BOARD MISSION

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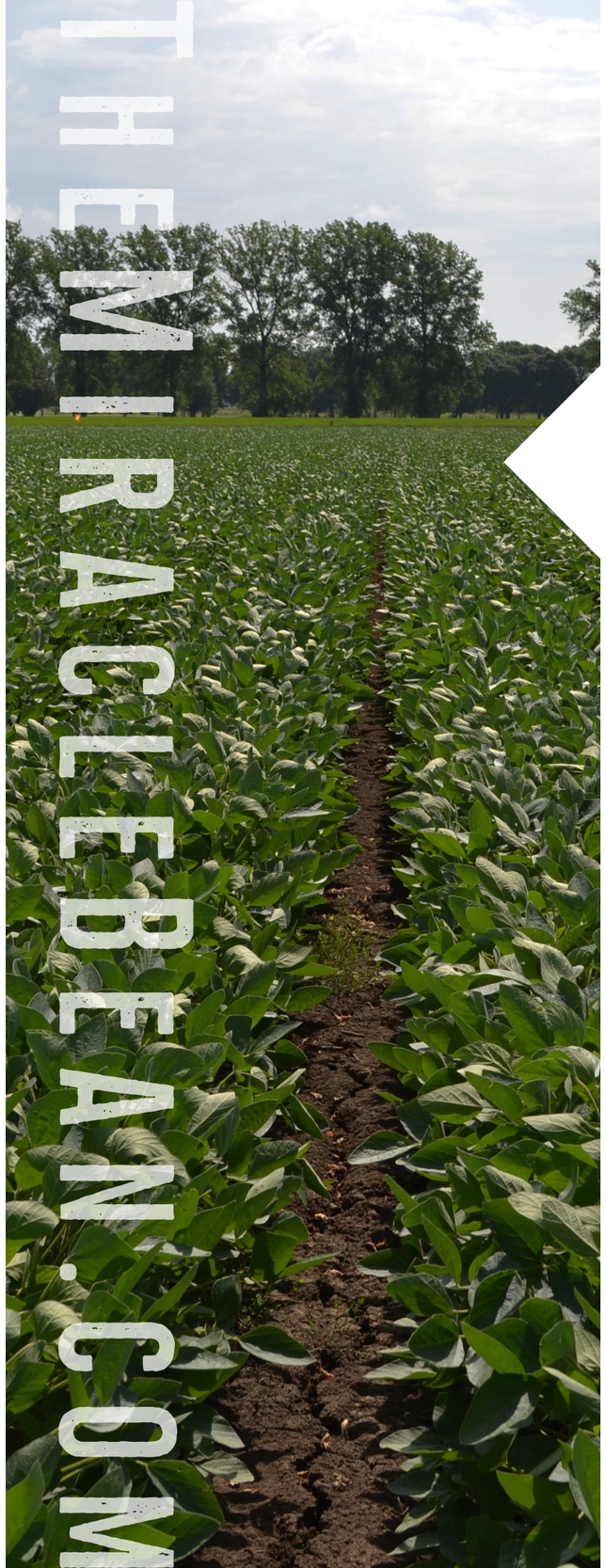
The Arkansas Soybean Promotion Board was established to improve the sustainability and profitability of the soybean industry in Arkansas. This board is responsible for distributing funds from the checkoff.

ARKANSAS SOYBEAN PROMOTION BOARD



2021 ARKANSAS CHECKOFF-FUNDED RESEARCH REPORT

CELEBRATING 50 ARKANSAS SOYBEAN PROMOTION BOARD

ARKANSAS SOYBEAN PROMOTION BOARD

TheMiracleBean.com

YOUR CHECKOFF INVESTMENT

When high-yielding harvests are not enough to secure success for today's soybean producers, checkoff dollars help ensure a strong, profitable future for producers by driving demand at home and abroad.

Administered by the *United Soybean Board*, producers invest 0.5% market price per bushel, known as a checkoff, into a fund. Used for research, market development, promotion and expansion, the *Arkansas Soybean Promotion Board* manages half of all checkoff dollars collected in the state and the USB adds the rest to the national checkoff fund.

Led by 78 volunteer farmers and directors, the USB is based in St. Louis, Missouri with activities monitored by paid staff. Nominated by their state's soybean board, or Qualified State Soybean Boards, they are appointed by the U.S. Secretary of Agriculture. Three members of the USB's board of directors hail from Arkansas.

SOYBEANS IN ARKANSAS

Traditionally one of the largest agriculture enterprises in the state with more than 3-million acres of soybean fields in 56% of the counties, Arkansas is one of the top 10 soybean producing states in the country.

- Animal agriculture is the number one customer of soybean, 98% of soybean meal feeds livestock and poultry.
- Broiler chickens consume about 40% of the domestic supply of soybean meal.
- Approximately 30% of soybeans are considered a double crop. Following spring's wheat harvest, soybeans are planted, allowing the harvest of two row crops in one year.
- Optimum planting in Arkansas is between May 5 – July 5 and soybeans will be harvested between October 15 and November 20.
- Irrigation-furrow via flood and sprinkler is common practice across more than 2 million acres of soybeans.

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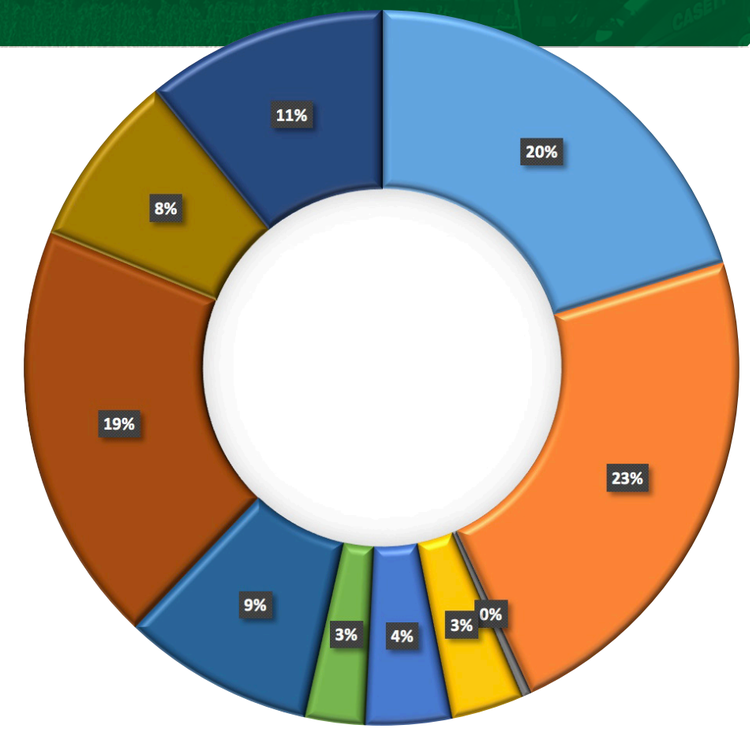
2021 ARKANSAS SOYBEAN PROMOTION BOARD RESEARCH ALLOCATIONS



Agronomy	$498,173	Irrigation	$212,847
Breeding	$564,333	Plant Pathology	$468,638
Economics	$10,080	Verification	$194,661
Education	$80,599	Weeds	$268,634
Entomology	$96,347	Research Total	$2,461,277
Fertility	$66,965		

Approved March 2021

Meet the Board Members

DONALD MORTON JR., CHAIRMAN

Donald Morton Jr. never wondered about the path he would take. Farming was a part of his past, and he wanted it for his future. A third-generation farmer, Donald started on his own in 1992 with 800 acres. After 29 years, his operation has grown 275% to 3,000 acres. He shares it with his wife, their children and their grandchildren. Donald hopes to see farming continue in his family.

