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New Products Trial – 2008: Report

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Introduction

Studies in North Carolina have shown that high plant populations lead to increased yield. Because ear size is determined by V6, good early growth is essential to obtain maximum ear size and yield. Several products have been introduced over the past few years which have the potential to promote either early growth or to enhance kernel weight by improving light use efficiency during the grain fill period. One of these products, Soil Plus, combines a humic acid with a blend of nutrients and has been effective in improving root growth. A variation on this product, Soil Plus 40, has been developed for use as a foliar product. The intent of this study to examine this new product and determine if it is effective in sustaining leaf health and improving light use efficiency.

Study Design

A single research trial was conducted in Beaufort County on a Cape Fear silt loam using the practices shown in Table 1.

Table 1. Soil and management information for research trial using Soil Plus in 2008.

Location	Soil Series	Planting Date	Hybrid	Seed Rate	Row Wth
Beaufort	Cape Fear S. Loam	Apr. 25, 2008	Pioneer 31G96	33000	30"

Methods

The study was designed as a randomized complete block with six treatments and an untreated check arranged in random in four blocks. In addition to the check the treatments were: (1) H0100 applied at 1 gal acre^{-1} in furrow at planting, (2) Bioforge applied at 1 pt acre^{-1} in furrow at planting, (3) Soil Plus applied at 0.75 qt acre^{-1} at planting, (4) H0640 applied at 4 lbs acre^{-1} in furrow at planting, (5) 10-27-0 plus Avail applied at a rate of 20 gal acre^{-1} in a 2 by 2 band beside the row at planting, and (6) Soil Plus 40 applied at 1 qt acre^{-1} at VT using a broadcast sprayer. H0100 and H0640 are humic acid materials both liquid and dry. Bioforge is a micronutrient product that has been shown to stimulate plant hormones involved in growth (auxin and cytokinin). Avail was added to the starter fertilizer mix (10-27-0) to promote P uptake. The plot area was treated with Bicep at planting and a combination of Roundup and Atrazine at layby (6 June) to control weeds. Nitrogen in the form of 30% UAN was applied on 6 June at a rate of 50 gal acre^{-1}. Plots were harvested in September using a Gleaner K2 combine with a Harvestmaster system that recorded plot weight, moisture, and test weight. All data were analyzed using PROC ANOVA in SAS (SAS Institute, Cary, NC). Mean separations were done using Fisher's protected LSD at p= 0.10.

Results

The weather at the site was extremely dry with no recorded precipitation between 28 May and 19 June. Although the plots showed symptoms of stress including leaf roll and reduced plant height an average yield of 147.98 bu acre^{-1} was measured at this site. When the data were analyzed the only significant differences were between the plots that were treated with 0.75 qt acre^{-1} of Soil Plus in furrow at planting (Treatment 3) and both the untreated check and Treatment 1 (H0100 applied at 1 gal acre^{-1} in furrow at planting). None of the other treatments differed significantly from the untreated check (Figure 1). The CV at this site was high (11%) resulting in a large LSD (24.5 bu acre^{-1}). This large variability within the treatment blocks was caused by differences in water availability among the plots.

Plot No.	Treatment	Block	Moisture	Tstwght	Yield
101	1	1	17.51	51.9	128.8877
207	1	2	17.17	56.5	152.6493
304	1	3	17.29	57.94	100.2991
405	1	4	17.49	53.79	153.4774
105	5	1	17.32	53.23	123.6539
204	5	2	17.34	55.47	150.5605
302	5	3	17.56	54.5	126.3306
407	5	4	17.29	55.37	185.9289
104	4	1	17.74	53.55	145.4905
206	4	2	17.27	56.05	180.4906
306	4	3	17.35	55.69	166.9762
401	4	4	17.43	55.63	158.0482
106	6	1	17.27	55.31	132.1059
202	6	2	17.53	54.02	161.6526
301	6	3	17.35	54.07	162.0562
403	6	4	17.62	54.17	158.4934
107	7	1	17.2	52.87	147.411
201	7	2	17.54	54.22	149.589
307	7	3	17.02	55.28	160.7681
404	7	4	17.17	52.49	148.3286
102	2	1	17.69	53.41	150.5292
205	2	2	17.48	55.24	182.6152
303	2	3	17.39	53.96	125.6785
406	2	4	17.39	57.06	153.9169
103	3	1	17.51	51.81	109.752
203	3	2	17.52	53.98	139.2487
305	3	3	17.47	55.89	126.7724
402	3	4	17.64	54.48	161.7403

