

Corn Management Research Report

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On Farm Evaluation of Starter Fertilizers on High P Testing Soils

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Location: Pennsylvania

Sponsor: Pennsylvania Department of Agriculture

Research Objective: To evaluate differences in early growth, yield, and nutrient uptake using three starter fertilizer programs at numerous locations with high P testing soil.

Background: With collaboration from farmers, researchers, and extension personnel we were able to continue our starter fertilizer research in 2002 with 20 on-farm field experiments throughout the state and 1 in New York. These were located in Lancaster, York, Lycoming, Schuylkill, Centre, Berks, Fayette, Juniata, Mercer, Crawford and Fulton counties. Overall, there were 17 sites where early season growth data was collected and 15 sites where yield data was collected. The remaining sites were eliminated from the experiment due to the drought in certain areas of the state.

Study Description:

At each site corn was planted using the three starter fertilizer treatments (none, 10-30-10 and ammonium sulfate (**AS**)) in replicated strip trial experiments. Starters were applied at similar rates at each site. Soil samples and 20 plant samples were collected at the V6 stage of growth to determine early season growth as influenced by starter fertilizers. Standard nutrient analysis were run on the soil samples and the plant samples were analyzed for N,P,K,Zn,Ca,Mg,Cu, and B concentration. Included is a summary of early season growth as well as an evaluation of yield. Early season plant nutrient uptake was calculated and presented using the data from the plant analysis and the V-6 dry matter yields.

Results:

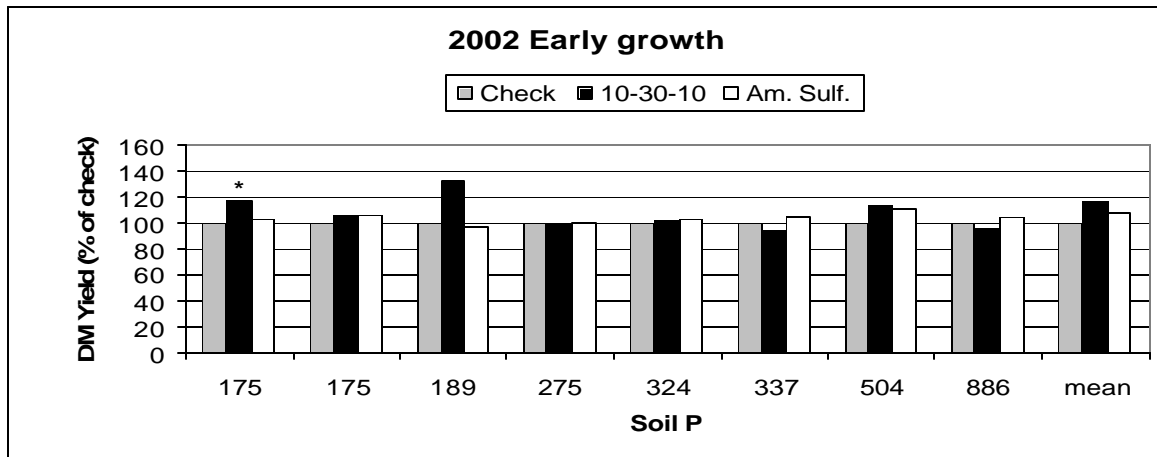
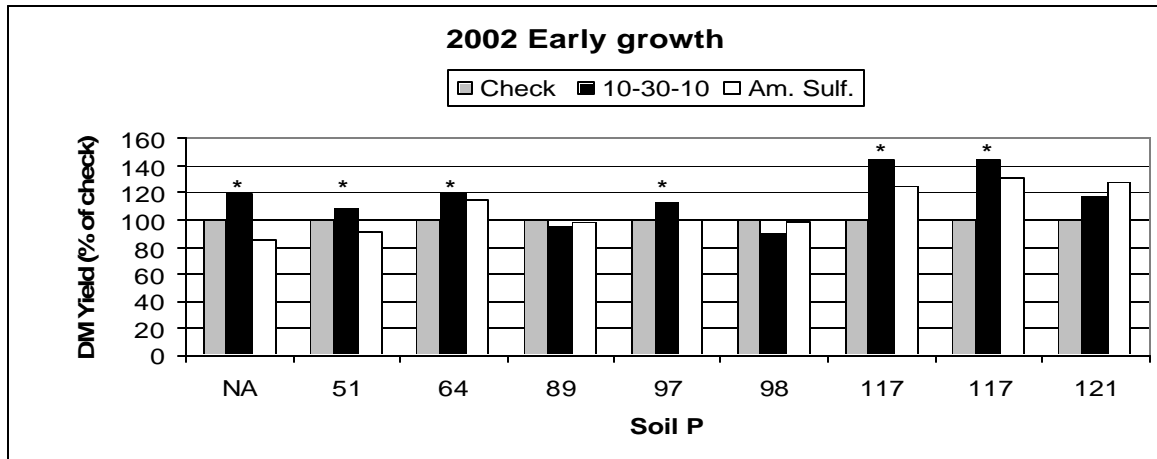
Early Growth