JOHN FREEMAN, VICE CHAIRMAN

When John Freeman said goodbye to his hometown of Dumas, Arkansas and hit the road to attend college almost eight hours away, he had little interest in careers outside of farming. He grew up on a farm and helped his dad in high school. And as the saying goes, "Farming gets in your blood." In 1989, after graduating from the University of Arkansas with an ag business degree, he planted his first crop.

His dad wasn't the best at yields, but he instilled a great farm ethic in John. John also credits Phil Tacker and Lanny Ashlock for influencing his approach to farming. But most of what John learned came from hands-on experience in the fields. He said, "It's one thing to sit in a class. It's another to apply textbook and practical knowledge."

DOUG HARTZ, SECRETARY

For those in the soybean industry, the Hartz name started it all. For Doug Hartz, his last name means the tradition his grandfather, Jacob Hartz Sr., started 95 years ago when he planted the first soybean crop in Arkansas. Doug says, "It's pretty awesome to know your grandfather introduced soybeans to Arkansas in 1926."

In college, Doug majored in agronomy and minored in business. After graduating, he worked in the family seed business, Hartz Seed Company, before moving to Hartz Agriculture Services, the family's farm management and real estate business. Farming the land the family owned and the land they managed, Doug served as a field agronomist and salesman.

Today, Doug is keeping the family business going and keeping the Hartz name in Arkansas soybeans by serving as the eyes and ears of the land and assets Hartz Agriculture Services manages.

RUSTY SMITH

Rusty Smith was raised with respect for agriculture, but he didn't grow up on a farm. His father worked for the University of Arkansas Division of Agriculture Extension Service, and Rusty earned his bachelor of science in agronomy. After graduation, he began working in chemical sales with a regional company. In 1989, Rusty found his love of farming and he's followed that path every day since with his wife Sarah, who is a third-generation farmer.

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JOSH CURETON

As a sixth-generation farmer, Josh Cureton has been working alongside his family on their property near Cash, Arkansas his whole life. According to him, farming is in his blood, and it is something he's known he has wanted to do since a very early age.

Josh gained the practical skills it takes to grow a crop from his father, and supplemented that knowledge with a bachelor's degree in agriculture he earned at Arkansas State University, where he graduated cum laude.

For Josh, his interest in agriculture stems from his love of growing things and watching new life emerge. This extends to his family, to which he says his work is dedicated, remarking how his efforts allow him to provide his wife and children a good life and opportunities for the future.

WEST HIGGINBOTHOM

West Higginbothom is a third-generation farmer who returned to his family's Marianna farm in 2009. When he graduated from the University of Arkansas, West wasn't ready to return to farm life, and his father encouraged him to try a career outside of agriculture.

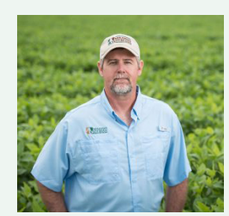
After college, he took his degree in business finance and insurance to a Washington, D.C., mailroom. He paid his dues and was eventually called up to work in ag policy for three different senators, including Arkansas's Blanche Lincoln. He then helped Georgia's Zell Miller with the 2002 Farm Bill before working exclusively for Mississippi's Thad Cochran.

Time ticked by, and the clock struck 10 years. West and his wife, who met in D.C., were ready to start a family and decided to move closer to their own. West got to keep his fingers in agriculture through farm bills, but he was ready to rejoin his father on the farm.

DEREK HELMS

When it comes to understanding the complexity of the agriculture industry, Arkadelphia dairyman and soybean producer Derek Helms is one of the most well-versed advocates around. Managing a diversified operation in Clark County has given Derek valuable insight into the many ways in which soybeans are marketed and utilized; from livestock feeds to biodiesel and everything in between. As a member of the Arkansas Soybean Promotion Board, Derek's goal is to facilitate a greater connection between our farmers, researchers, and consumers while promoting opportunities that showcase the versatility of soybeans.

Derek holds an ag business degree from Southern Arkansas University and is a board member of his local Farm Bureau and the Clark County Cattlemen's Association. He enjoys educating people about the soybean industry as much as he does learning about the latest research and advancements in soybean production. However, his favorite part about being a soybean producer is harvesting his crop and reaping the reward of his hard work each year.



JOE THRASH

Joe Thrash said he spent his childhood on the farm with his dad, wearing the paint off the fenders of a few tractors. A third-generation farmer, he didn't know what else there was to do, but after high school, Joe packed up and headed to the University of Arkansas to pursue a career in agronomy. It didn't take long for him to realize home is where the farm is.

SHANNON DAVIS

Shannon Davis is a soybean grower from Bono, Arkansas. Davis has served on the Arkansas Soybean Promotion Board for nine years and is active in a variety of leadership roles in his community.

RESEARCH FEATURE

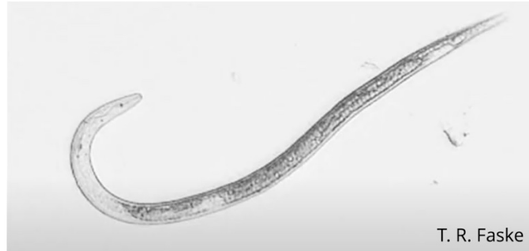
Arkansas Research Arms Soybean Farmers Against Southern Root-Knot Nematodes

By Laura Temple, Soybean Research Information Network

Soil harbors countless beneficial microorganisms that help plants thrive. But it also harbors plant-killers. In Arkansas and other areas of the Mid-South, the southern root-knot nematode decimates soybeans.

"Nematodes are tiny, non-segmented round worms," explains Dr. Travis Faske, professor and Extension plant pathologist with the University of Arkansas. "Just a few species are plant-parasitic, meaning they feed on and damage crops. But the southern root-knot is the number one plant-parasitic nematode in Arkansas."

This nematode can cause dead spots in soybean fields with 50 to 100% yield reduction. Faske leads ongoing research funded by the Arkansas Soybean Promotion Board to identify management options to help soybean farmers fight southern root-knot and other nematode problems.



T. R. Faske

> *"The southern root-knot is the number one plant-parasitic nematode in Arkansas."*

"Most nematode management strategies focus on soybean cyst nematode, which can be a problem in the Mid-South," he says. "We focus on southern root-knot nematode."

