Soybean Foliar Feeding Trial 2019 Summary

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Introduction

Farmers across a wide range of US soybean growing environments are interested in using foliar nutrient products to increase yield and profitability. But, applying foliar fertilizers increases on-farm expenses and could decrease profitability where these fertilizers are not associated with a yield increase. In 2019, we established field trials to better understand which growing environments may see a yield increase when foliar nutrient products are applied. Trials were placed in 20 locations across 13 states in fields with different environmental conditions and yield potentials. Yield averages for each location can be found across the 20 environments in Figure 1.

Methods

Six foliar nutrient products, selected with the input of industry professionals, and one untreated control were applied to small plots in a randomized complete block design at all sites (Table 1). Products were applied at soybean growth stage R3 to align with commonly used fungicide and insecticide application timing. Nutrients applied in each product are listed in Table 2.
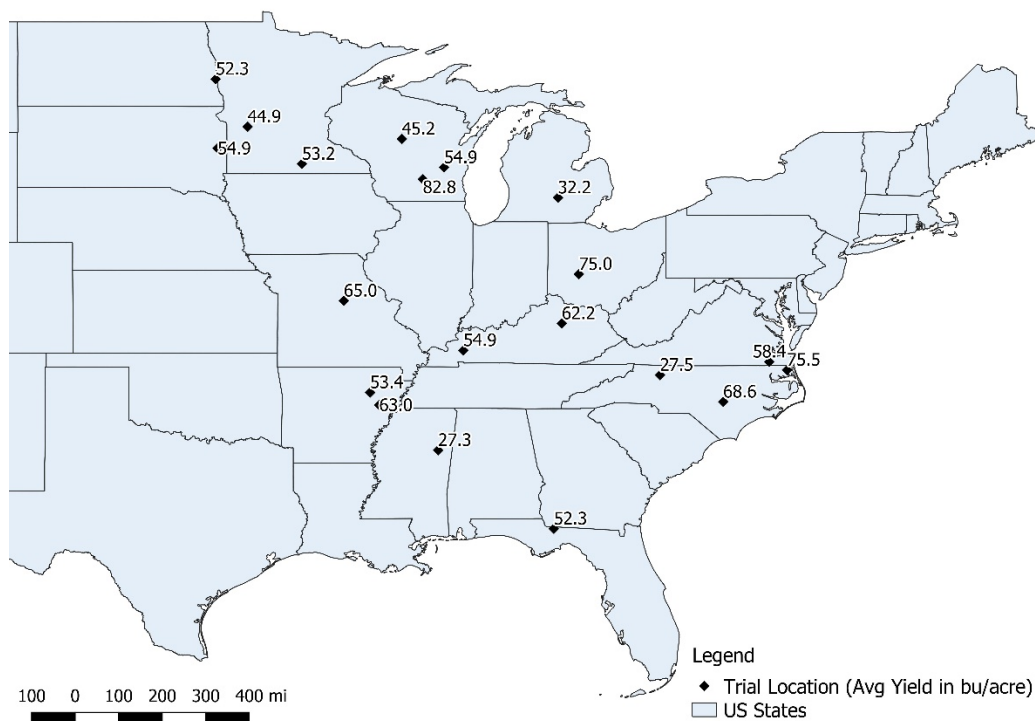
Figure 1. Map of 2019 sites with their average yield (bu/acre).

Table 1. List of foliar products names, brands, and application rate.

Treatment Name	Company	Application Rate
FertiRain	AgroLiquid	3 gal/A
SureK	AgroLiquid	3 gal/A
HarvestMoreUreamate	Stoller	2.5 lb/A
Smart B-Mo	Brandt	1 pt/A
Smart Quarto Plus	Brandt	1 qt/A
Maximum NPact K	Nutrien	1.5 gal/A
Untreated Control	-	-

Table 2. Nutrients applied for each treatment in lb/A.

Treatment Name	N	P	K	S	Mn	Fe	Mo	Zn	B	Other
FertiRain	3.5	0.9	0.9	0.5	0.02	0.03	-	0.03	-	-
SureK	0.6	0.3	1.7	-	-	-	-	-	-	-
HarvestMoreUreamate	0.1	0.25	0.56	-	0.01	-	0.002	0.01	-	Ca, Mg, B, Co, Cu
Smart B-Mo	-	-	-	-	-	-	0.006	-	0.07	-
Smart Quarto Plus	0.13	-	-	0.05	0.05	-	0.001	0.05	0.01	-
Maximum NPact K	1.9	-	1.9	-	-	-	-	-	-	-
Untreated Control	-	-	-	-	-	-	-	-	-	-

For the 2019 yield data, all sites were analyzed separately using Analysis of variance (ANOVA) in R 3.6.2. Means separation was performed using least significant differences as calculated using the package

agricolate (α=0.05 for all analyses). A summary of yield by treatment for each site is in Table 3. For sites with statistically significant differences in yield between treatments, the highest average yield at each site is in bold and the yield for treatment(s) that are statistically similar to the highest-yielding treatment are denoted with asterisks (*).