For early growth, significant differences between treatments occurred at seven sites (Figure 1). Averaged over all sites, both starters had a significant effect on early growth. The average yield increase was 17% for the 10-30-10 and 8% for the AS. Early growth response occurred most when the soil P was at or below 175 ppm. No significant starter response was found above 175 ppm.

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Figure 1. Early season corn growth as affected by two starter fertilizers at 17 locations in 2002. Locations with a significant treatment effect at the 0.10 level are denoted by *.



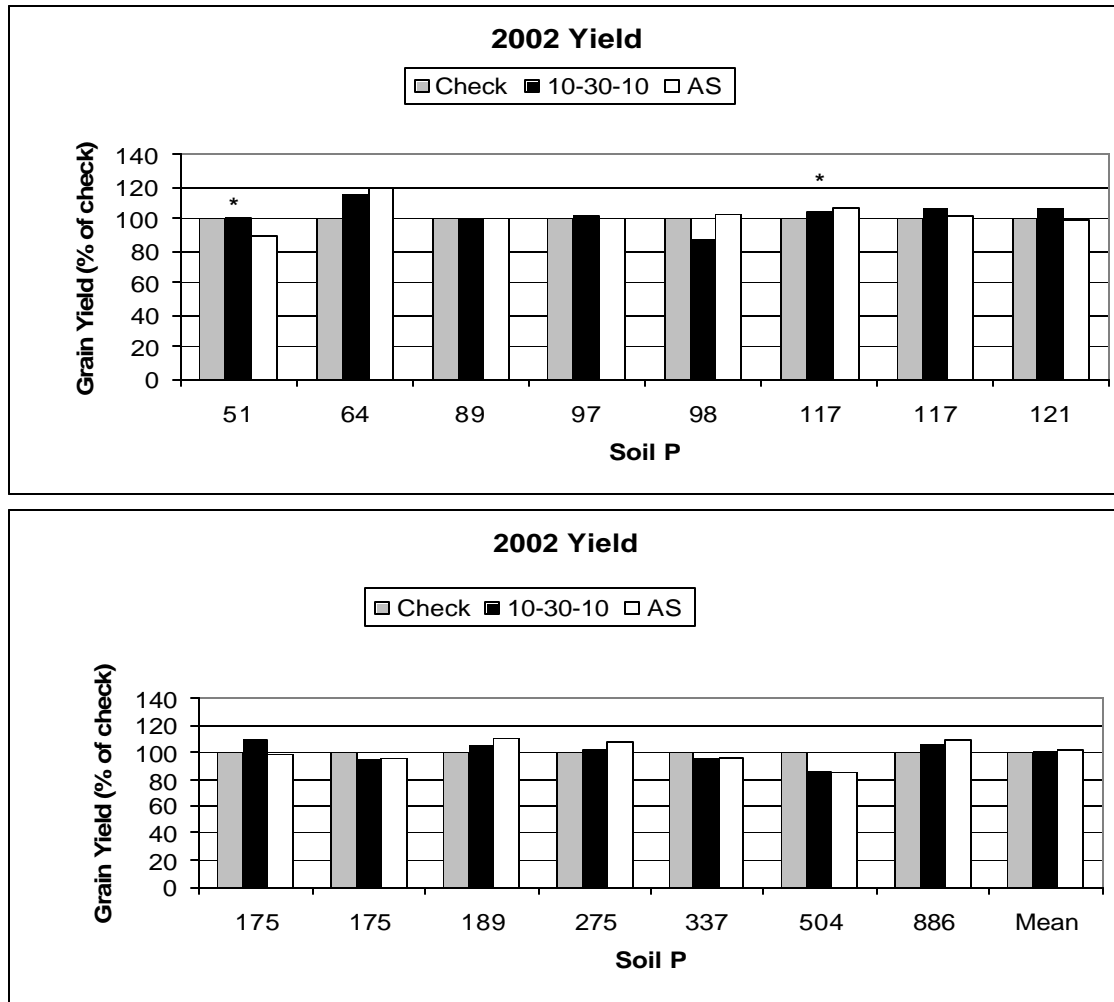
Grain Yield

The grain yield response to the starter fertilizers was generally smaller and less frequent than the early growth response. Positive effects from the starter occurred on one of the 15 sites where yield data was collected (Figure 2). At one site, a yield depression occurred when AS was used. Averaged over all sites, the yields of the 10-30-10 starter treatment and AS were similar and averaged about 2 % higher than the check. There seems to be a greater positive impact from starters when the soil test phosphorous levels are at the low end of the high P range (51-117 ppm soil P). As soil test P increased above 117 ppm, there were no significant yield advantages due to starter fertilizer.