The Arkansas video collection from the SCN Coalition's "Let's Talk Todes" series features Faske discussing southern root-knot nematodes. Part of their challenge is that all the primary crops grown in the region – soybeans, cotton, corn, grain sorghum and rice – serve has hosts for the nematode and are susceptible to damage. Peanuts are the only non-host crop grown in the region, though the prolonged flooding of rice can drown them and reduce populations in those fields.

How do farmers know if they have these nematodes in their fields?

They aren't visible to the naked eye, and in soybeans symptoms show up late in the season, usually under the heat and stressful conditions in August. The Arkansas Soybean Promotion Board funds free soil assays to Arkansas farmers as part of this project so they know where they need to protect against these pests.

"Nearly every soybean-growing county in Arkansas has southern root-knot nematodes," Faske says. "While they aren't in every field, soil testing tells farmers where they need management strategies. Tests also allow us to monitor their spread."

CONSISTENT EFFICACY RATINGS

In response to the challenges of southern root-knot nematodes, many control options have been developed. Faske evaluates seed-applied nematicides, biologicals, soybean cultivars and combinations of these options. His results help farmers decide how to manage fields with known southern root-knot nematode pressure. In addition, this project includes determining the impact of reniform nematodes, another plant-parasitic species that is spreading in the Mid-South.

"We've been doing this research for more than a decade," Faske says. "But several seed-applied nematicides have been developed over that time, soybean breeding continues to develop new cultivar lines and other biological and foliar plant growth treatments claim to impact nematodes. Farmers want to know how well these treatments work, and we try to answer that question."

Resistance to southern root-knot nematodes or effectiveness controlling them can be subjective. Faske and his team evaluate every option they can find to provide a consistent measure of effectiveness. His trial plots now cover 13 acres in cooperating farmers' fields with known heavy southern root-knot nematode pressure. The team monitors soybean roots to rate the percent of galls, or knots, this nematode creates on them.

"The galls each hold a female nematode that is stealing water and nutrients from the soybean to reproduce," he explains. "When soybeans experience stress from hot, dry Arkansas weather, they can't overcome that competition for resources with the nematodes and die early."

The percentage of soybean roots with galls objectively shows the degree of variety resistance or the effectiveness of seed-applied nematicides. All trials are taken to yield, as well. Faske shares results with farmers through University of Arkansas Research and Extension publications and blog posts.

Those southern root-knot nematode ratings help farmers stay profitable, according to Doug Hartz, a professional farm manager based in Stuttgart and member of the Arkansas Soybean Promotion Board.

"One of the farmers I work with who operates one of our client's properties was ready to stop renting this farm because of the well-below-average soybeans yields it produced," Hartz says. "The farm had known southern root-knot nematode pressure. Although the farmer chose varieties rated resistant by suppliers, the soybeans weren't performing in the field."

Hartz connected with Faske's team and offered a field as a trial location in 2016. And since then, the farmer chooses varieties based on gall ratings and yield data from Faske's trials.

"Soybean yields on that farm have increased 20% or more by using Faske's data," Hartz says. "The cooperation between the farmer, landowner and researcher allowed us to get more accurate in-field ratings to manage southern root-knot nematode, and reinforces the value of independent research. That demonstrates exactly what the Arkansas Soybean Promotion Board tries to do with checkoff investments. We support research that keeps farmers on the leading edge."

The Arkansas Discovery Farm Program

INVESTIGATORS:
Mike Daniels,
Andrew Sharpley

GOAL: Document sustainable and viable row-crop farming systems on real, working farms that promote agricultural profitability and natural protection.

VALUE TO SOYBEAN INDUSTRY: Little to no data exists that addresses natural resource sustainability associated with row crop agriculture in Arkansas. Documenting environmental impacts of Arkansas farming systems, as well as evaluating the efficacy and cost-effectiveness of alternative practices, will bridge a knowledge gap that now keeps farmers, natural resource managers and decision-makers alike from confidently taking effective actions that ensure both economic and environmental sustainability.

Developing Profitable Irrigated Rotational Cropping Systems for Arkansas

INVESTIGATORS:
Jason Kelley, Jeremy Ross

GOAL: Evaluate economics and feasibility of eight rotational cropping systems under irrigated conditions at the Lon Mann Cotton Branch Station near Marianna.

VALUE TO SOYBEAN INDUSTRY: Long-term crop rotation studies involving corn/soybean rotations have primarily been confined to the Midwest. In Arkansas and the Mid-South region, most of the crop rotation studies in past years have focused on cotton. Past research typically has shown a 5-15% greater cotton yield the year following corn. Reasons listed for increased cotton yields generally involved reduction in reniform nematodes, less disease pressure and/or increased soil fertility, or unknown reasons. As cotton acreage declines and soybean, corn, grain sorghum and wheat are planted on those acres, and as corn acreage expands into typical rice/soybean rotation systems, more information is needed for producers as to which crop rotation sequence produces the greatest yields and profitability under Mid-South irrigated conditions.

Field-Based Determination of Chloride Tolerance in Soybeans

INVESTIGATOR:
Trenton Roberts

GOAL: Implement a field-based assessment of chloride tolerance in soybean which will provide a more accurate representation of which soybean cultivars are classified as includers, excluders and mixed reaction types.

VALUE TO SOYBEAN INDUSTRY: Clarifying whether a variety is truly a Cl includer or excluder is important to soybeans produced on poorly drained soils in areas with irrigation water having high Cl (most of eastern Arkansas). The current greenhouse screening method does not provide a robust rating system for varieties. A field screening technique is logical, time efficient, and a method that can be easily adopted by any seed company for in-house variety screening. The data collected from these trials will be compiled with other cultivar evaluation to provide Arkansas soybean producers with reliable field-based information to make well informed cultivar selection decisions.

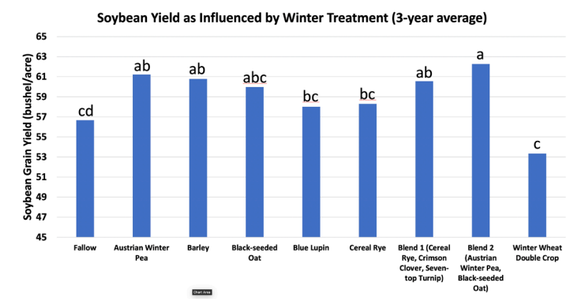
Influence of Cover Crops and Soil Health on Soybeans

INVESTIGATOR:
Trenton Roberts

GOAL: To investigate the short-term and long-term benefits of cover crop implementation on corn and soybean yield, nutrient use efficiency, water use efficiency and soil health.

