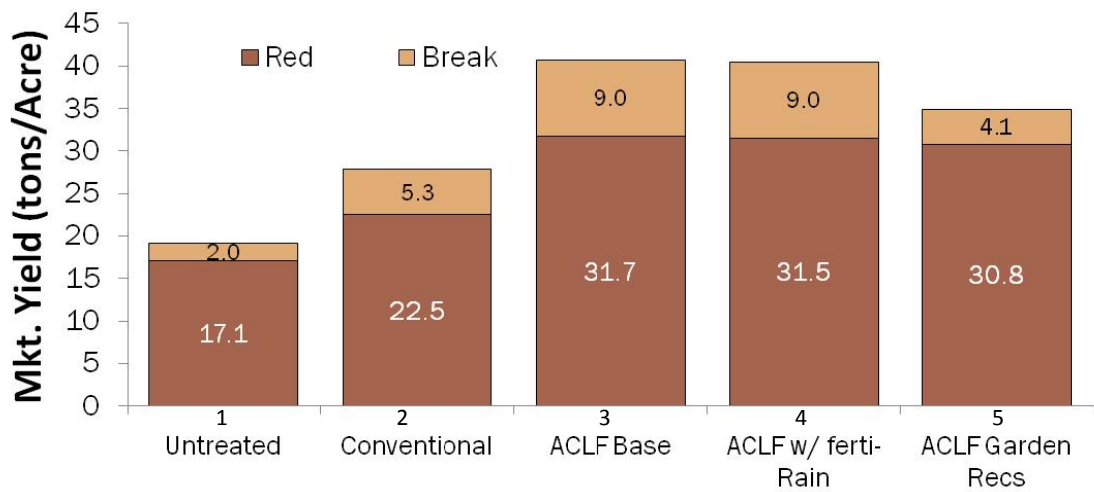


Figure RT1. End of the season Yields by color grade for Roma tomatoes from multiple fertility programs, 2009 harvest.

Conclusions:

- The season was very cool and all plants struggled initially to get established.
- Without any fertilizer applications in 2009, the untreated tomatoes yielded very well. Residual fertility in the plot areas from the prior crop was likely higher than anticipated.
- The Conventional fertility program production was higher than the untreated, but well below the ACLF Base fertility program for yields in both grade designations of the data in this trial.
- The ACLF Base treatment yields were just over 9 tons/Acre greater than the conventional fertility program for red tomatoes, but nearly 13 tons/A greater when the break colored tomatoes are included for total marketable yield per acre.
- Weekly use of ferti-Rain didn't enhance the Roma tomato yield above those observed for the ACLF Base treatment in this trial. The cooler growing conditions this season may have limited the potential for yield enhancement, even with the extra fertility from these applications.
- ACLF Garden recommendations were not as high as the ACLF Base program, but they exceeded the conventional fertility program for total yields. A home owner who followed these recommendations should achieve very good tomato yields.

*See Product Descriptions in the introduction for more information on ACLF products used.

Table RT1. Fertility programs for Roma, processing type, tomato production, 2009

Treatment		Rate/A (gal/A)	Method of Application
1	Untreated Control	0	na
2	0-0-60+Mn+B+Zn 10-34-0	423#, 5#, 1#, 4# 6	PPI Transplant band
	28% UAN+10-34-0	63.4+5.9	
3	PG + SK + Micro 500+ Mn HN + SK	3.6+1.5+4 qt, 1 pt 40+18.5	Transplant PPI/band
	PG + SK + Micro 500+ Mn HN + SK ferti-Rain (F-07)	3.6+1.5+4 qt, 1 pt 40+18.5 1.5	Transplant PPI/band weekly
5	Garden Recommendations Green Grow Wright Professional Green Lawn	12 (Transplant) + 13 (drench) 10 x 2 apps	Total Trans/Soil soil drench

The plots were established on May 14 by banding the liquid fertilizers down the center of the plots and/or broadcasting the appropriate dry fertilizers into the plot areas. The center 2 ft of each 5 ft wide plot was then covered with plastic mulch. The following day Tomato transplants were then placed every 12" down the center of the plastic, 15 per plot. The soil around each transplant was doused with 4.2 oz of a transplant solution (~300 GPA) containing the fertilizers described in the above table or only water. However, the transplant volume was essentially doubled for each plant in the "Garden Recommendations" treatment. Every plant also received an application of Ridomil and Admire just after planting for early season disease and insect management. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. The foliar applications were started at early bloom and repeated every week up until mid- September. This resulted in approximately 10 foliar applications for the season. At the end of September, most tomatoes were fully red and mature. Still, some were only beginning to show color while a small percentage was still full green. On Sept 30th, all fruit were removed from each plot, sorted according to color (Reds, breaks, Green & rots) and weighted to determine yields. The green and rotten fruit represented a relatively low percentage of the yield in all plots, so data were not presented.

#See Appendix "V" for additional information on equipment used, application methods, irrigation description and general plot maintenance.



Responsible Nutrient Management

Trt.	Yield	Nutr. /A	NUE [#]
2	32.7	503.3	129.8
3	45.5	146.9	619.8
4	44.9	173.6	517.1
5	41.5	95.6	867.6

[#]Nutrient Use Efficiency
(Lb. Yield/ Total Lb Nutrients applied)

*See *Product Descriptions* in the introduction for more information on ACLF products used.