

Corn: Methods of Application and Placement

- Planter Fertilizer Placement in Corn (2000)
- “Combined” Fertilizer Applications in Corn (2002)
- Corn Fertilizer applications: All at once or split applied? (2002)
- Planter Fertilizer Rate and Placement Comparison for Corn (2007)
- Fertilizer Application Comparison Corn (2009)

Experiment: Planter Fertilizer Placement Comparison in Corn
Year: 2000 (00-07)
Date of Planting/Harvest: May 5 / October 19
Plot Size: 4 row x 75 ft.

Soil Test Levels
 pH: 7.7 CEC:11.6
 OM: 3.4% P1:32
 K: 66 (1.5% base sat.)

Best placement of Liquid planter fertilizer is an ongoing concern for growers. This experiment was designed to evaluate three different liquid fertilizer placement methods.

Fertilizer application equipment. In-furrow applications were made using Flo-Rite tubes attached to Keeton Seed Firmers. The Flo-Rite tubes are made of stainless steel and attach to the top of the seed firmers. The split-stream device is called a "Sideshooter", which has a crimp at the end of the stainless steel tube, which causes the fertilizer to come out in a "V" pattern, such that the majority of the fertilizer hits the furrow walls, rather than directly on the seed. The Flo-Rite tubes and Sideshooter are manufactured by Farmer Fabrications of Hicksville, Ohio. The inch to the side of the seed application was through a tube behind a coulter, which placed the fertilizer an inch to the side of the seed furrow. Soil moisture was good at time of planting. Following are pictures of the application equipment .



"In Furrow" with Flo Rite tube on Keeton Seed Firmer.

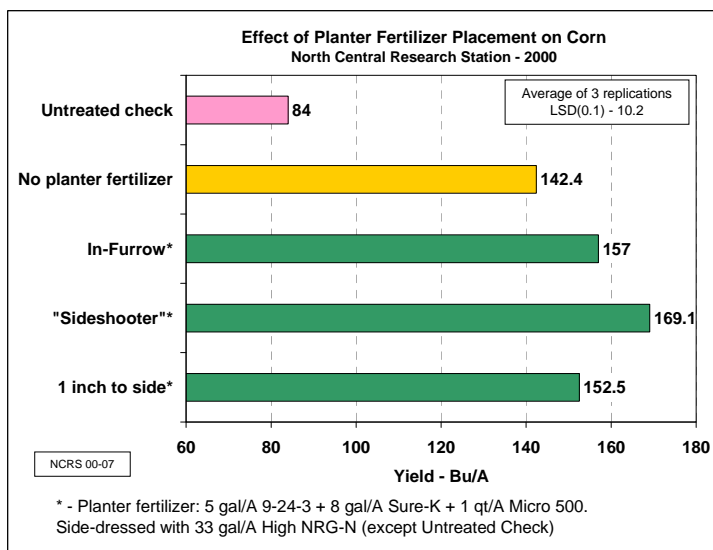


"Sideshooter" tube on Keeton Seed Firmer.



Placement 1 inch to the side of the seed furrow with fertilizer disk.

Fertilizer placement comparison. For this comparison, a fertilizer rate of **5 gal/A 9-24-3 + 8 gal/A Sure-K + 1 qt/A Micro 500** was used. Treated plots were sidedressed with 35 gal/A of High NRG-N. Yield results appear in the following chart.



- The Sideshooter application method produced the highest yield, likely due to better distribution of nutrients around the seed.
- The 13.25 gal/A is somewhat higher than the average in-furrow rate of application. However, stand counts were not affected by any application method. In-Furrow: 23,007 plants per acre; Sideshooter: 23,676; 1 inch to the side: 23,010; check: 23,542.

Experiment: “Combined” Fertilizer Applications in Corn
Year: 2002 (02-04)
Date of Planting/Harvest: April 26 / October 23
Plot Size: 4 row x 130 ft.

Soil Test Levels
 pH: 7.0 CEC: 8.7 OM: 2%
 P1: 61 ppm
 K: 72 ppm (2.1% base sat.)