Results

Of the 20 sites in 2019, significant differences in yield between treatments were only observed at the Fond du Lac, WI site. At Fond du Lac, WI, Maximum NPact K yielded 61.4 bu/ac, which was significantly higher than the untreated control. Average yield for HarvestMoreUreaMate and Smart B-Mo was not statistically different from Maximum NPact K. At all other sites (19 sites out of 20 sites total in 2019), yields for all treatments were not statistically different. Trials are being conducted again in 2020. Upon completion of harvest in 2020, we will analyze and post additional data from both years of the trial including yield, tissue nutrient concentration, soil samples, and protein and oil concentration.

Table 3. Treatment means (standard deviation) for each site in 2019. HarvestMoreUreaMate was not applied at the Lexington, Kentucky site. For sites with statistically significant differences in yield between treatments, the highest yield at each site is in bold and the yield for treatment(s) that are statistically similar to the highest-yielding treatment are denoted with asterisks (*).

Site	Control	FertiRain	SureK	HarvestMoreUreaMate	Smart B-Mo	Smart Quarto Plus	Maximum NPact K
Newport, Arkansas	53.7 (4.7)	54.4 (4.5)	56.7 (6.3)	53.2 (7.1)	53.4 (7.9)	53.6 (8.4)	54.2 (8.2)
Pinetree, Arkansas	62.7 (7.0)	63.5 (6.8)	64.7 (5.5)	60.3 (6.3)	62.7 (2.3)	62.6 (6.4)	65.2 (4.1)
Florida	53.7 (5.4)	54.4 (11.3)	50.5 (14.6)	50.1 (10.2)	56.8 (5.2)	50.4 (8.1)	50.5 (8.6)
Lexington, Kentucky	67.6 (4.8)	60.1 (8.9)	65.6 (6.8)	---	58.3 (9.6)	61.9 (16.2)	60.5 (7.6)
Princeton, Kentucky	56.5 (4.1)	57.7 (14.0)	55.4 (6.7)	53.7 (12.2)	53.4 (7.5)	56.0 (8.5)	52.1 (7.8)
Michigan	34.1 (4.4)	31.4 (4.6)	35.9 (12.8)	33.0 (9.9)	32.2 (7.3)	35.0 (4.8)	33.6 (5.4)
Danvers, Minnesota	44.5 (5.6)	44.8 (4.6)	44.3 (10.3)	50.0 (6.7)	43.9 (6.7)	43.5 (12.6)	43.0 (9.1)
Minnesota Lake, Minnesota	53.4 (1.2)	52.5 (0.4)	54.2 (3.7)	52.7 (3.0)	51.0 (4.4)	55.1 (2.7)	53.3 (3.1)
Mississippi	27.2 (3.1)	26.4 (3.5)	27.2 (3.0)	27.5 (3.1)	27.2 (2.4)	29.5 (1.3)	26.8 (2.6)
Missouri	64.4 (2.4)	64.2 (3.9)	66.2 (2.4)	64.7 (1.8)	63.8 (3.4)	65.5 (1.8)	67.3 (2.9)
Currituck, North Carolina	77.0 (2.1)	76.4 (2.1)	72.5 (3.3)	73.6 (3.0)	75.9 (2.4)	77.0 (3.9)	76.7 (4.5)
Sampson, North Carolina	73.4 (3.9)	66.6 (3.3)	67.8 (4.9)	70.2 (3.5)	70.2 (4.9)	70.0 (5.4)	65.9 (7.8)
Yadkin, North Carolina	29.0 (7.1)	26.9 (2.8)	26.8 (5.0)	26.6 (4.5)	28.9 (7.5)	27.2 (1.9)	27.2 (4.2)
North Dakota	51.4 (9.0)	52.0 (5.9)	55.4 (4.5)	53.1 (5.3)	50.7 (7.5)	52.5 (7.7)	52.3 (4.8)
Ohio	75.2 (3.5)	73.9 (3.2)	74.9 (3.0)	76.1 (3.4)	75.1 (4.4)	75.2 (4.6)	75.7 (3.3)
South Dakota	55.5 (2.9)	54.4 (6.7)	56.4 (3.3)	53.5 (5.1)	53.5 (3.8)	55.6 (2.8)	56.1 (5.2)
Virginia	54.9 (9.2)	60.0 (7.0)	56.8 (10.2)	56.9 (7.0)	56.8 (7.1)	61.8 (3.8)	62.6 (4.8)
Arlington, Wisconsin	82.0 (4.7)	82.5 (6.6)	81.6 (6.9)	79.5 (7.3)	83.1 (4.1)	82.2 (5.9)	83.3 (4.7)
Fond du Lac, Wisconsin	54.9 (4.7)	53.2 (6.7)	50.5 (6.9)	56.5* (7.3)	58.4* (5.4)	53.8 (5.1)	**61.4** (6.8)
Marshfield, Wisconsin	47.5 (7.1)	42.0 (6.3)	43.8 (6.8)	50.5 (8.9)	46.9 (8.2)	41.0 (7.4)	45.6 (10.2)
Average (all sites)	55.9	54.9	55.4	54.8	55.1	55.5	55.7