

IMPACT OF SOYBOOST™ APPLIED WITH SIDEDRESS NITROGEN ON WHEAT YIELD AND GRAIN PROTEIN

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Report on Field Trials Supported in Part By CropChem/Super Green Turf Co.

Introduction

Soy Boost + P™ is a humic acid-based foliar treatment that works by stimulating plant responses. Based on a combination of nutrients (5-10-5 with trace amounts of Zinc and Boron), this product promotes growth and has been reported to increase yield in soybean. Because of the need to improve tiller development through improved plant growth in late winter and the critical role that nutrition has in increasing grain protein, it would appear that this product could be used in North Carolina to improve wheat yield and grain quality. This study was designed to test this hypothesis.

Study Design

In 2001-02, this study was conducted at two locations in Eastern North Carolina: Tidewater Research Station (TRS) and Circle Grove Seed Farm (CGSF). In 2002-03, the study was continued at the TRS site. At TRS, the soil series was classified as a Cape Fear Silt Loam and at CGSF the soil series was a Hyde Silt Loam. Pioneer '25R61' was planted on 29-Oct 2001 at CGSF and on 10-Nov 2001 and 2-Nov 2002 at TRS in 6 2/3-inch rows in plots 7-ft wide by 30-ft long. A seeding rate of 32 seeds/ft² was used at both locations in both years. Soil tests at all sites indicated adequate levels of P and K. Therefore, neither of these elements was applied prior to planting. No N was applied prior to or at planting.

The study was arranged using a randomized complete block design. Ten treatments including two non-treated checks were randomly assigned to five replicated blocks selected from a uniform area of the field. The treatments were:

- A. Non-Treated Check
- B. 100 lbs N/acre applied at GS3 (late January, tiller development stage)
- C. 100 lbs N/acre applied at GS5 (late February, beginning of jointing)
- D. 50 lbs N/acre applied at GS3 and 50 lbs N/acre applied at GS5
- E. 100 lbs N/acre and 1 qt SoyBoost + P applied at GS3
- F. Non-Treated Check
- G. 100 lbs N/acre applied at GS3 and 60 lbs N/acre applied at GS7 (late boot stage)
- H. 100 lbs N/acre applied at GS3 and 30 lbs N/acre applied at GS7
- I. 100 lbs N/acre applied at GS3 and 1 qt SoyBoost + P applied at GS7
- J. 100 lbs N/acre and 1 qt SoyBoost + P applied at GS5

At TRS and CGSF in 2001-02, the GS3 treatments were applied on 6-Feb 2002, the GS5 treatments on 6-Mar 2002, and the GS7 treatments were applied on 18-Apr 2002. At TRS in 2002-03, the GS3 treatments were applied on 27-Jan 2003, the GS5 treatments on 2-Mar 2003, and the GS7 treatments on 21-Apr 2003. Nitrogen was applied at GS3 and

GS5 using 30% UAN solution. At GS7, N was applied using Urea (44% N) dissolved in water at a ratio of 6 lbs of Urea to 1 gal of water. For the treatments where SoyBoost + P was applied, SoyBoost was mixed with the N solution at the time of application. All treatments were applied by hand with a backpack sprayer. At all sites, grain yield was measured by harvesting each plot using a small plot combine. Grain samples were collected at harvest and sent to Waters Laboratories (Camela, GA) for analysis to determine grain protein and N content.

Results

To simplify results, yield and grain quality data from the non-treated check treatments (A and F) were averaged. Since treatments D, G, and H involved either different timing of the N applications or different amounts of total N, these treatments were not used in this analysis of the effects of SoyBoost + P.