VALUE TO SOYBEAN INDUSTRY: Winter cover crops have been promoted based on the environmental benefits of reduced erosion and nutrient loss. Limited work has been done to date on species selection and cultural management practices for effective use of winter cover crops in Arkansas corn and soybean rotational systems. Identifying the correct species, planting date and fertilization needs are essential for effective cover crop use and continued profitability of our soybean production systems. Costs and challenges of winter cover crops will be easily offset by:

1) the potential decrease in fertilizer needs
2) improved soil conditions that lead to better growth or reduced irrigation needs and
3) reduction in environmental impacts that threaten the long-term sustainability of Arkansas corn and soybean production.



Inclusion of winter cover crops can have both short-term and long-term impacts on corn and soybean production. Understanding cover crop species selection and cultural management practices is one of the most important steps in realizing the benefits of their effective use.

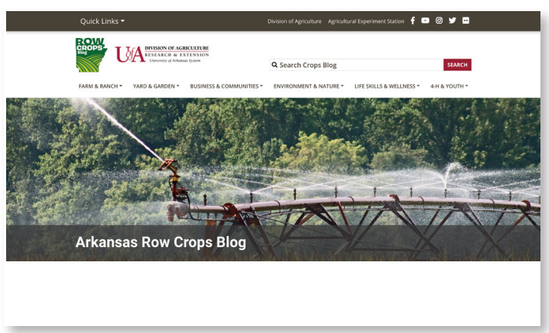
Improving Technology Transfer for Profitable and Sustainable Soybean Production

INVESTIGATOR:
Jeremy Ross

GOAL: To ensure the timely development and distribution of the Soybean Update and other soybean production publications. Improve the rate of technology transfer and adaption by the implementation of educational programs that impart critical decision-making information. Continue to coordinate state and regional meetings to facilitate the latest soybean production updates. Publication of the Soybean Research Series.

VALUE TO SOYBEAN INDUSTRY: Each year, the University of Arkansas Division of Agriculture tests over 200 different soybean varieties and experimental lines. Timely distribution of this information is vital for producer decision making of varieties. Every three years, Arkansas hosts the Tri-State Soybean Forum, which brings in soybean producers and industry personnel from Arkansas, Louisiana, and Mississippi to hear current research results. The Arkansas Soybean Research Series is a repository for yearly research results from projects funded by the Arkansas Soybean Promotion Board.

Available at:
https://arkansascrops.uada.edu/default.aspx



Investigating Emerging Production Recommendations for Sustainable Soybean Production

INVESTIGATORS:
Jeremy Ross, Gus Lorenz

GOAL: Investigate new and untested management inputs to improve soybean production using the Full Season Soybean Production System.

VALUE TO SOYBEAN INDUSTRY: Each year Arkansas soybean producers are encouraged by industry representatives and salesmen to implement new and often untested management inputs to improve soybean production. The lack of an effective testing program for these materials can lead to uninformed applications. This project seeks to test recommended applications and provide scientifically tested results to growers for consideration on their own operations.

Purification and Production of Pre-Foundation Seed of UA Soybean Lines

INVESTIGATORS:
Leandro Mozzoni and Glenn Bathke

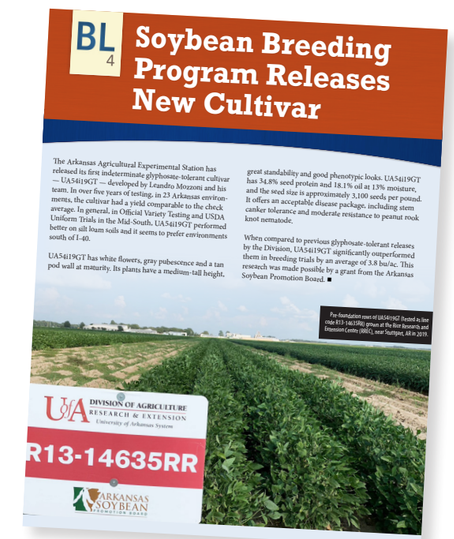
GOAL: Purify and maintain seed of released cultivars and germplasm lines for foundation seed production. Purify and increase breeder seed of promising breeding lines in preparation of release.

VALUE TO SOYBEAN INDUSTRY: Maintain the genetic purity of UA soybean breeding lines and cultivars, and provide high-quality products to seed dealers and Arkansas farmers.

Utilizing Chloride Tolerance Markers and Phenotypes to Develop Improved Varieties

INVESTIGATORS:
Ken Korth,
Leandro Mozzoni

GOAL: Develop tools and soybean breeding materials that will result in improved selection of existing varieties, and/or development of new varieties, with enhanced tolerance to environmental stresses such as chloride toxicity.


BL 4

Soybean Breeding Program Releases New Cultivar

The Arkansas Agricultural Experimental Station has released its first indeterminate glyphosate-tolerant cultivar — UA5415GT — developed by Leandro Mozzoni and his team. In over five years of testing, in 23 Arkansas environments, the cultivar had a yield comparable to the check average. In general, in Official Variety Testing and USDA Uniform Trials in the Mid-South, UA5415GT performed better on silt loam soils and it seems to prefer environments south of I-40.

UA5415GT has white flowers, gray pubescence and a tan pod wall at maturity. Its plants have a medium-tall height, great standability and good phenotypic looks. UA5415GT has 34.8% seed protein and 18.1% oil at 13% moisture, and the seed size is approximately 3,100 seeds per pound. It offers an acceptable disease package, including stem canker tolerance and moderate resistance to peanut root knot nematode.

When compared to previous glyphosate-tolerant releases by the Division, UA5415GT significantly outperformed them in breeding trials by an average of 3.8 bu/ac. This research was made possible by a grant from the Arkansas Soybean Promotion Board. ■

Pre-foundation rows of UA5415GT (tested as line clip R13-14635RR) grown at the Rice Research and Extension Center (RREC), near Stuttgart, AR in 2019.

DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

R13-14635RR

ARKANSAS SOYBEAN PROMOTION BOARD

VALUE TO SOYBEAN INDUSTRY: Breeding lines have been regularly screened for chloride uptake and salt sensitivity, and the best evidence for impact has been the release of multiple varieties that are chloride-excluders for commercial production. Our recent work on DNA markers should help us determine the accuracy of variety designations as includer vs. excluder, and to know the level of salt-tolerance variation within populations.

Breeding New and Improved Soybean Cultivars with High Yield and Disease Resistance

INVESTIGATOR: Leandro Mozzoni

GOAL: Develop high-yielding MG 4-5 cultivars (conventional and glyphosate tolerant) adapted to various environments and production systems in Arkansas. Develop new varieties and germplasm with resistance to soybean cyst nematode (SCN), root knot nematode (RKN), sudden death syndrome (SDS), stem canker (SC) or frogeye leaf spot (FLS).

VALUE TO SOYBEAN INDUSTRY: UA breeding program provides high-yielding cultivars with low costs to growers and seeds for the conventional and GT (RR1) cultivars can be saved and re-used for planting. UA soybean releases have also served as crossing materials for public and private breeding programs.