Treatment Name	Yield
check	133.8284
HM9946 1 gal/a in furrow	134.3783
BioForge - 1 pt/a in furrow	146.6185
Soil Plus 40 - 1 qt/acre tassel	151.5242
10-27-0 + Avail	153.1849
HM0625 - 4 lb/a in furrow	153.577
Soil Plus - 0.75 qt/acre in furrow	162.7514
mean	147.98
CV %	11.1
LSD	24.5

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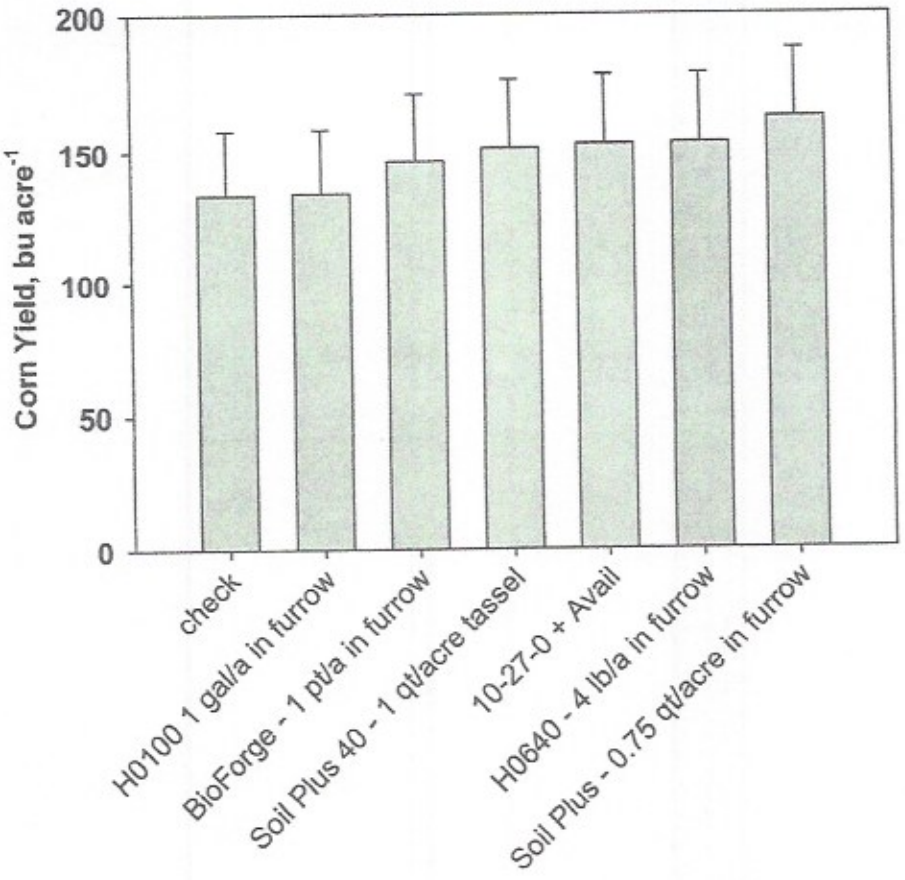

Figure 1. Corn yield measured from plots where different products were applied either in furrow at planting or at VT. Error bars indicate the LSD (p=0.10) for determining differences among treatments.

Conclusions Based on These Results

1. As indicated in previous studies Soil Plus applied in furrow at planting did improve yield compared with the untreated check. The impact of Soil Plus appears to come from the combination of nutrients and humic acid. Other treatments in this study which contained humic acid alone (H0100 and H0640) or which contained only nutrients (Bioforge and 10-17-0+ Avail) did not result in a significant yield increase although there were numerical increases compared with the untreated check.

2. Soil Plus 40 applied at VT (tassel) did not significantly increase yield compared to the untreated check. The severe drought which reduced plant height and leaf area probably limited any potential impact of a foliar application at this stage of growth. More research is needed to determine if Soil Plus 40 applied at tassel will improve yield.