Grain Yield

At all sites in both years, the addition of 100 lbs N/acre with or without SoyBoost + P significantly increased grain yield. While the addition of SoyBoost + P at TRS in 2001-02 did not significantly increase yield over that obtained with N alone when applied at GS3, GS5, or GS7, numerically there was a consistent improvement in grain yield of 5.7 bu/acre when used at GS3 and 7.2 bu/acre when applied at GS5 (Fig. 1). At CGSF in

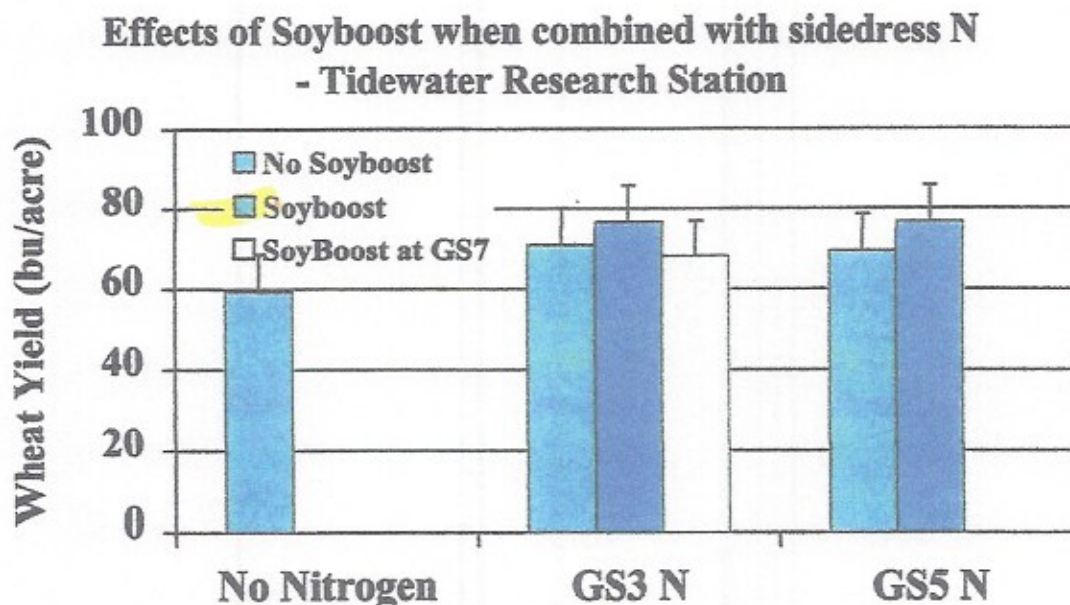


Fig. 1. Effect of SoyBoost + P on wheat yield at the Tidewater Station in 2001-02 when combined with N applied at either GS3 or GS5 or when used as a supplemental treatment at GS7.

2001-02, there was a significant improvement in grain yield (21.6 bu/acre) when SoyBoost + P was combined with N at GS5 (Fig. 2). Grain yields were numerically higher when SoyBoost + P was combined with N at GS3 (2.6 bu/acre) or applied as a supplemental treatment at GS7 (1.4 bu/acre). When applied at GS5, the addition of

