



2006

Research *Initiatives*

Your soybean checkoff. Finding solutions to production problems through cooperative research and coordination.

The NCSRP board of directors has approved the following research priorities:

SOYBEAN APHID

- Management & biological control

SOYBEAN CYST NEMATODE

- Changes in resistance

SOYBEAN DISEASES

- Soybean virus
- Phytophthora
- Frogeye leaf spot & charcoal rot
- Iron deficiency chlorosis
- Sudden death syndrome
- Asian soybean rust

Our goal is to help soybean producers be more profitable by investing in research programs that improve soybean health. NCSRP continues to invest in cutting-edge research that has both short- and long-term benefits for Midwest soybean producers.

Reducing yield loss from the soybean aphid is a top priority. Researchers continue to identify natural predators that can be used to suppress the aphid population. I look forward to the release of some of these predators in the near future.

Asian soybean rust research is also a top priority. Researchers from several Midwest states are conducting research on an array of soybean rust projects at the University of Florida's Quincy Research Station. NCSRP's partnership with the center enables researchers to conduct research where rust is most likely to show up every year.

NCSRP is nationally recognized for its investments in aphid research, soybean rust and sentinel plots, and for its novel investments in identifying emerging viruses. However, none of this would be possible without you.

THANK YOU for your continued financial support.

Gregg Fujan
President

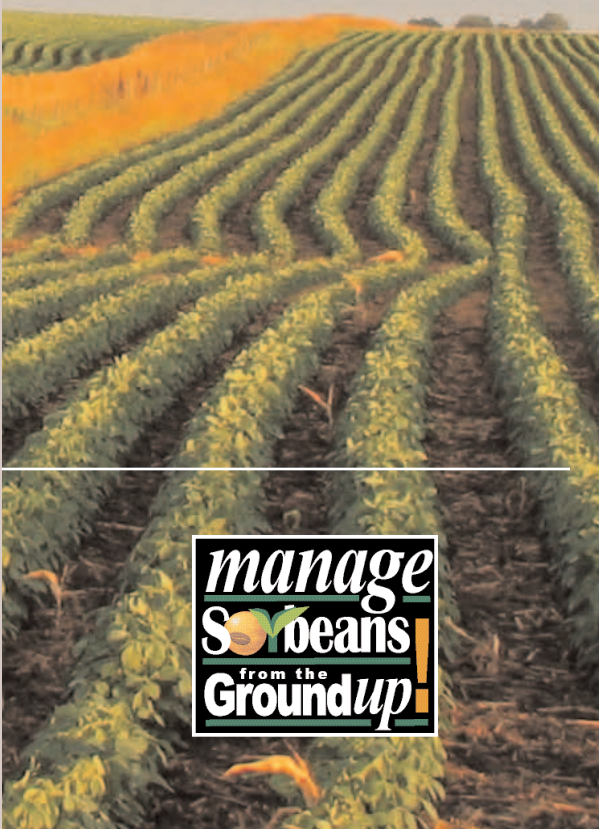
*North Central
Soybean Research
Program*



Gregg Fujan
President



North Central Soybean Research Program



Aphid



Soybean aphid management in the North Central states

This project continues NCSRPs commitment to solving the aphid problem. The research proposes to operate a regional suction trap network to collect soybean aphid data that can be correlated with field populations or to predict following-season aphid densities; evaluate soybean aphid-resistant breeding lines in replicated field plots; and refine the economic threshold for soybean aphid.

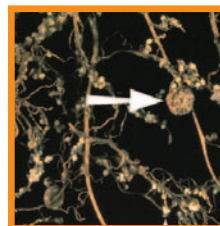
Participating Universities: *University of Minnesota, Iowa State University, Michigan State University, Purdue University, University of Illinois and the Illinois Natural History Survey, Kansas State University and USDA-ARS, University of Nebraska, South Dakota State University and University of Wisconsin.*

Biological control of the soybean aphid

This project will implement a biological control program to provide the North Central soybean producer with increased management options for controlling the soybean aphid. The research program will determine the potential for establishing safety and compatibility of imported natural enemies of the soybean aphid, educate growers of the potential of biocontrol to manage soybean aphids, and develop a region-wide program to provide biocontrol options to the Midwest soybean producer.