The Effect of SoilPlus and PN40 & PN+ on Corn – 2005

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The Study

In 2005, this study was conducted on the Burbage farm near Pantego, NC on a Hyde silt loam soil. Forty-Five gallons of 30% UAN solution were applied per acre prior to planting (25 April) to supply the N for the study and Bicept II and gramoxone were applied for pre-emergence weed control. DeKalb DKC69-71 RR/YG with Poncho 250 seed coating was planted with a drill in 7" rows in plots 7 feet wide by 30 feet long. Experimental design consisted of a split plot arrangement laid off in two blocks. The main plots consisted of four different row configurations: Ultra Narrow Row (7 inch rows), Narrow row (14 inch rows), Wide row (28 inch rows) and Twin rows (7 inch twin rows with 21 inch row middles). Subplots consisted of four treatments: Soilplus, an enzyme product that stimulates growth and promotes stress tolerance; PN40 and PN+, a humic acid product consisting of micronutrients that can be foliar applied; 19-19-0, a common starter fertilizer material; and an untreated check. Soilplus and PN40 & PN+ were applied in-furrow at recommended rates. 19-19-0 was applied in a 2 X 2 band at planting. Precise plant population of 34,000 plants per acre and plant-to-plant spacings were achieved by overseeding and hand thinning at growth stage V4. Roundup was applied for weed control. At VT, five consecutive plants were excavated by digging to retain the bulk of the root mass. Stalk diameter was measured at the internode just below the ear leaf and the roots were then washed to remove dirt, measured for depth and diameter, and trimmed from the plant. This root material was then dried for 48 hrs at 60^0 C and weighed. Grain yield was determined by hand harvest of ears from either 2 (14-inch, 28-inch, and twin rows) or 4 (7-inch rows) rows from each of the plots. These ear samples were threshed, weighed, and the moisture measured.

Results

Stalk and Root Measurements

Significant treatment effects were found for stalk diameter, root ball diameter, and root mass. However, no significant differences were noted for root depth. For both stalk and root ball diameter Soilplus resulted in significantly higher values compared to the other two treatments and the untreated check (Figures 1 and 2). In the case of stalk diameter neither the PN40 & PN+ nor the 19-19-0 increased stalk diameter compared to the check. However, both PN40 & PN+ and 19-19-0 increased root ball diameter when compared to the untreated check. Both Soilplus and 19-19-0 significantly increased root mass compared to PN40 & PN+ and the check (Figure 3). There were no significant differences in root mass between the PN40 & PN+ treatment and the check.

Corn Yield

The lack of replicated blocks reduced the statistical power of this test. As a result no significant differences were found in corn yield among the three treatments and the untreated check. Numerically, Soilplus and 19-19-0 resulted in the highest yields (190 bu $acre^{-1}$ and 185.8 bu $acre^{-1}$, respectively). PN40 & PN+ and the check had the lowest yields (169.4 and 167.1 bu $acre^{-1}$, respectively). There were no significant yield differences between the different row spacings.

Summary

In this study Soilplus was the most effective treatment resulting in higher values for stalk diameter, root ball diameter, root mass, and yield compared to the check. While both PN40 & PN+ and 19-19-0 improved certain stalk or root properties, only 19-19-0 resulted in an economic yield increase.

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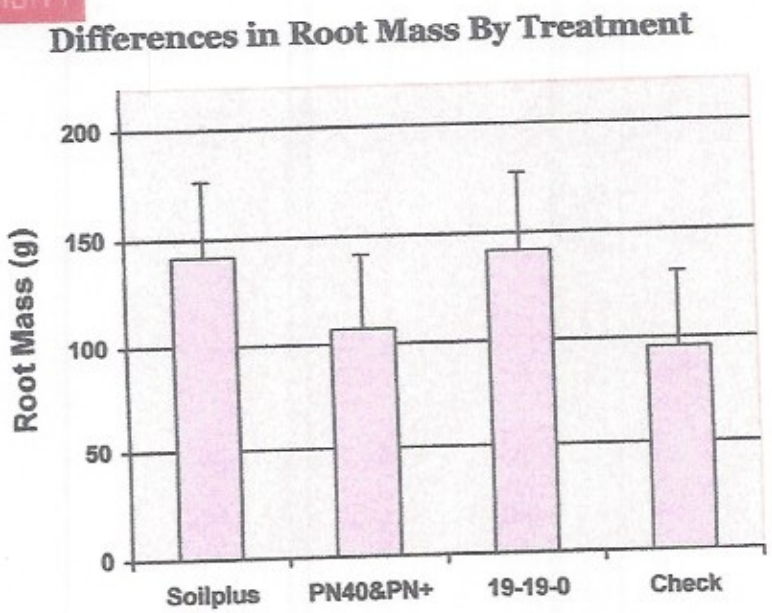

Figure 3. Differences in root mass resulting from different treatments at planting. Anything between the top of the colored bar to the top of the error bar would not be considered statistically different.