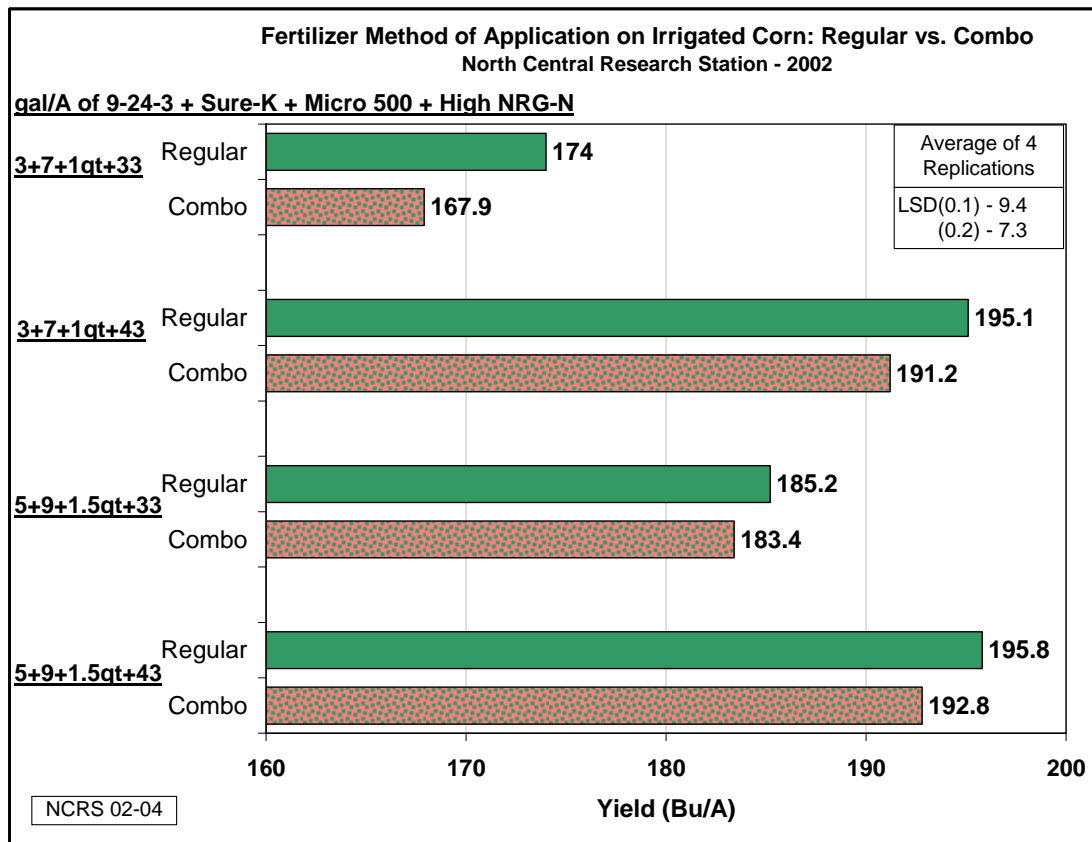
Objective: Determine if “combo” fertilizer application is as effective as the “regular” fertilizer application in producing high corn yields.

Combined or “combo” fertilizer application is where the Liquid nutrient inputs are all combined into a single fertilizer product. Thus, rather than application of 9-24-3 and Sure-K and Micro 500 at planting and then separate application of High NRG-N, these are combined and part (i.e. 10 gal/A) is applied at planting and the rest at side-dress. Since High NRG-N makes up the largest volume input into corn, the “combo” fertilizer would contain relatively high percentage of High NRG-N relative to the other fertilizers.

As with the previous experiment, the same two rate structures were used, and applied either as “regular” or “combo”. Planter fertilizer placement was 1 inch to the side of the seed.