Participating Universities: *Purdue University, Illinois Natural History Survey and the University of Illinois, Iowa State University, University of Minnesota, Beneficial Insect Inductions Research Unit, Newark, DE., University of Wisconsin, Michigan State University and South Dakota State University; With overseas collaboration from Japan (University of Utsunomiya, and Japanese National Agricultural Research Service), China (Chinese Academy of Sciences and USDA/ARS Sino-American Biological Control Laboratory, Beijing) and Korea (Seoul National University).*

SCN



Investigations of changes in resistance of PI88788 to field populations of soybean cyst nematode

Most soybean varieties with resistance to SCN utilize PI88788 as the source. Previous research conducted by the University of Illinois suggests PI88788 may be losing its effectiveness against SCN. This project will determine the current effectiveness of PI88788 as a source of resistance to soybean cyst nematode in several North Central states and determine the effectiveness of other sources of SCN resistance in areas where PI88788 may no longer be effective.

Participating Universities: *Purdue University, USDA/ARS/West Tennessee Experiment Station, USDA/ARS/University of Illinois and Agriculture and Agri-Food Canada.*

Diseases



Mitigating the effects of soybean virus disease in the North Central states

Soybean viruses rob Midwest producers of 12 million bushels annually. Virus symptoms are nearly indistinguishable from other stressors and damage from some

herbicides. Bean pod mottle virus and soybean mosaic virus are the most damaging, but new, more potentially damaging viruses, have been found.

This research will improve diagnostic capabilities for selected soybean viruses; determine the source, movement, and risk of soybean dwarf virus, a new, potentially devastating disease; and identify sources of tolerance/resistance to important soybean viruses.

Participating Universities: Iowa State University, University of Wisconsin, University of Tennessee, University of Kentucky, South Dakota State University, USDA/ARS/University of Illinois, USDA/ARS/Ohio State University and USDA/ARS/Fort Detrick.

Limiting losses to *Phytophthora sojae* in the North Central region

Only SCN robs producers of more soybean yield than *Phytophthora* root and stem rot. NCSRP continues to invest heavily in research to mitigate yield losses to *Phytophthora*. From this research, soybean producers will have new sources of resistance to protect their yield for many years and have up-to-date information to help crop professionals better understand ways to reduce yield loss from *Phytophthora*.

This 11-state project strives to: 1) Screen the soybean plant introductions that have been identified with novel Rps genes for resistance/susceptibility to *Phytophthora sojae* isolates representing diverse populations from all of the North Central states; 2) Identify the Rps genes that may exist in soybean plant introductions that are currently being incorporated into northern soybean germplasm; 3) Characterize the *Phytophthora sojae* population across the region for pathotypes (races) as well as metalaxyl sensitivity; 4) Evaluate the effects of cultural practices on minimizing losses to *Phytophthora sojae* on varieties with different levels of partial resistance; and 5) Identification of molecular markers that can readily be used by participants to evaluate the *Phytophthora sojae* diversity in their states.

Participating Universities: The Ohio State University, USDA/ARS/University of Illinois, USDA/ARS/Purdue University, Iowa State University, Kansas State University, Michigan State University, University of Minnesota, University of Missouri, University of Nebraska, North Dakota State University, South Dakota State University, University of Wisconsin and Ontario, Canada.



Managing frogeye leaf spot and charcoal rot in the North Central region

The primary objective of this nine-state project is to develop additional information on two soybean diseases, frogeye leaf spot and charcoal rot, which are expanding in the North Central region. This project will specifically: 1) Evaluate resistance to frogeye leaf spot and charcoal rot in released varieties and elite germplasm; 2) Develop cultivars with resistance to frogeye leaf spot and charcoal rot; 3) Verify the greenhouse screening protocol for resistance to charcoal rot; 4) Characterize prominent pathotypes of *Cercospora sojina* with germplasm differentials and molecular markers; 5) Review and update Plant Health Initiative educational materials; 6) Develop annual report on the impact of the diseases in each state; and 7) Develop chemical management strategies for frogeye leaf spot.

