Second quarter progress report FY21 - Kleinjan

National Soybean Fertilization Studies: I. Feed Me: Foliar Fertilizer Value for Soybean; II. Sulfur Fertilization Response in Soybean

Objectives:

1) Identify yield response in soybean to sulfur fertilizer and foliar nutrient applications (commonly marketed products).
2) Conduct economic analyses on the value of these products.
3) Extend results to soybean growers through extension networks.

Objective 1. Identify yield response in soybean to sulfur fertilizer and foliar nutrient applications (commonly marketed products).

In 2020, the sulfur study was performed at 19 locations in 7 states with three rates of ammonium sulfate applied (Dr. Shawn Conley, UW lead PI). The foliar feed project was performed at 26 locations throughout 14 states with six commonly marketed foliar fertilizer products applied (Dr. Rachel Vann, NCSU lead PI).

In South Dakota, both studies were planted in Brookings (high-yield environment) and Reliance (stressful environment). Plots were planted at both locations in mid-May. Soil samples were collected and sulfur fertilizer treatments were surface-applied within one week of planting. Foliar fertilizer treatments were applied with a backpack sprayer at the R3 growth stage (late July for both locations). Trifoliate samples were collected from each plot prior to and two weeks following foliar fertilizer application (Figure 1). Leaf samples were sent to the North Carolina Department of Agricultural and Consumer Services – Agronomic Division laboratory for analysis. Plots were harvested with a Kincaid plot combine in mid-October and grain samples were sent to the University of Wisconsin for analysis.

Sulfur Study

A visual representation of the data distribution/yields by treatment for the sulfur study is shown as boxplots in Figure 1. Soil test levels of S were 30 lbs/acre (High) and 16 lbs/acre (Low) at the Brookings and Reliance locations, respectively. While it appears there may have been a response to sulfur at the Brookings location, statistical analysis showed no differences in any fertilizer treatments at either Brookings ($Pr(> F) = 0.123$) or Reliance ($Pr(>F) = 0.308$)). Soil test levels of S were 30 lbs/acre (High) and 16 lbs/acre (Low) at the Brookings and Reliance locations, respectively. Results of this study suggest that a response to S in soybeans may not be predictable by soil test levels alone. A national summary has not been shared at the date of this report.

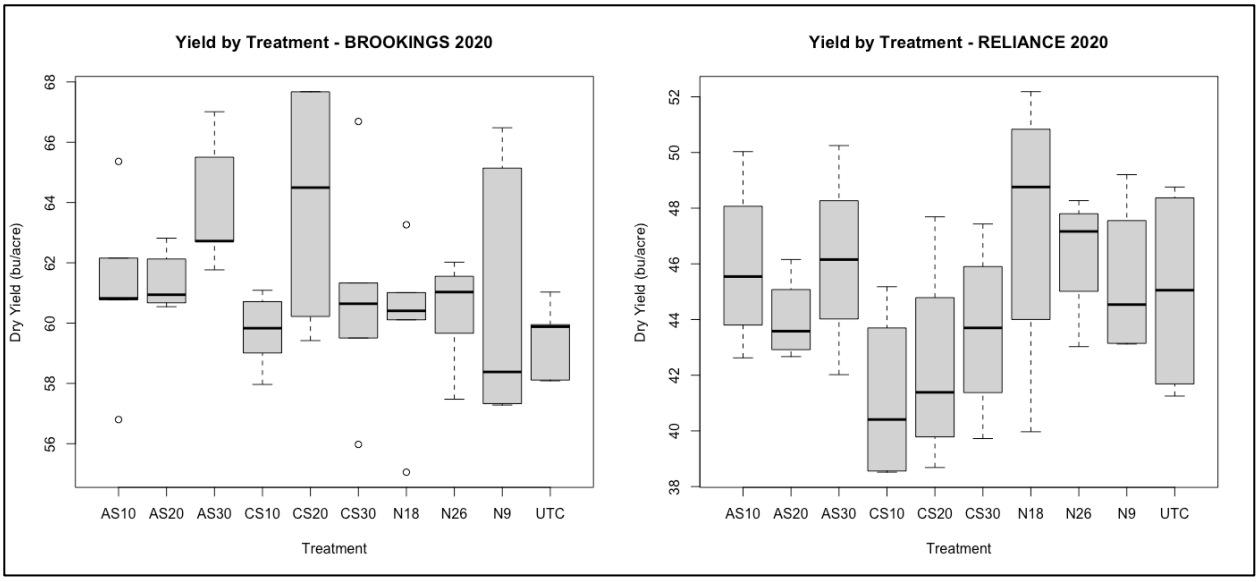

Figure 1. Soybean yields by fertilizer treatment for Brookings and Reliance, SD. Treatments: (AS = Ammonium Sulfate; CS = Calcium Sulfate; N = Urea; & rate, (eg. AS10 = 10 lbs/acre S from ammonium sulfate); UTC = untreated check).

Foliar Feed Study

Soil test values for the soybean foliar feed study locations are summarized in Table 1. Fertilizer products along with rates and nutrients supplied are summarized in Table 2. A visual representation of the data distribution/yields by treatment for the foliar fertilizer study is shown as boxplots in Figure 2. There were no significant differences between any of the treatments and the untreated check at either Brookings (Pr(> F) = 0.517) or Reliance (Pr(>F) = 0.389)). The outcome of this study seems to confirm results from the national study in 2019 where there was no response to foliar fertilization at nineteen of twenty environments. It is commonly theorized in the soybean extension specialist group that soybeans respond more to nutrients already in the soil rather than to relatively low rates of foliar nutrient application. At the time of this report, trifoliate tissue sample analysis has not been reported. In addition, a national foliar feed summary has not been shared.