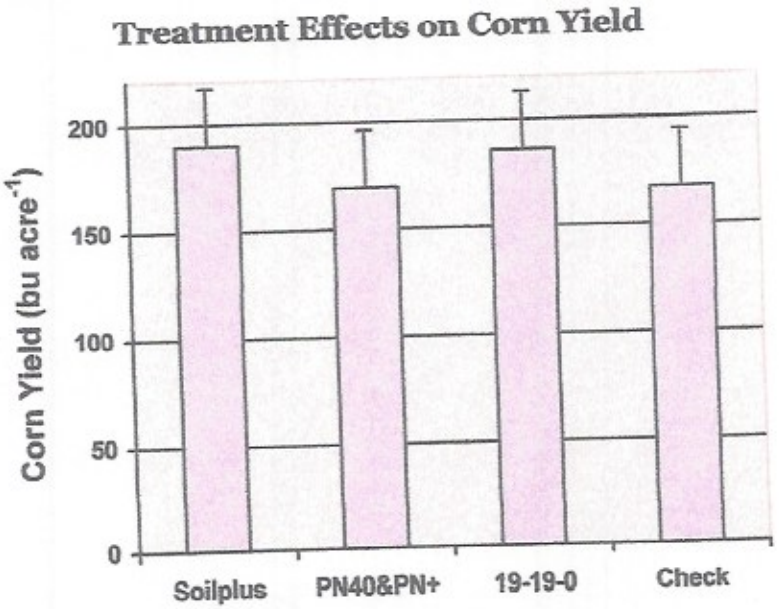

Figure 4. Differences in corn yield resulting from different treatments at planting. Anything between the top of the colored bar to the top of the error bar would not be considered statistically different.

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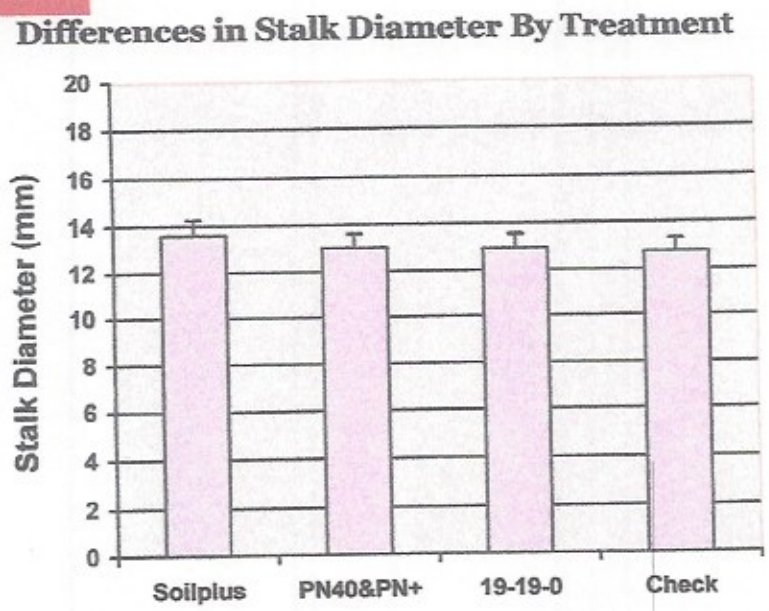

Figure 1. Differences in stalk diameter resulting from different treatments at planting. Anything between the top of the colored bar to the top of the error bar would not be considered statistically different.