Breeding Soybean Under Reduced Irrigation Conditions

INVESTIGATORS: Leandro A. Mozzoni, Larry C. Purcell, Christopher G. Henry

GOAL: Assess if different irrigation conditions at reproductive stages influence the breeding decisions of prioritizing populations and selection within breeding populations.

VALUE TO SOYBEAN INDUSTRY: Help breeders understand how to better breed and select for soybean cultivars adapted to various water regimes, and to develop a practical genomic selection tool that allows for the effective selection for yield and drought traits that are controlled by a large number of genes.

Francis Ravelomboia, graduate student

Soybean Germplasm Enhancement Using Genetic Diversity

INVESTIGATOR: Leandro Mozzoni

GOAL: To introduce genetic diversity for yield from exotic plant introductions (PIs) and from elite germplasm into high-yielding lines adapted to Arkansas environments. Incorporate unique traits of interest, including grain quality, disease and stress tolerance, early maturity and indeterminacy from diverse germplasm into elite Arkansas cultivars and lines using various breeding and selection schemes.

VALUE TO SOYBEAN INDUSTRY: Increase yield potential by developing locally-adapted cultivars/germplasm with diverse genetic traits for yield, maturity, increased adaptation, stress tolerance, pest and disease resistance, and quality attributes.

Utilization of Chile for Winter Nursery Progeny Rows to Supplement MG4 Soybean Variety Development

INVESTIGATOR: Leandro Mozzoni

GOAL: To utilize a winter nursery in Chile for growing MG4 progeny rows and reselection rows to support the transition into 80% MG4 commodity variety development by 2021.

VALUE TO SOYBEAN INDUSTRY: The UA soybean breeding program has been providing high-yielding MG5 cultivars at low costs to growers, but it needs to rapidly expand the footprint in early maturities. Utilizing a winter nursery for progeny rows will enable us to perform two cycles of selections on a given calendar year, thus reducing the number of years it takes to bring MG4 soybean varieties to the market.

Evaluation and Identification of Early-Maturing Soybean with Drought and Heat Tolerance

INVESTIGATORS: Larry Purcell, Leandro Mozzoni

GOAL: Develop breeding lines from populations segregating for drought tolerant traits. Evaluate yields of elite lines selected for high water use efficiency and high germinability. Introgress heat tolerance, high germinability into the UA Soybean Breeding program.

VALUE TO SOYBEAN INDUSTRY: Early-planted and early-maturing (MG 3 and 4) soybean have a demonstrated track record for having high yields and decreased irrigation requirements compared with full-season soybean, but seed from early-maturing varieties often has poor germination and wrinkled seed that may be docked. The research proposed is a long-term effort to develop drought tolerant MG4 varieties that produce high-quality seed when maturing under these stressful conditions.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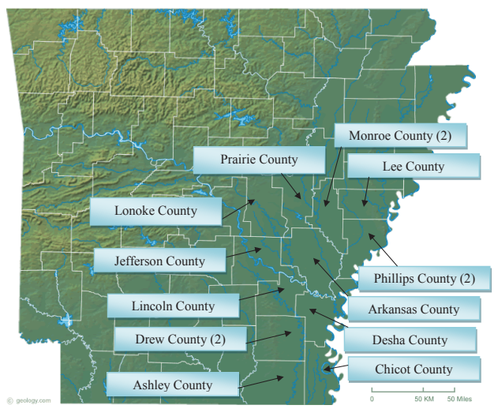
ECONOMICS

Economic Analysis of Soybean Production Practices

INVESTIGATOR: C. Robert Stark Jr.

GOAL: Conduct an economic analysis of 2020 SRVP production practices. Standardize economic analysis by integrating 2019 verification data with data from previous years and make interstate comparisons. Expand current economic assistance and interpretation of agronomic results for projects previously funded by or proposed to ASPB. Conduct economic analysis of 2018 Farm Bill provisions specific to Arkansas soybeans.



VALUE TO SOYBEAN INDUSTRY: This 2021 project extends previous SRVP work to address requested irrigation and weed control issues. Benefits from economic analysis of alternative soybean production strategies assist producers in identifying opportunities to adjust individual costs and incomes while providing a significant reduction in the risk levels that producers face. Maintenance of a historical database of annual SRVP data provides valuable time series soybean data for extended research. Economic analysis of Board-funded production projects adds value to the projects and increases the return for check-off dollars invested. Results enable producers to make management decisions based on profit maximization rather than just maximizing yield.

Soybean Enterprise Budgets and Production Economic Analysis

INVESTIGATORS: Breana Watkins

GOAL: Provide soybean enterprise budgets that are flexible for representing alternative production practices of Arkansas producers. Costs and returns analyses with budgets are extended by production economics analysis to investigate factors impacting farm profitability.

VALUE TO SOYBEAN INDUSTRY: Profitability is always on the mind of soybean producers. Because of the complexities of inputs and markets, tools need to be developed beyond the "back of the envelope" calculations. This budget template allows the collection costs of machinery and other inputs and allows producers to determine the benefit of alternative practices. Monthly reports of market fundamentals that determine commodity price outlook are also produced. Whole farm budgets are produced for financial and public policy fundamentals.

EDUCATION

Soybean Science Challenge

INVESTIGATORS: Julie Robinson, Karen Ballard

GOAL: To engage Arkansas high school science students and teachers statewide in "real world" Arkansas-specific soybean science education through original curriculum and a continuum of educational methods that include: classroom instruction, lab instruction, online and virtual live-streaming education, personal mentoring, student-led research and award recognition, and partnerships with state and national educators, agencies and the popular media.

VALUE TO SOYBEAN INDUSTRY: Students from across our state are being challenged to understand the complexity of the evolving science undergirding production agriculture and to critically think about issues regarding food, fuel, feed and agricultural sustainability that will directly impact their futures. We are now present "at the table" as the attitudes of our youth are being shaped.

ENTOMOLOGY

Educating Growers and Consultants on Insect Monitoring and Control

INVESTIGATORS: Gus Lorenz, Ben Thrash, Nick Bateman

GOAL: To educate growers, consultants, and other agricultural industry members on the proper techniques for monitoring and management of soybean insect pest populations and to help provide them with the tools they need to make effective and economical decisions.

VALUE TO SOYBEAN INDUSTRY: Soybean production has changed drastically in the past 10-15 years. The adoption of reduced tillage, Roundup Ready and early season soybean production has also caused changes in soybean insect management. Few would argue that soybean insect management has become even more important in recent years and the changes in production have resulted in a need for increased awareness of soybean insect pests. These changes in production have created a need to educate growers and other decision-makers on the proper methods for monitoring insects and increase the awareness of the proper management techniques for effective and economical insect control. This research is intended to ensure Arkansas soybean producers' money is wisely spent for insect management.

ENTOMOLOGY

Development of Integrated Management Strategies for Insects in Soybeans

INVESTIGATORS: Ben Thrash, Gus Lorenz, Neel Joshi, Glenn Studebaker, Nick Bateman

GOAL: Develop cost-effective and sustainable recommendations for the management of the major insect problems in soybeans in different growing regions in Arkansas. Insect management continues to be a major focal point for growers and consultants in Arkansas soybeans, and developing sound recommendations for the most effective and economical control of insects is key to helping soybean producers be profitable. This project addresses various aspects of integrated management of problematic pests associated with soybean production.