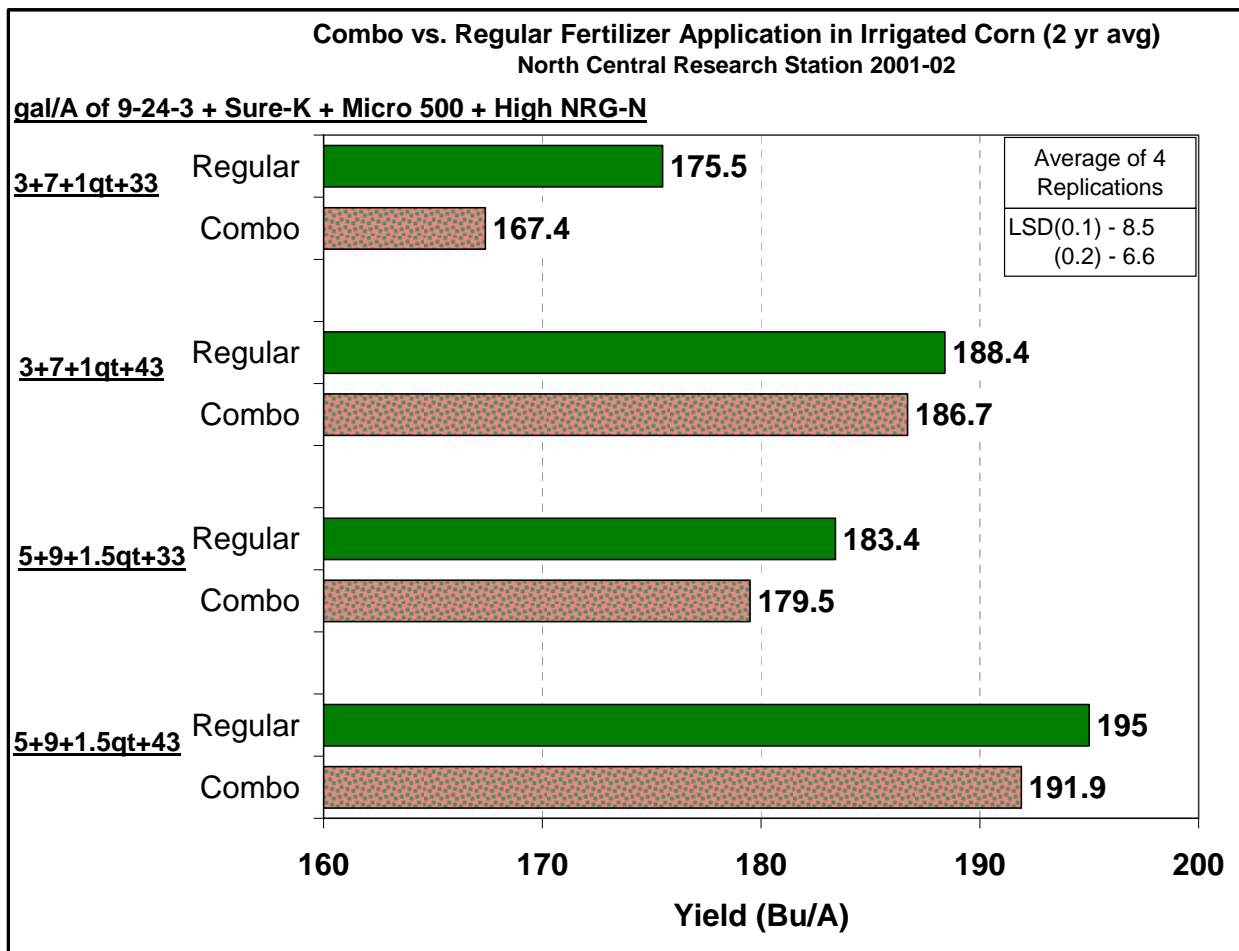
“Regular”: 9-24-3 + Sure-K + Micro 500 applied with planter; High NRG-N side-dressed with cultivation.

“Combo”: 9-24-3 + Sure-K + Micro 500 + High NRG-N combined into one product and 10 gal/A applied with planter and the rest side-dressed with cultivation.



- The “Combo” applications were very close in yield to the “Regular” applications, except for the lowest rates where the Combo was significantly lower than the Regular application. However, this rate structure was not effective in either case.
- It was interesting to see that yields from both the Combo and Regular applications very closely followed the same yield trends.
- The Combo treatment appears to be an effective alternative to corn fertilization. However, one concern may be where soil P or K is very low. With the Combo, since not all of the P and K fertilizer is planter-applied, there may not be enough of these nutrients to prevent crop deficiency.

This is the second year of this experiment, and the two-year averages are in the following chart. Similar to 2002, the averages of the Combo are very close to, but slightly less, in yield than the Regular applications. Also, the advantage of the increased nitrogen rate for top yield is apparent.