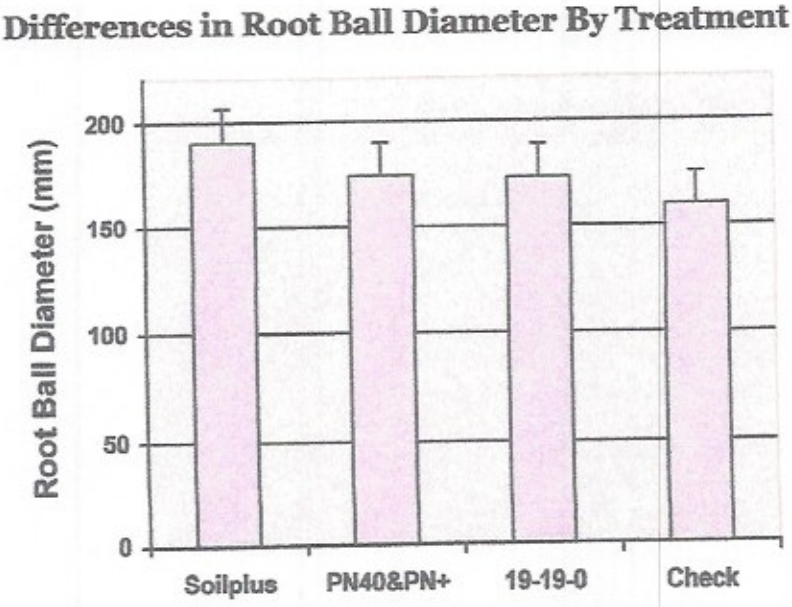

Figure 2. Differences in root ball diameter resulting from different treatments at planting. Anything between the top of the colored bar to the top of the error bar would not be considered statistically different.

Impact of P 40 & PN+™ and Soil Plus on Corn Yield in 2004

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Introduction

P40 + PN+™ is a humic acid-based foliar treatment that works by stimulating plant responses. Based on a combination of nutrients, this product promotes growth and has been shown to increase yield when compared to a non-treated check. Corn yield is highly related to early growth and rooting depth on the high-organic, muck soils common to the Tidewater Region of North Carolina. Wet, cool conditions common in the spring on these soils, especially when corn is planted using no-till practices, often reduce nutrient uptake and yield potential. The objective of this project was to determine if the use of P40 + PN+ would help the corn plant overcome limitations to nutrient uptake and improve yield.

Results and Conclusions

Table 1 and Figure 1 show comparisons of yield data from both trials indicating that the PN40 + PN+ treatment resulted in significant yield gains when compared to the untreated check at both sites. While yield did not differ significantly among treatments of 19-19-0, Soil Plus and PN40 + PN, the PN40 + PN treatment always resulted in the highest yield with increases of 6.4 bu/acre at the Pasquotank site and 12.3 bu/acre at the Columbus site over the use of 19-19-0. The use of Soil Plus resulted in yields that were similar to those obtained with 19-19-0.

Table 1. Yield for PN40 + PN and Soil Plus corn treatments compared to an application of 19-19-0 in a 2 x 2 band and a non-treated check at two different locations in North Carolina.

	Location by County	
Treatment	Pasquotank	Columbus
None (check)	190.1 a	95.3 a
19-19-0	203.6 ab	108.3 ab
Soil Plus	204.8 ab	108.7 ab
PN40 + PN	210.0 b	120.6 b
LSD($p<0.05$)	17.5	16.0

Cooperative Extension Service

Impact of P 40 & PN+™ on Corn Yield in 2002

Dr. Ronnie W. Heiniger

Study Design

At Beaufort County in 2002, this study was conducted on the Haslin farm on an Arapahoe Organic Muck soil. At Tyrrell County, the study was conducted on the Spruill farm on a Cape Fear Silty Loam. A Pioneer corn hybrid was planted on April 24th at a seeding rate of 32,000 seeds per acre. Nitrogen and other essential nutrients were applied based on recommendations by the North Carolina Department of Agriculture or, in the case of nitrogen, based on farmer experience. Standard management practices were used to control weeds, insects, and diseases. Other than some drought stress, no other adverse environmental effects were noted. Six treatments consisting of applications of P40 & PN+, micronutrients, and a non-treated check were randomly applied to four replicated blocks selected from a uniform area of the field. All treatments were applied by hand with a backpack sprayer. Stand counts were taken at V2-3 and grain yield from each of the plots was measured using a small plot combine.

Results

P40 and PN+ significantly increased corn yield compared to the check. In most cases, grain yield from applications of P40 & PN+ or selected micronutrients were similar. However, multiple applications of P40 and PN+ did significantly increase corn yield at Beaufort County plots compared to applications of selected micronutrients.

Table 1. Yield for four different application-timing treatments of P40 & PN+ or micronutrients compared to a non-treated check at two different locations in North Carolina.

Timing of Application	Tyrrell	Beaufort
None (check)	169.3 b	207.3 c
P40 & PN+	181.7 a	220.0 ab
Chelated Cu	176.9 ab	214.3 bc
Sulfur	175.5 ab	212.0 bc
Manganese	170.6 ab	211.1 bc
Boron	179.2 ab	N/A
P40 & PN+ multiple	N/A	227.9 a
LSD	11.2 $p < 0.05$	10.6 $p < 0.05$