VALUE TO SOYBEAN INDUSTRY: New pesticides are being released for bollworms, soybean loopers, and fall armyworms. These are viruses that are specific to the particular caterpillar and have been found to be effective with a good residual. The treatments containing these products are competitively priced as compared to chemical insecticides. Conducting on-farm trials to determine level of control, for developing a data set to help determine recommendations on use, will be important.

An increasing number of growers are adopting cover crops across the state. Soybean seed treatments and foliar insecticide applications, as well as cultural control methods, need to be evaluated in cover crops for control of commonly associated insect pests.

FERTILITY

Fertilization of Soybean

INVESTIGATOR: Trenton Roberts

GOAL: The overall mission of this research is to identify potential yield limitations via soil and plant analysis and aid in the prevention of soybean yield loss attributed to insufficient (or toxic) mineral nutrition. The specific goals addressed with this project are to
1) continue short- and long-term phosphorus (P) and potassium (K) fertilization trials
2) continue to evaluate soybean fertilization strategies with macro and micronutrients
3) investigate remote sensing technologies and
4) assess nutrient concentration variability at the production scale.

VALUE TO SOYBEAN INDUSTRY: Soybean fertilization costs represent about one-fifth of the total operating expenses budgeted for full-season soybean grown on silt loam soils. Accurate identification of P- and K-deficient soils and knowledge of other yield-limiting nutrients will enable recommendations to be refined so that the correct fertilizer sources and rates are applied at the times and frequency required to maximize yield and sustain soil productivity. Long-term fertilization trials are invaluable for verifying that recommended P and K fertilizer rates are sufficient for sustainable production and, as illustrated by our development of critical leaf-K concentrations for developing tissue-based interpretations to verify sufficient crop nutrition. Correlating and calibrating nutrient information from soil and tissue analyses is a long-term process that requires a large number of site-years with a wide range of soil properties to ensure soil test recommendations are as accurate and precise as possible. With current advancements in remote sensing and the adaptability of new platforms to unmanned aerial systems there is the opportunity for assessing soybean nutritional status using aerial imagery. Developing tools that will allow producers to identify potential nutrient deficiencies before they can be detected through deficiency symptomology can help ensure that nutrients such as K are no longer yield-limiting factors in Arkansas soybean production systems.

IRRIGATION

Promoting Irrigation Water Management for Soybeans

INVESTIGATORS: C. G. Henry, M. Ismanov, P.B. Francis, L. Espinoza, T. Spurlock

GOAL: Demonstration and technology transfer of irrigation water management practices on grower fields. Compare yield and water use differences to document the efficacy and improved profitability of conservation practices. Develop recommendations for surge irrigation and soil moisture sensors. Disseminate information to growers, consultants, and end users through U of A Extension meetings and workshops.

VALUE TO SOYBEAN INDUSTRY: To date, 122 participants have attended the surge school and 149 attended the soil moisture schools for a total of 840 contact hours. Surge irrigation respondents reported moderate to substantial learning (99%) in hands-on exercises. In the soil moisture sensor schools, 87% reported moderate to substantial learning on how to assemble and install soil moisture sensors. Over 180 irrigators are using this app to interpret soil moisture sensor readings. The sap flow component of this project is providing key data that is being used to provide better termination recommendations for soybeans. Poly printer has been developed to aid implementation of Computerized Hole Selection.

PLANT PATHOLOGY

Comprehensive Disease Screening of Soybean Varieties in Arkansas

INVESTIGATORS: Travis Faske, Terry Kirkpatrick

GOAL: To provide independent evaluation of new soybean cultivars for resistance to major diseases and nematodes and deliver this information in a timely manner on the Arkansas Variety Testing Website.

VALUE TO SOYBEAN INDUSTRY: This program provides comprehensive information on the disease package that each new cultivar contains prior to widespread planting of the cultivars in the state, lowering the risk of severe disease losses due to incorrect cultivar selection.

Development of an Effective Program to Manage Fungicide-Resistant Diseases of Soybeans in Arkansas

INVESTIGATORS: Travis Faske, Alejandro Rojas

GOAL: Develop practical management strategies to manage fungicide-resistant foliar diseases. Determine the potential risk of triazole-resistance and SDHI-resistance in various fungal diseases and develop guidelines to reduce the impact of all fungicide-resistant diseases to maximize profit for the Arkansas soybean producers.

VALUE TO SOYBEAN INDUSTRY: The detection and confirmation of a new fungicide-resistant disease would prevent the unnecessary application of an ineffective fungicide, thus saving money. Furthermore, field studies are used to provide information of fungicide efficacy in the field and evaluate these fungicides' efficacy to suppress fungicide-resistant diseases on soybean yield. Finally, the information collected from these studies will be used and deployed to provide practical solutions for the control of fungicide-resistant soybean diseases in Arkansas.

Cover Crops and the Control of Soybean Diseases

INVESTIGATORS: John Rupe and Alejandro Roja

GOAL: Compare the effects of seed treatments on stands and yields of soybeans planted no-till into established cereal rye cover crops terminated at different times before planting. Evaluate the effect of cereal rye cover crops on soil health including soil chemical and physical characteristics, soil microbial communities, and soil-borne pathogens including nematodes.

VALUE TO SOYBEAN INDUSTRY: Cover crops change the soil environment. These changes may reduce some pathogens, but may increase seedling diseases especially if soils remain cool and wet due to increased biomass. Growers terminate cover crops at different times generating different amounts of biomass. This study determines the effects of cover crops alone or in combination with seed treatments on seedling diseases, soybean cyst nematode and yield over several years of no-till and cover crop use.

Determining the Impact of Disease and Stinkbug Feeding on Soybean Quality

INVESTIGATORS: Terry Spurlock, Nick Bateman, John Rupe, Robert Stark

GOAL: Determine the major factors affecting soybean seed quality and develop management strategies for growers to avoid quality losses.

VALUE TO SOYBEAN INDUSTRY: Soybeans were subjected to major rain events in 2017 and 2018, and timely harvest was not obtainable. Major dockage for poor seed quality was observed during both of these years. During 2017, high densities of redbanded stinkbug were observed in the central and southern regions of Arkansas. These areas were already having issues with seed quality due to the

stinkbug infestations, and when hurricane Harvey made landfall, quality issues nearly doubled. Scientific observation revealed that this stink bug alone could cause upwards of 20% damaged seed in an untreated environment with no rainfall events. With poor weather conditions, percent damaged seed increased to 35-40%, and was likely compounded by fungal disease. Soybean seed quality has been a reccurring issue over the past several year, with some of the losses being related to disease, insects, weather, or a combination of all three. Growers need a set of best management practices for protecting themselves against soybean seed quality loss.