Experiment: Corn Fertilizer Application: All at once, or split applied?

Year: 2002 (02-04)

Date of Planting/Harvest: April 26 / October 23

Plot Size: 4 row x 130 ft.

Soil Test Levels

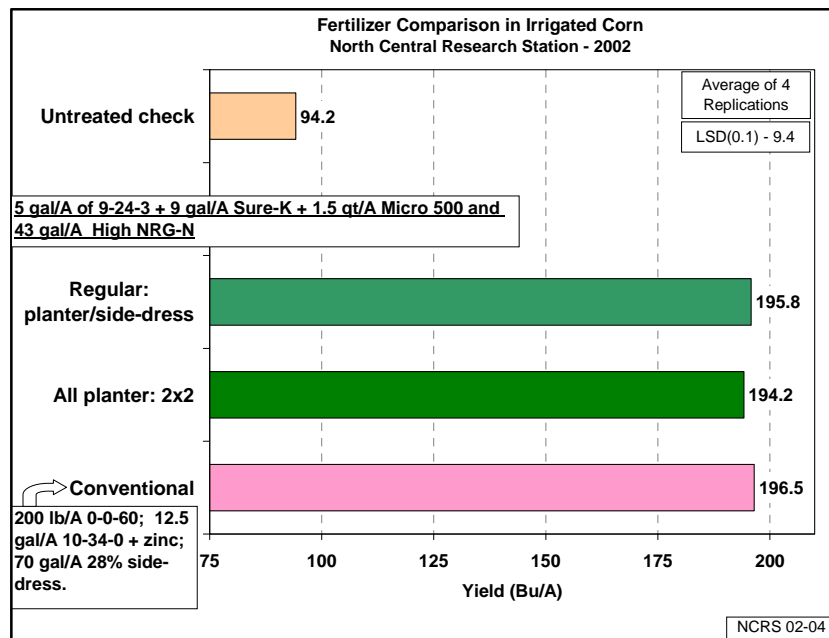
pH: 7.0 CEC: 8.7 OM: 2%

P1: 61 ppm

K: 72 ppm (2.1% base sat.)

Traditional liquid fertilizer application to corn involves P and K fertilizer (Pro-Germinator 9-24-3, Sure-K plus Micro 500) applied with the planter, and the nitrogen (High NRG-N) applied at sidedress. However, there are some growers who prefer to apply all of the crop's fertilizer at planting. This has the advantage of not having to return for any subsequent application, although the gallons applied with the planter can be high.

In this experiment with irrigated corn, the fertilizer rate is 5 gal/A 9-24-3 + 9 gal/A Sure-K + 1.5 qt/A Micro 500 and 43 gal/A High NRG-N, for a total of 57.375 gal/A. This treatment was applied either all at once in 2x2 placement with the planter; or in a split application with the Pro-Germinator 9-24-3, Sure-K and Micro 500 applied with the planter (1 inch to the side of the seed) and the High NRG-N applied at sidedress. A comparison treatment of 0-0-60, 10-34-0 and 28% UAN was included. Yield results appear in the following graph.



- There was no significant differences between these treatments. Thus, the fertilizers can be all applied 2x2 with no expected reduction in yield compared to split applications.
- The conventional treatment could not take advantage of the convenience of liquid potassium like Sure-K, which necessitated an extra trip through the field to apply dry potash.
- There were big differences in amounts of nitrogen – phosphate – soluble potash applied per acre for the same yields:
Conventional: 395 lb/A (0.5 Bu per lb of plant food applied)
Agro-Culture Liquid Fertilizers: 155 lb/A (1.25 Bu per lb of plant food applied)

Experiment: Planter Fertilizer Rate and Placement Comparison for Corn

Year (Experiment Number): 2007 (07-516)

Date of Planting/Harvest: May 8 /

Hybrid: Dekalb DK4626

Plot Size (replications): 6 row x 130 ft (4 reps)

Soil Test Levels (ppm)

pH: 7.4 C.E.C.: 8.1
OM: 2% Bicarb P: 16 H
K: 85 L (2.7% base sat.)

