Fertility and Agronomic Resource Management Extension and Research for soybean (FARMERs) Program - 02-2022

Annual Report

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Background and Objectives

Near record high fertilizer prices has placed increased strain on already small profit margins. For this reason, up to date non-biased research data is necessary to ensure that all soil fertility management decisions are creating not only maximum yield but profitability as well. An example of this would be ensuring the any yield increases associated with micronutrient applications are similarly increasing net returns. Many growers in Mississippi also face K deficiency on a regular basis. As K is mobile in plant tissue and early detection is critical, we must ensure that tissue samples are being collected from the correct location in the plant canopy. Due to relatively flat landscape of the Delta region of Mississippi, flooding is a problem that many soybean growers must deal with on a fairly regular basis. After flooding events growers are looking for ways to accelerate soybean recovery. With this, many growers will make a foliar application of N with the belief that it supplements what has been lost from root inactivity and hastens recovery time. It is also crucial that research personnel continually collect production field level data to stay abreast of ever-changing soil conditions and be able to proactively prepare for possible issues. Specific objectives are 1) Data collection; 2) Establishing optimum tissue sampling location within a plant canopy for early deficiency detection of plant-mobile nutrient potassium; 3) Establishing optimum boron fertilizer application rates and timings for soybean grown on soils ranging from clay to sandy loam; 4) Determine the effect of foliar N applications on soybeans subjected to flooding during the late vegetative to early reproductive growth stages; and 5) Provide first-hand learning opportunities for existing and new soil fertility programs.

Report of Progress/Activity by Objective

Across the Delta 6 different fields were sampled to a depth of 12 inches to aid in understanding current soil fertility conditions of soybean production fields. Samples were split into depths of 0-6 and 6-12 inches for analysis. Average soil fertility levels for all 6 locations are shown in Table 1. Across all locations, variation in nutrient levels between the 0-6- and 6-12-inch depths varied only slightly. Possibly aiding the growers in obtaining the yields they made. Across all locations soybean grain yield averaged 74 bushels/acre.

Potassium rate trials were implemented in Stoneville and Starkville, MS to determine the optimum tissue sampling location for early detection of potassium deficiency. Neither location was responsive to K rate and averaged 74 bu/a in Stoneville and 56 bu/a in Starkville. Being non-responsive sites also meant that no deficiency was observed and is supported by tissue samples. At each sample timing, tissue K concentrations were within .3% of each other at the top and bottom of the plant sampling locations (Figure 1).

On the sandy loam soil in Stoneville, applying 0.25 lbs/a of Solubor at the R1 & R3 growth stages increased yield 6.5 bu/a compared to the control and applying 0.5 lbs/a of Solubor Flow at the R1

growth stage increased yield 6.2 bu/a compared to the control. No other treatments were statistically different from the control. On the clay soil in Stoneville and at the site in Starkville, there were no differences between treatments. This preliminary data indicates that sandier soils in the Delta may benefit from foliar B applications during the early reproductive stages while clay soils in the Delta and soils in the hills have sufficient B for soybean production.

There were no differences between treatments following the flooding and foliar N applications. We hypothesis that the lack of treatment response is due to the limited depth of the flood, an exceptionally hot and dry year which made maintaining the flood for required durations difficult and a potentially low N rate. We are reevaluating field layout to get taller levees for greater flood depth as well as easier flood management and the N rate used for 2023.

During the 2022 growing season soybean fertility information was shared with local producers on numerous occasions. Ten on-farm evaluations/consultations were performed with area producers to address soil fertility concerns and potential nutrient deficiency scenarios. Information regarding nutrient deficiency symptomology was presented at three scout schools to instruct crop scouts on what symptomology to look for and how to differentiate between nutrient deficiencies common to soybean grown in Mississippi. Information was also shared with soybean growers at 5 producer meetings conducted throughout Mississippi.

Tables and Graphs

Table 1. Average soil nutrient levels across 6 locations in the Mississippi Delta at 0-6 and 6-12 inches.

Depth	Nutrient								
	P	K	Ca	Mg	Na	Zn	Mn	S	pH
	lbs/a								
0-6”	140	429	5,666	1,069	57	3.33	80	189	6.9
6-12”	144	327	4,814	865	48	3.35	69	167	6.9

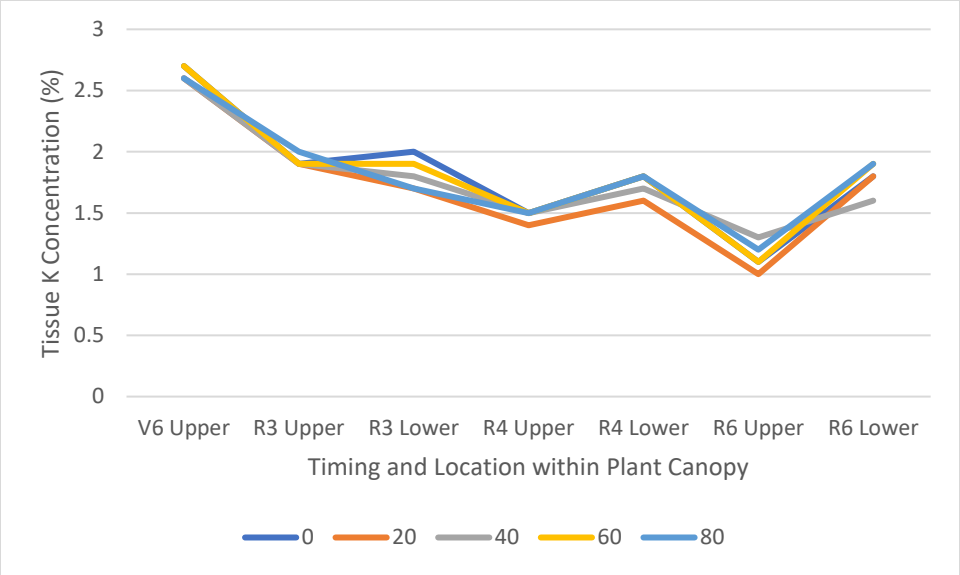

Figure 1. Average soybean tissue K concentration from 5 K fertilizer rates collected in either the upper canopy (upper most fully developed trifoliate) or lower canopy (lower most fully developed trifoliate) across 7 sample timings.