Determining the Value of Fungicide Application on Regional, Field Level and Within-Field Scales

INVESTIGATOR: Terry Spurlock

GOAL: Cooperate with farmers, consultants and county agents to determine when and where a fungicide application or fungicide product(s) marketed to improve plant health protects a soybean crop and adds value above the input cost.

VALUE TO SOYBEAN INDUSTRY: This research aims to answer difficult questions asked by farmers and consultants as to the value added by foliar applications of various aggressively marketed products.

Understanding Charcoal Rot and Taproot Decline; A Soybean Disease of Increasing Importance in Arkansas

INVESTIGATORS: Terry Spurlock, John Rupe

GOAL: To better understand and implement effective management practices for these diseases.

VALUE TO SOYBEAN INDUSTRY: Charcoal rot, reportedly caused by the fungus *Macrophomina phaseolina*, appears to be a serious yield limiting disease for Arkansas soybean production. Areas affected by charcoal rot are clustered in fields. Within the clusters of disease, plants defoliate and mature early, pod fill is poor and many pods are aborted. There are no commercially available varieties that have demonstrated resistance to charcoal rot. Further, chemical control applied as a seed treatment or in-furrow has shown little efficacy. The disease appears to be stress related. However, the vast regional area affected by charcoal rot each year suggests the stresses may be common. Understanding the relationship of field-level variability (soil factors relating to plant stress, drought stress, nutrient deficiencies, and other diseases) would provide farmers an opportunity for a more integrated approach to manage the disease each year.

Recently, a group of scientists from the University of Arkansas, Mississippi State University, and Louisiana State University have characterized a new disease of soybean prevalent in our three states, Taproot decline (TRD). The regional distribution of disease occurrence and yield loss is unclear at this time. However, it has been found as far north as Craighead Co. and some farmer and consultant reports indicate losses could be as high as 10 bu/A in fields. In 2016, fields in Mississippi and Louisiana suffered substantial yield losses from this disease. Currently, we do not have seed treatment fungicide or varietal recommendations for growers to combat TRD. Understanding the regional distribution, commercially available seed treatment efficacy, and varietal susceptibilities are necessary for successful management of this disease in Arkansas.

Soybean Research Verification Program

INVESTIGATORS: Jeremy Ross, Chad Norton, Chris Elkins

GOAL: To verify University of Arkansas, Division of Agriculture recommendation for soybean production, and to maintain an economic database of production practices on a large-scale field basis.

VALUE TO SOYBEAN INDUSTRY: Soybean yields in Arkansas continue to increase, but yields can increase more if Arkansas soybean farmers adopt and implement new technology. To increase the state's yield average, new technology including "Precision Agriculture" must be quickly transferred from the university researcher to the soybean producer. The SRVP allows soybean producers to observe Division of Agriculture-recommended production practices being implemented on typical producer fields across the state. The SRVP provides for faster adoption of new and existing technology for improved soybean production efficiency for both irrigated and non-irrigated production. The SRVP also demonstrates the profitability of recommended production systems in "real world" high-yield irrigated environments and also the variable non-irrigated environments and offers an opportunity to enhance cooperating producers' and county extension agents' marketing expertise.

Arkansas ROW CROP VERIFICATION

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

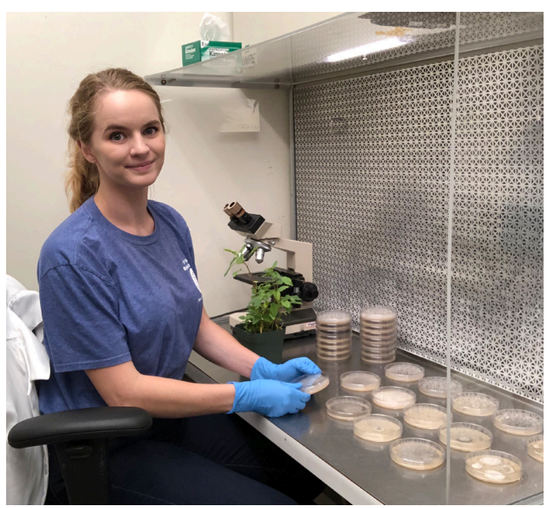
ARKANSAS SOYBEAN PROMOTION BOARD

Accelerated Development of Bioherbicides to Control Palmer Amaranth (Pigweed)

INVESTIGATORS: Burt Bluhm, Kelly Cartwright

GOAL: Create novel, highly aggressive bioherbicide products, through unique molecular genetic approaches, that specifically and effectively suppress Arkansas populations of pigweed.

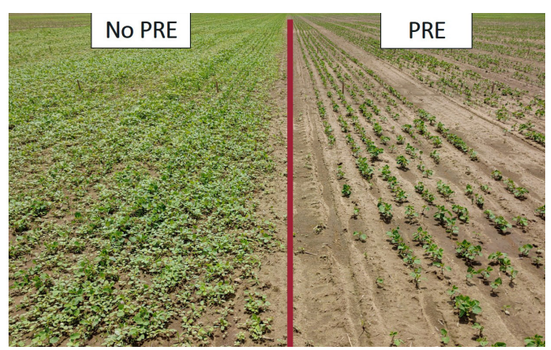
VALUE TO SOYBEAN INDUSTRY: Herbicide-resistant weeds are the most problematic and expensive management issue in row-crop agriculture. Weed problems, particularly pigweed, are more pronounced in Southern states such as Arkansas, where producers have witnessed more rapid increases in resistant weeds, especially in soybean, cotton, rice, and corn. Attempts to control such "super" weeds lead to as much as an extra $30-50 of input costs per acre. In some cases, extra costs can exceed $150/acre if hand-rouging is required. These costs, coupled with yield losses directly from competition, cause more than $1 billion in losses throughout the Mid-South and South in soybeans, corn and cotton.



A Team Approach to Weed Management in Soybeans

INVESTIGATORS: Thomas Butts, Tom Barber, Jason K. Norsworthy, Nilda R. Burgos

GOAL: To evaluate new and emerging technologies, rapidly identify herbicide-resistant weeds, determine their distribution, determine their mechanisms of resistance, and develop viable, unbiased solutions for managing herbicide-resistance in Arkansas. In addition, research focused on reducing the soil-weed seedbank and controlling other problematic weeds for soybean producers in Arkansas. A major goal will be providing a rapid information exchange between the grower, extension personnel, and researchers through publications such as the MP-44, MP-519, various fact sheets as well as through blog posts, podcasts, and text messaging services..