Effects of Soyboost when combined with sidedress N - Circle Grove Seed Farm

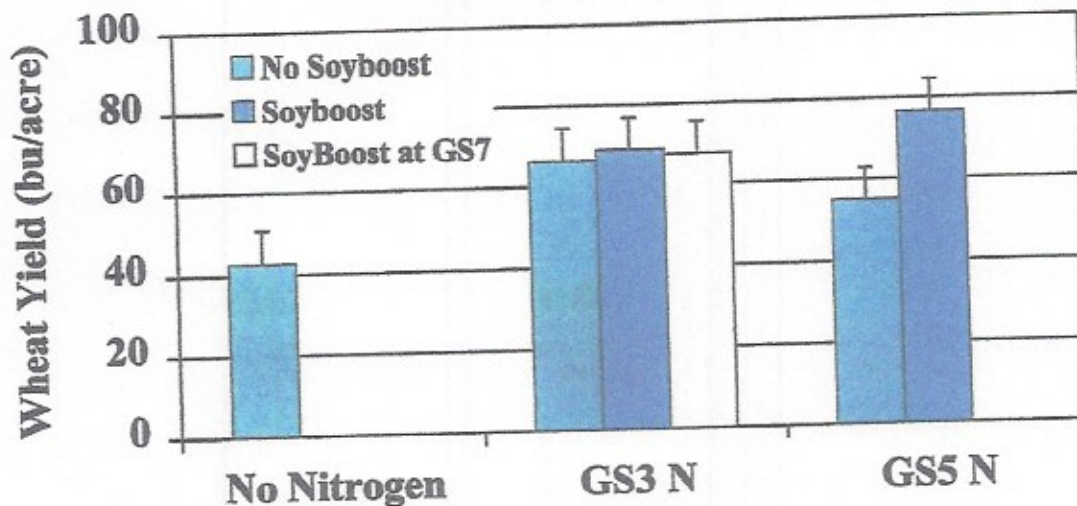


Fig. 2. Effect of SoyBoost + P on wheat yield at the Circle Grove Seed Farm in 2001-02 when combined with N applied at either GS3 or GS5 or when used as a supplemental treatment at GS7.

SoyBoost + P increased seed number and, in turn, grain yield. At TRS in 2002-03, SoyBoost + P did not significantly increase grain yield (Fig. 3) when combined with N at GS 3. However, yields were numerically higher (4.7 bu/acre). SoyBoost + P significantly increased yield by 12.1 bu/acre when applied as a supplemental treatment at GS7 compared to N applied at GS3 or when SoyBoost + P was combined with N at GS5 (10.7 bu/acre). Consistent rainfall resulted in saturated soils throughout most of the late winter and early spring resulting in nutrient deficiency symptoms. The addition of SoyBoost + P appeared to alleviate these problems and resulted in increased grain yield.

Grain Quality

The impact of SoyBoost + P on the amount of grain nitrogen and percent protein differed by location in 2001-02. At TRS in 2001-02, SoyBoost did not significantly increase either grain N or protein compared to just using 100 lbs N/acre. Applying SoyBoost + P as a supplemental treatment at GS7 did not significantly increase grain N or protein compared to even the non-treated check. There was an extended period of time following the application of SoyBoost on 18-Apr 2002 that may have limited the effect of this treatment at TRS. In comparison, SoyBoost + P significantly increased grain N and percent protein at CGSF in 2001-02. Compared to the application of 100 lbs N/acre at GS3, the addition of SoyBoost either at GS3 or at GS7 increased protein from 1.7 to 1.9%

with the supplemental application at GS7 being the most effective. Compared to the application of 100 lbs N/acre at GS5, SoyBoost + P increased protein by 0.8%. Clearly SoyBoost + P had a positive impact on grain quality at CGSF in 2001-02 with the supplemental application at GS7 being the most effective application timing.

Table. 1. Grain nitrogen and percent protein results from six treatments with and without SoyBoost + P applied at either the Tidewater Research Station or Circle Grove Seed Farm in the 2001-02 growing season.

Treatment	Tidewater Research Station		Circle Grove Seed Farm	
	Grain N	Protein	Grain N	Protein
	--- % ---	-- % --	--- % ---	--% --
Non-treated Check	1.77 a	10.30 a	2.01 a	11.72 a
100 lbs N at GS3	2.10 bc	12.27 bc	2.02 a	11.80 a
100 lbs N and SoyBoost at GS3	2.24 c	13.04 c	2.32 b	13.50 c
100 lbs N at GS5	2.09 bc	12.18 bc	2.16 ab	12.60 b
100 lbs N and SoyBoost at GS5	2.25 c	13.12 c	2.30 b	13.43 c
100 lbs N GS3/SoyBoost GS7	2.00 ab	11.64 ab	3.08 c	13.66 c

Within a column treatments denoted by different letters are significantly different a $p < 0.05$

Conclusions

Over the three site years tested, the application of SoyBoost + P had a positive impact on grain yield with significant yield increases found when the material was applied at either GS5 or as a supplemental treatment at GS7. Despite the poor growing conditions in 2002-03, the application of SoyBoost + P improved yield. Grain quality results from two locations in 2001-02 were not conclusive. There was clearly a positive effect of applying SoyBoost + P on grain N and protein at CGSF with the supplemental treatment at GS7 being the most effective. However, no significant improvements were found in grain N or protein at TRS even though there were numerical increases in these properties when SoyBoost + P was applied either at GS3 or GS5. These conflicting results may have been caused by dry weather during grain fill at TRS.