Table 1. Soil test values for soybean foliar fertilizer study locations in SD.

Location	Soil texture	OM (%)	P (ppm)	K (ppm)	pH	CEC (meq/100g)
Brookings	clay loam	3.8	21	124	6.9	18.8
Reliance	silty clay loam	3.3	18	300	5.9	21.0

Table 2. List of foliar fertilizer products applied along with nutrients/rates supplied.

Treatment Name	N	P	K	S	Mn	Fe	Mo	Zn	B	Other
Check	-	-	-	-	-	-	-	-	-	-
FertiRain	3.5	0.9	0.9	0.5	0.02	0.03	-	0.03	-	-
HarvestMoreUreamate	0.1	0.25	-	-	0.01	-	0	0.01	-	Ca, Mg, B, Co, Cu
Maximum NPact K	1.9	-	1.9	-	-	-	-	-	-	-
Smart B-Mo	-	-	-	-	-	-	0.01	-	0.07	-
Smart Quarto Plus	-	-	-	0.04	0.08	-	0	0.08	0.06	-
SureK	0.6	0.3	1.7	-	-	-	-	-	-	-

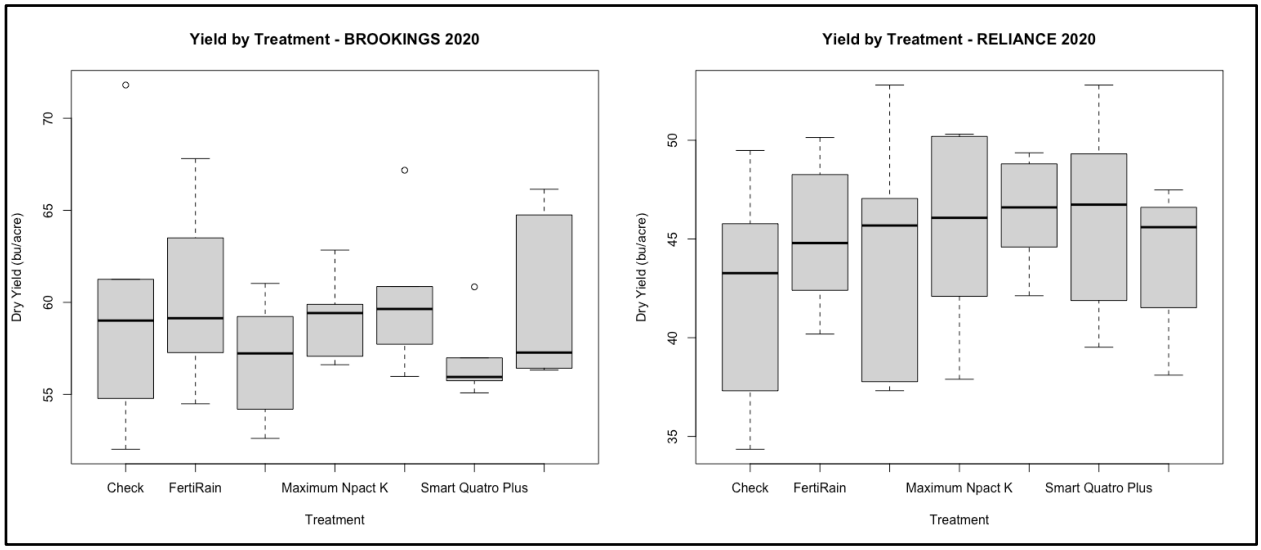

Figure 2. Soybean yields by foliar fertilizer treatment for Brookings and Reliance, SD. Note: due to space requirements not all treatments are listed.

Objective 2. Conduct economic analyses on the value of these products.

Due to the lack of response to treatments, there is no economic analysis planned for SD at this time. If national summaries indicate a response to either of the studies, an economic analysis will be performed at that time.

Objective 3. Extend results to soybean growers through extension networks.

South Dakota results will be shared with growers through winter talks (most likely virtual at this point), radio interviews, SDSU extension website publications, and social media during the January - May 2021 timeframe. I plan to discuss both projects on the SDSU Extension Crop Hour on 3/12/2021. Anthony Bly used some of the the data for a soybean fertility talk during the SDSU Extension Crop Hour on 1/21/2021 https://www.youtube.com/watch?v=q3-UNOJxeao&list=PLlldDb7IZYqKjH8R6mijQ6boYgNgDnwKN&index=11

I plan to write two articles for the SD Crop and Pest Newsletter during the 2021 growing season.

A national summary fact sheet will be published for each study and posted on the Soybean Research Information Network Website (https://soybeanresearchinfo.com/) likely in late 2021. Peer-reviewed publications will follow.

A virtual meeting of extension agronomists involved in the project will occur in March to discuss how to proceed with national publications.

Other Comments: Budget Report

To date I have $2,183.34 remaining in the grant fund. I still need to reallocate some travel and supplies expenses from my general activity account the past summer/fall to this grant. A portion of the travel was meant to help cover costs to a national meeting (Commodity Classic) which is no longer taking place. After a discussion with Adam Kask, it was determined that I could use these monies to pay for other travel expenses related to the project (There were more trips to Reliance than I budgeted for initially).