VALUE TO SOYBEAN INDUSTRY: Proper weed control accounts for a significant portion of annual budgeted production expenses. In addition, yield loss from even moderate weed infestations can be greater than 25%. The rapid adoption and widespread use of soybean weed control information has been of great value to growers. The project will allow growers to closely follow the discovery of resistant and new weed species through timely information for the control and management of these weeds on their farms. Over the past 10 years, the discoveries of the existence of glyphosate-resistant horseweed, common ragweed, giant ragweed, Palmer amaranth, and johnsongrass and most recently, PPO-, VLCFA-inhibitor-, and glufosinate-resistant pigweed, in Arkansas soybean fields has been a direct result of Soybean Board Funding. With continued reliance on glyphosate for weed control in soybean, these resistant biotypes have become more widespread and additional weeds may develop resistance to glyphosate. Although glyphosate-resistant common ragweed, giant ragweed, and johnsongrass currently appear somewhat isolated, glyphosate-resistant horseweed now infests the entire Mississippi Delta region of Arkansas, and glyphosate/PPO-resistant Palmer amaranth has now been confirmed in all major field crop counties. Glyphosate-resistant Palmer amaranth populations are also known to be resistant to ALS-inhibiting herbicides, which comprise the largest family of soybean herbicides. A further concern is that some of these resistant biotypes are also resistant to multiple herbicide modes of action such as metolachlor in the Group 15 herbicide family. Failure to adequately control any of these weeds can result in total crop loss. The further development of herbicide resistance to new technology is also a concern and will be addressed by this program. Research from this funding has provided best management practices for Palmer amaranth control and has resulted in a shift in preemerge herbicide selection to include metribuzin as a key component for multiple-resistant pigweed control. Results have also shown that multiple herbicide modes of action are necessary at planting. Soybean producers have adopted these recommendations for pigweed at a high rate across the state. Additionally, research from this funding has helped to identify diverse integrated weed management tactics and developed strategies to successfully implement them across Arkansas soybean acres.

Screening for Soybean Tolerance to Metribuzin

INVESTIGATORS: J.K. Norsworthy, Jeremy Ross

GOAL: The goal of this project is to screen all varieties entered in the Arkansas OVT for tolerance to metribuzin, allowing growers to make informed decisions as they select varieties and develop robust weed control programs.

VALUE TO SOYBEAN INDUSTRY: Metribuzin (Sencor or Lexone) was used by most Arkansas soybean growers prior to adoption of Roundup Ready in the mid- to late 1990s. Metribuzin is a broad-spectrum residual herbicide that provides a high level of control of Palmer amaranth, the most problematic weed for Arkansas soybean growers today. Soybean varieties differ in tolerance to metribuzin; hence, annual testing of available varieties was routine prior to Roundup Ready soybeans to allow growers to best match a variety with their anticipated use of metribuzin.

Now that preemergence, residual herbicides are once again a major component of weed management in Arkansas soybeans, screening of soybean varieties for tolerance to metribuzin is again needed. In addition to metribuzin-alone products, such as Metri, Metribuzin, etc., a variety of metribuzin-containing products are being promoted and used by Arkansas soybean growers. Some of these products include *Canopy* (metribuzin + chlorimuron), *Authority MTZ* (metribuzin + sulfentrazone), and *Boundary* (metribuzin + S-metolachlor). The metribuzin rate in these products is less than that which will provide effective control when metribuzin is used alone. The reason for the lower rates of metribuzin in these products is because the sensitivity of the current soybean varieties to metribuzin is unknown; hence, a low rate is applied to minimize the risk of injury to the most sensitive varieties. Soybean producers in Arkansas would greatly benefit from being able to use a full rate of Metribuzin in soybeans, especially considering that PPO-resistant Palmer amaranth was documented in 12 counties in northeast Arkansas. Our field research indicates that Metribuzin needs to be a major component of the preemergence weed control program on any acre for which the PPO herbicides failed, especially those north of I-40. We currently recommend a full rate of Metribuzin plus a chloroacetamide on every PPO-resistant pigweed acre.

A Golden Age

Arkansas's soybean industry celebrates the golden anniversary of the Arkansas Soybean Promotion Board in 2021

The year is 1971 and The Information Age in America is just beginning. Here in The Natural State, the Arkansas General Assembly passes Act 259, establishing the Arkansas Soybean Promotion Board (ASPB), providing producers in the state with an organization that will work to improve the soybean industry.

Fifty years later, soybeans reign as the top row crop in Arkansas covering 3 million acres between the state's eastern border and Pope County in the Arkansas River Valley. Since the Arkansas Soybean Promotion Board's creation, the annual economic impact of soybean production in Arkansas has grown to $2 billion, with approximately 50% of the industry's crop exported each year. As the state's soybean industry celebrates the Arkansas Soybean Promotion Board's 50th anniversary this year, its members are reflecting on the role the board has played in the enhancement of communities across our state and nation that have benefited from the soybean industry's success over the past half-century.

As markets have evolved over the years, Arkansas has emerged a leader within the U.S. soybean industry.

Jim Carroll of Brinkley, a fourth-generation soybean producer and former ASPB member, served in 2020 as chair of the United Soybean Board (USB). The USB administers soybean checkoff activities focusing on research and market development and expansion. In this role, Carroll has been a vocal advocate for the producers of Arkansas, acknowledging their innovation and skill at growing soybeans.

"The Arkansas soybean industry is producing some of the best quality crops we've ever seen. Our farmers are doing a lot of things right, and it's important that we share those things with our industry," Carroll said. "I'm proud of our farmers and want to see them get the recognition they deserve."

Arkansas Soybean Promotion Board Chairman Donald Morton of Prairie County, shares Carroll's enthusiasm for the industry's achievements. He invites soybean producers and consumers alike to join ASPB in this year's 50th anniversary celebration.

A lot has happened in the last year, not to mention the last 50 years. But one thing has never changed. We're still farming and we always will," Morton said. "I continue to be amazed by the resiliency of our farmers. I encourage everyone to take time this year to reflect on how far we've come as an industry, and celebrate our collective achievements."

CONTROLLING YOUR PROBLEM WEEDS?

Don't Worry. We're On It.

Herbicide-resistant weeds cost soybean farmers time and money, impacting profitability. Fortunately, your state soybean checkoff is on the job with research projects to help you adopt the best management practices to preserve crop-protection technologies and enhance the overall sustainability of your U.S. soy crop.

LEARN ABOUT THESE PROJECTS AND MORE AT
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ARKANSAS SOYBEAN PROMOTION BOARD

THE HARD WORK BEHIND YOUR HARD WORK

FUNDED WITH SOYBEAN CHECKOFF DOLLARS THROUGH THE UNITED SOYBEAN BOARD AND NORTH CENTRAL SOYBEAN RESEARCH PROGRAM

BATTLING BILLION-DOLLAR YIELD ROBBERS?

Don't Worry. We're On It.

Sudden death syndrome, stink bugs, soybean cyst nematodes and many other yield-robbing pests and diseases. It's a rough world out there, costing soybean farmers billions of dollars every year. Fortunately, your state soybean checkoff is on the job with research projects to develop effective traits and practices to get back as much of your yield as possible.

LEARN ABOUT THESE PROJECTS AND MORE AT
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ARKANSAS SOYBEAN PROMOTION BOARD

THE HARD WORK BEHIND YOUR HARD WORK

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