Objective: Evaluate two different planter-applied rates of Liquid fertilizer and three different planter fertilizer placements on corn stand and yield.

Fertilizer rate and placement are continuing areas of question. We have conducted placement studies in the past at the North Central Research Station where in-furrow applications were shown to be better than placement away from the seed. But there is the danger of seedling injury should the rate be too high or if conditions are dry. In this experiment, two different rates of fertilizer were used and each in three different placements by the planter.

Fertilizer rates:

1. Low rate: 2 gal/A Pro-Germinator + 4.5 gal/A Sure-K + 1 pt/A Micro 500 + 8 oz/A Boron (6.6875 gal/A).
2. High Rate (2x low rate): 4 gal/A Pro-Germinator + 9 gal/A Sure-K + 1 qt/A Micro 500 + 1 pt/A Boron (13.375 gal/A)

Fertilizer placement:

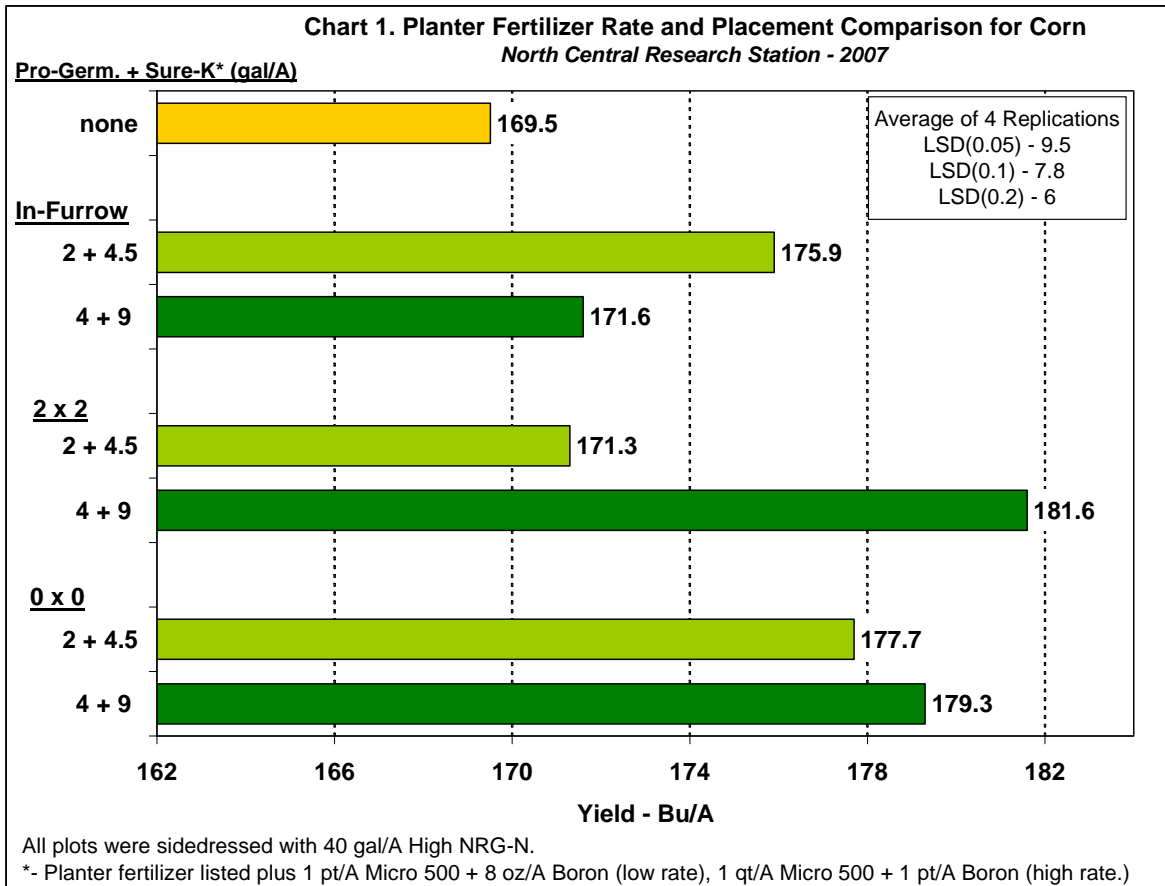
1. In-Furrow with Keeton seed firmers
2. 2x2 placement, which is 2 inches over and 2 inches down from the seed.
3. 0x0 placement, which directly over the seed row through tubes behind the press wheels. This offers an advantage in simplicity and economy, if effective. The pictures below show fertilizer application through the tubes over the row. (Note: the raised boxes are for 15 inch rows used for soybeans.) The first picture on the shows fertilizer placement with these tubes behind the planter. However, one note for the future, is to run the plastic tubes through rigid metal tubes attached to the planter itself to reduce bouncing of the tube tips.