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Figure 2. Effect of starter fertilizer on corn grain yield at 15 locations in 2002. Locations with a significant treatment effect at the 0.10 level are denoted by *.



Nutrient Uptake

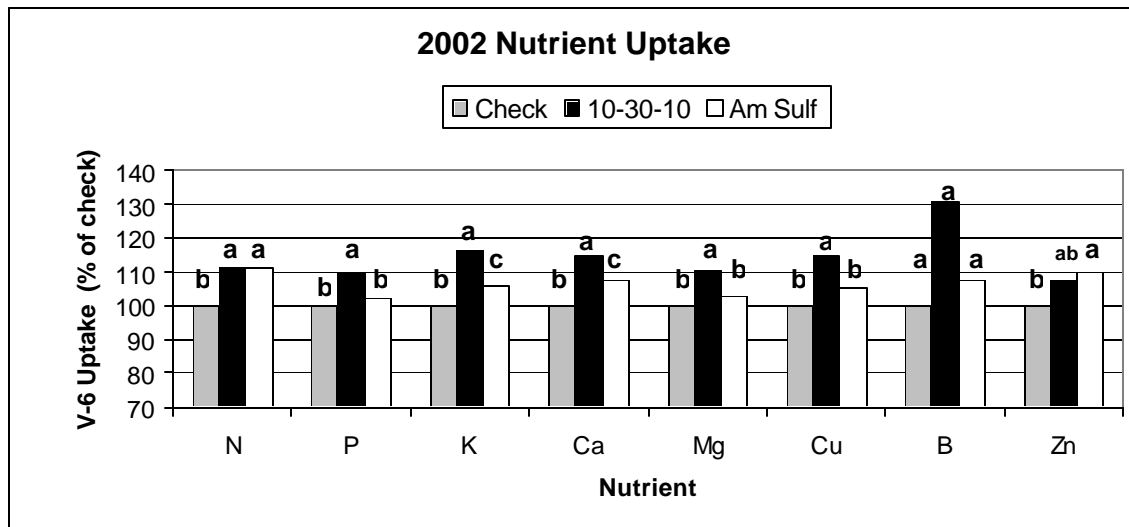
Averaged across all sites, nitrogen uptake at V-6 was significantly increased by 11% when 10-30-10 was the starter. Nitrogen uptake was also similar to 10-30-10 when AS was used. Phosphorous uptake in the 10-30-10 treatment was significantly increased by 10% over the check and 8% over the AS treatment (Figure 3). The AS and check treatments were similar and not statistically different. Potassium uptake was highest when 10-30-10 was the starter. The AS treatment had significantly higher potassium uptake when compared to the check while the 10-30-10 treatment was statistically higher than the AS. Early calcium uptake was similar to potassium uptake. Early season magnesium and copper uptake was significantly increased over the check when 10-30-10 was used by 10% and 15%, respectively. No magnesium or copper uptake response from AS was found. Early boron uptake differences were numerically large between treatments; however no significant differences occurred between treatments. Using 10-

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30-10, there was a 31% increase in boron uptake, while an 8% increase was found when AS was the starter. Zinc uptake was significantly increased over the check using AS. The 10-30-10 treatment was statistically similar to the check. Overall there were no uptake penalties at the V-6 growth stage caused by starter fertilizer.

Figure 3. Combined nutrient uptake at the V-6 growth stage averaged across 17 on-farm sites in 2002. Treatments denoted with the same letter are not significantly different at the 0.05 level.



Conclusions:

Over the last three years we have conducted on-farm research at over 40 locations that tested high in soil phosphorous. Significant early growth responses have most often come from using 10-30-10; however these have been poor indicators of yields. Significant positive yield responses from starter have most often come from using ammonium sulfate. If soil phosphorous is above 75-100 ppm it is probably unnecessary for a phosphorous based starter for normal planting conditions. We have found ammonium sulfate to perform, in most cases, better than 10-30-10 on high P soils and it's a good source of N that the crop needs anyway. If the crop will be planted into warm soil high in P, a starter is probably not necessary. More of our research summaries can be found at <http://cornandsoybeans.psu.edu/research.html>.

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