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- Tidewater Research Station**

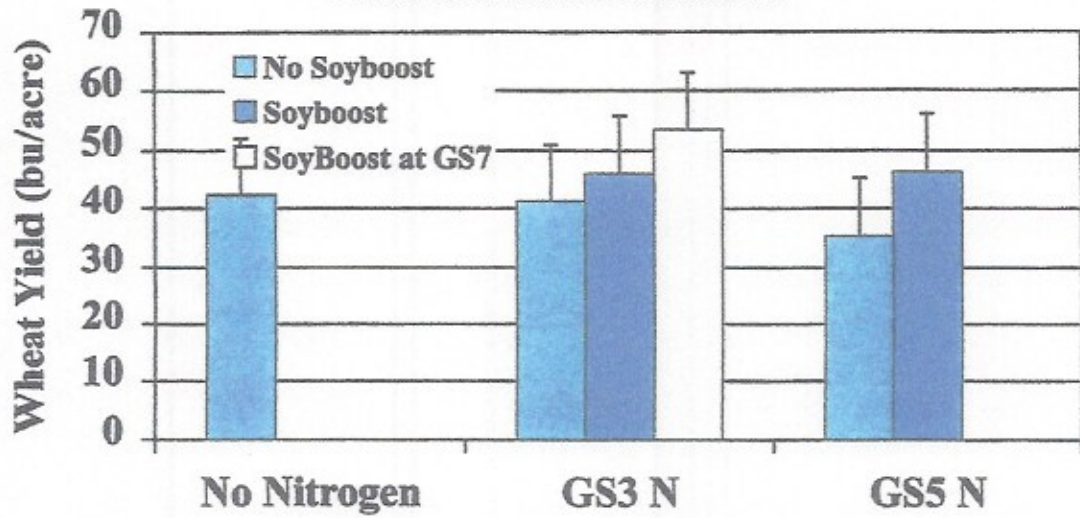


Fig. 3. Effect of SoyBoost + P on wheat yield at the Tidewater Research Station in 2002-03 when combined with N applied at either GS3 or GS5 or when used as a supplemental treatment at GS7.

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Study Design

In 2003-04, this study was conducted at the White Hat Seed Farm near the city of Hertford in Eastern North Carolina. The soil series was classified a Roanoke Silt Loam. Pioneer '25R61' was planted on 22-Oct 2003 in 6 2/3-inch rows in plots 7-ft wide by 30-ft long. A seeding rate of 28 seeds/ft² was used. Soil tests indicated adequate levels of P and K. Therefore, neither of these elements was applied prior to planting. No N was applied prior to or at planting.

The study was arranged using a randomized complete block design. Six treatments including a non-treated check were randomly assigned to four replicated blocks selected from a uniform area of the field. The treatments were:

- A. Non-Treated Check
- B. 100 lbs N/acre applied at GS3 (late January, tiller development stage)
- C. 100 lbs N/acre applied at GS5 (late February, beginning of jointing)
- D. 100 lbs N/acre applied at GS3 and 1 qt SoyBoost + P applied at GS7
- E. 100 lbs N/acre and 1 qt SoyBoost + P applied at GS3
- F. 100 lbs N/acre and 1 qt SoyBoost + P applied at GS5

The GS3 treatments were applied on 12-Feb 2004, the GS5 treatments on 3-Mar 2004, and the GS7 treatment was applied on 12-Apr 2004. Nitrogen was applied at GS3 and GS5 using 30% UAN solution. For the treatments where SoyBoost + P was applied, SoyBoost was mixed with the N solution at the time of application. All treatments were applied by hand with a backpack sprayer. At all sites, grain yield was measured by harvesting each plot using a small plot combine. Grain samples were collected at harvest and sent to Waters Laboratories (Camela, GA) for analysis to determine grain protein and N content.

Results

Grain Yield

The addition of nitrogen (N) alone either at Feeke's 3 or Feeke's 5 significantly increased yield compared to the check but neither timing was superior to the other (Fig. 1). The addition of SoyBoost + P significantly increased grain yield compared to N applied alone when Soyboost was applied at Feeke's 5. While the addition of SoyBoost + P at either Feeke's 3 or Feeke's 7 did not significantly increase yield over that obtained with N alone, numerically there was a consistent improvement in grain yield from 8 to 11 bu/acre.