The next picture below shows the Liquid placement, as the darkened soil from fertilizer contact, over the closed seed row.



Yield results appear in the following chart.



Placement and rate had an effect on yield. In data not shown, there was no difference in stand counts between treatments.

- With the in-furrow placement, yield was numerically higher with the low rate compared to the high rate. The low rate did yield significantly higher than the no fertilizer. But with the 2x2 placement, the high rate yielded significantly higher than the low rate. It's possible that the high rate of 13+ gal/A did cause some crop injury when placed in contact with the seed, although it did not affect stand. But when placed away from the seed there was no injury and it resulted in the highest yielding treatment.
- The low rate yielded numerically higher when placed in-furrow compared to 2x2. With low rates, it may be better to place in contact with the seed.
- The yield with the 0 x 0 was consistently good with both rates applied. There is probably some downward movement with water, but also likely is nutrient uptake from the shallow roots and brace roots.
- The 0 x 0 offers the opportunity for application of nitrogen, as does the 2 x 2 placement. But the economy of the 0 x 0 equipment gives it an advantage worth further investigation.



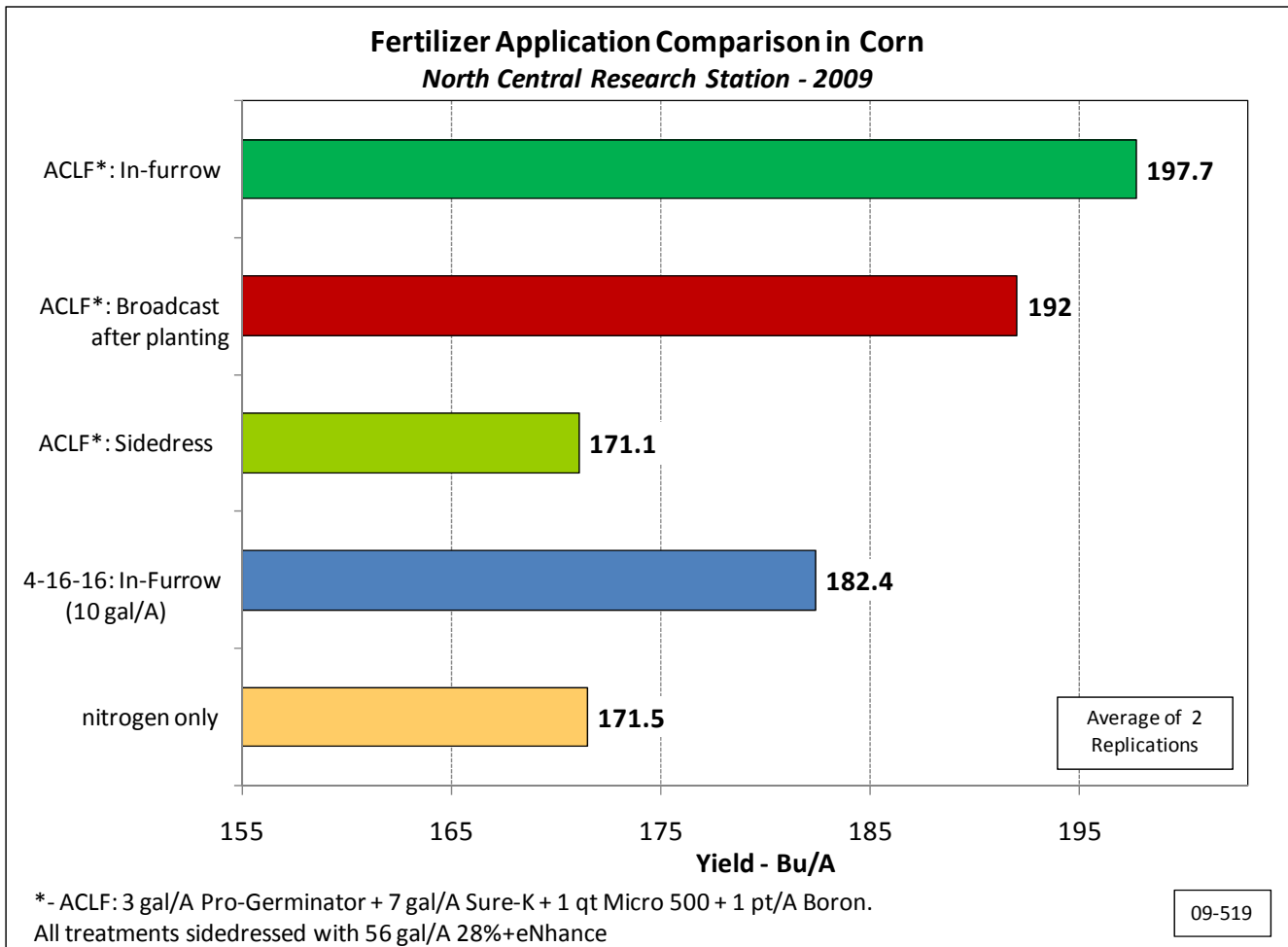
Experiment: Fertilizer Application Comparisons for Corn (09-519)

