

Please use this form to clearly and concisely report on project progress. The information included should reflect quantifiable results that can be used to evaluate and measure project success. Comments should be limited to the designated boxes. Technical reports, no longer than 4 pages, may be attached to this summary report.

Project Number:	
Project Title:	Soybean yield components and seed nutrient concentration responses among nodes to phosphorus fertility
Organization:	University of Arkansas & Louisiana State University
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Report Date:	3 rd Quarter, 2023

In the Progress Summary section below, please provide a brief summary of project progress in lay language that will be shared publicly in the [National Soybean Checkoff Research Database](#). Do not include any confidential or proprietary information. If no lay language is provided, the contents of this entire report will be published in the [National Soybean Checkoff Research Database](#).

Progress Summary (in non-proprietary lay language suitable to be shared publicly):

The project's objectives are to evaluate the effects of phosphorus (P) nutrition on irrigated soybean seed yield, selected yield components (seed weight, pod and seed numbers, and seed abortion among nodes), the patterns of tissue-P concentration across time, and seed nutrient concentration among nodes. The project is being conducted on soils having very low soil-test P at the LSU AgCenter's Macon Ridge Research Station in Winnsboro, LA, and the University of Arkansas Division of Agriculture's Rice Research Extension Center near Stuttgart, AR. The project was started in 2021, and the results from three site years are consistently showing that plants receiving no-fertilizer P have lower leaf-P concentrations at early reproductive stages, lower seed weight, and fewer pods and seeds across node sections than the fertilized treatments. Seed abortion followed a similar trend as soybean yield components, with the highest-yielding node sections also having the greatest seed abortion indicating potential competition for P or other resources among developing seeds.

Detailed Progress Status – Expand upon the above section. What key activities were undertaken and what were the key accomplishments during this reporting period? List each key deliverable from the proposal and describe progress made (or not made) toward achieving it, including metrics were appropriate.

2023 Project Update

Three field trials with five fertilizer-P rates (0, 40, 80, 120, and 160 lb P₂O₅/acre) applied as triple superphosphate (TSP, 0-46-0) were established in Louisiana and Arkansas to address the study objectives.

Two P fertilization trials were established in 2023 in Louisiana on a Gigger-Gilbert silt loam soil with Low soil-test P at the LSU AgCenter – Macon Ridge Research Station (MRRS), Winnsboro, LA. Fertilizer-P treatments were broadcast on the top of the seedbed before planting. At site 1 Dyna-

Gro S47XF23S soybean variety was planted on May 18 and at site 2 Progeny 4604XFS was planted on June 5 on 40-in. spaced seed beds. Each experimental plot is 35-ft long x 13.33-ft wide and consists of 4 rows. The experiments were designed as a randomized complete block with 4 replications. The P fertilization trial established site 1 was irrigated with groundwater rich in salts which caused severe plant injury and compromised the experiment. Therefore, the investigators decided to abandon the trial and not analyze the leaf samples that were collected and not measure yield components among node sections. Site 2 was not affected by irrigation water, and therefore whole plant samples were collected to evaluate yield components and grain yield response to P fertilization was determined.

The Arkansas trial was conducted within a long-term trial established in 2007 at the Rice Research Extension Center (RREC) in Stuttgart, AR on a Dewitt silt loam with mean soil-test P varying from Very Low to Above Optimum among fertilizer-P rate treatments. The trial has a randomized complete block design with 6 blocks, is cropped to rice and soybean rotation under no-tillage, and fertilizer-P treatments are applied to the same plots annually. Individual plots measure 15-ft wide and 25-ft long, which allows at least two passes with a small plot (8- or 9-row) drill with 7.5-in. row spacings. The Pioneer 52A14SE soybean variety was planted on May 15.

Soybean showed visual plant height differences between the no-P control and fertilized treatments since early vegetative growth stages at both locations, being consistent with previous trials in 2021 and 2022. Soybean leaf-P concentration was affected by fertilizer-P rate and sampling time at the RREC, supporting the results from the 2021 and 2022 growing seasons. Overall, the greatest leaf-P concentrations were observed at the R1 and R2 growth stages, and then consistently decreased throughout the season with the control presenting the lowest leaf-P concentrations. Phosphorus availability positively affected soybean yield, with the 40 and 80 lb P₂O₅/ac rate treatments producing 8.5 and 14% greater yield than the no-P control in Arkansas, respectively, and the 80 lb P₂O₅/ac rate producing 12% greater yield than the 0 and 40 lb P₂O₅/ac treatment in Louisiana. Selected yield components among node sections are currently being evaluated and thereafter the seeds will be processed for nutrient analysis.