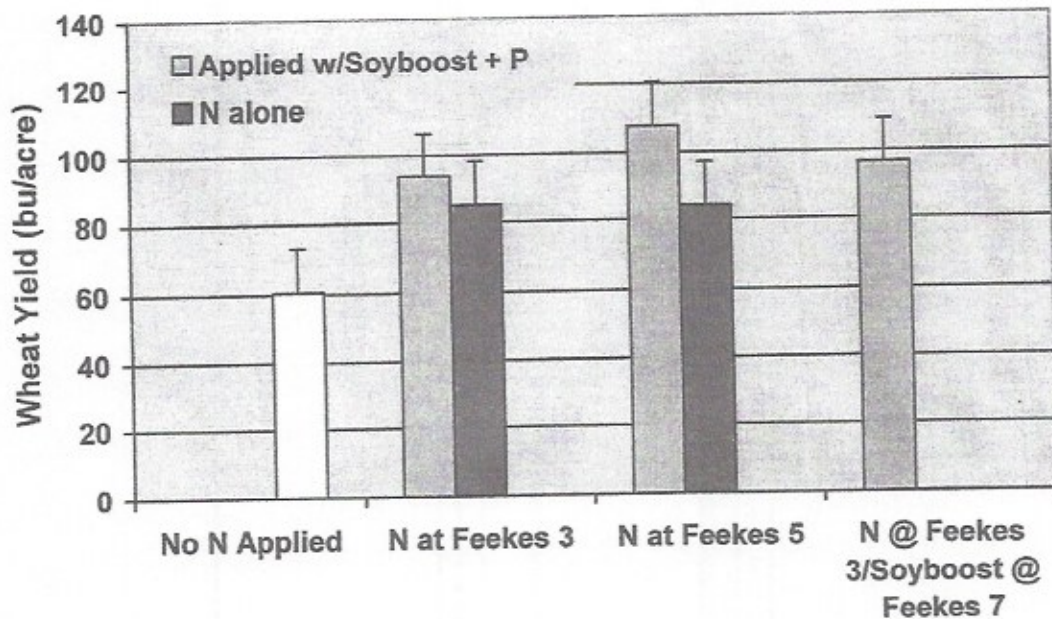


Fig. 1. Effect of SoyBoost + P on wheat yield at White Hat Seed Farm in 2003-04 when combined with N applied at either GS3 or GS5 or when used as a supplemental treatment at GS7.

Grain Quality

SoyBoost did not significantly increase either grain N or protein compared to just using 100 lbs N/acre. Applying SoyBoost + P as a supplemental treatment at GS7 did not significantly increase grain N or protein compared to an application of N alone.

Conclusions

The application of SoyBoost + P had a positive impact on grain yield with a significant yield increase found when the material was applied at GS5. Grain yield in these plots were high and the addition of Soyboost + P resulted in improved growth. The lack of a significant response from the Feeke's 7 application of Soyboost + P differed

from what we recorded in 2002-03 and was probably due to an application of N at the flag leaf stage that burned the flag leaves and reduced late season response to added nutrients. As in previous years, grain quality results were not conclusive (Table 1). There were no significant improvements in grain N or protein when SoyBoost + P was applied either at GS3 or GS5.

Table. 1. Grain nitrogen and percent protein results from six treatments with and without SoyBoost + P applied at either the White Hat Seed Farm in the 2003-04 growing season.

Treatment	Tidewater Research Station	
	Grain N --- % ---	Protein -- % --
Non-treated Check	1.94 a	11.10 a
100 lbs N at GS3	2.48 b	14.27 b
100 lbs N and SoyBoost at GS3	2.44 b	14.04 b
100 lbs N at GS5	2.79 c	14.82 c
100 lbs N and SoyBoost at GS5	2.68 c	14.86 c
100 lbs N GS3/SoyBoost GS7	2.42 b	14.21 b

Within a column treatments denoted by different letters are significantly different a $p < 0.05$