Planted: 5/6/09	Hybrid: DKC46-60	Population: 36,000
Plot Size: 15' x 130'	Replications: 2	Harvested: 11/4/09
Broadcast: 5/6/09	Sidedress: 6/3/09	

Soil Test Values (ppm):													
pH	CEC	% OM	Bicarb	K	S	% K	% Mg	% Ca	% H	% Na	Zn	Mn	B
7.5	9.2	2.3	18	88	10	2.5	30.9	65.1	0		1.3	12	0.8

Objectives: Compare different application methods of Pro-Germinator + Sure-K + micronutrients: 1. In-furrow at planting, 2. Surface Broadcast after planting, and 3. Sidedressed with the nitrogen. The ACLF fertilizer treatment was 3 gal/A Pro-Germinator + 7 gal/A Sure-K + 1 qt/A Micro 500 + 1 pt/A Boron. In-furrow application of another liquid fertilizer from another manufacturer, 4-16-16, was included for comparison, as was a treatment of no P-K fertilizer (nitrogen sidedress only).

Results:



LSD(0.05): 10.3, (0.1): 8.3. CV: 5.2%.

Conclusions:

The highest yield was from the in-furrow application. This was the expected outcome. But surprisingly the

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

yield from the broadcast application was quite close to that of the in-furrow. This comparison has not been thoroughly researched and caution should be exercised for this interpretation, but it is interesting.

- When the P and K fertilizers are not applied until sidedress, there was no benefit compared to that of the nitrogen alone. Although only around 30 days after planting, this was too late to get the early growth benefits. Nor would the corn roots be able to fully access the banded sidedress application placed in the row middle for awhile until roots reach the application band.
- The comparison fertilizer 4-16-16 yielded significantly lower than the similarly placed Pro-Germinator + Sure-K + micronutrients, even though application rate was the same. Does this mean that fertilizers are different???

The following pictures were taken on June 12, which was 37 days after planting and 9 days after sidedress. The fertilizer application was 3 gal/A Pro-Germinator + 7 gal/A Sure-K + 1 qt/A Micro 500 + 1 pt/A Boron.



No fertilizer applied other than sidedress nitrogen.



Fertilizer applied in furrow with planter using Rebounder™ seed firmers.



Fertilizer applied broadcast after planting.



Fertilizers applied with nitrogen at sidedress.

- Growth differences based on fertilizer application method are seen in these pictures. Best early growth, and ultimately best yield, was obtained with the in-furrow placement. Although not much larger in size, the corn that received the broadcast application appears greener than the corn that received all fertilizers at sidedress. This indicates that the fertilizer is being accessed and used by the corn. The yield indicates this was the case. However, further testing is needed before this application method is recommended.