Participating Universities: Southern Illinois University, University of Illinois, Iowa State University, Kansas State University, North Dakota State University, South Dakota State University, USDA/ARS/Purdue University, USDA/ARS Jackson, TN, University of Georgia, University of Missouri, University of Nebraska and University of Tennessee.



Breeding and management strategies for overcoming iron deficiency chlorosis in soybeans

Both breeding and management strategies are involved in this research. The breeding component

will: 1) Evaluate soybean genotypes for chlorosis symptoms and yield in paired sites (IDC and non-IDC sites within single fields) at multiple locations; 2) Quantify any association between IDC score and yield; 3) Compare yield ranks in IDC sites and non-IDC sites; and 4) Identify single cultivars that yield competitively on both IDC and non-IDC sites and identify cultivars that are top-yielding on either IDC or non-IDC sites. While the management component will: 1) Quantify the impact of a competition crop such as oats on concentration of NO₃-N in soil and soybean plants growing in soils having properties conducive to IDC; 2) Develop management practices such as seeding rate, and time of application of glyphosate for the competition crop; 3) Calculate the economic benefit of the competition crop where IDC is a major problem; and 4) Quantify the uptake of N and impact on soil moisture by the oats grown in this production situation.

Participating Universities: University of Minnesota, North Dakota State University, South Dakota State University, Kansas State University, University of Nebraska, Iowa State University, North Dakota State University and South Dakota State University.

North Central SDS variety testing program

The project objectives are to continue and expand the cooperative soybean variety-testing program designed to identify varieties with high resistance to SDS and other diseases of importance to soybean producers in the North Central Region.

Participating Universities: *Southern Illinois University, Iowa State University, University of Missouri, Purdue University, University of Arkansas and University of Tennessee.*

Enhancing disease resistance in soybeans through the tools of biotechnology

This project is designed to expand the understanding of the underlying molecular clues of plant/parasite interactions. Specifically, the objectives are to: 1) Express zoospore encystment peptide in soybean as a means to block the life cyst of the *Phytophthora sojae*; 2) Express a tobacco RNA-dependent RNA polymerase gene in soybean as a means to maintain soybean's virus surveillance mechanism; 3) Introduce two bacterial-derived insect toxins into soybeans as a means to combat aphid predation; and 4) Use a candidate gene approach to clone genes mapped to known QTLs associated with fungal resistance in soybeans.

Participating Universities: *University of Nebraska and University of Missouri.*



Preparation for soybean rust: Evaluation of canopy coverage and effects of fungicides on midwestern soybean cultivars

The project objectives are to develop protocols to improve canopy coverage using current application equipment and evaluation of the effects of fungicides that are labeled on the Section 18 Emergency Exemption Request on current commercial soybean cultivars.

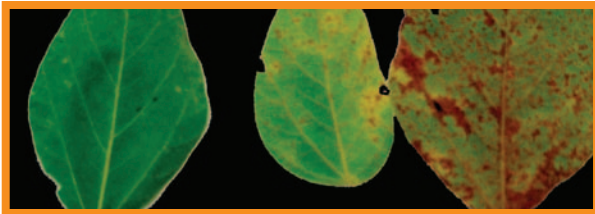
Participating Universities: *USDA/ARS/University of Illinois, University of Nebraska, University of Kentucky, Mississippi State University, South Dakota State University, Louisiana State University, University of Florida and University of Georgia.*

Population dynamics and epidemiology of Asian soybean rust in North American soybean production systems

This novel initiative will: 1) Determine what conditions are necessary for *Phakopsora pachyrhizi* to overwinter in northern Florida; 2) Develop field-scale disease models based on temperature, relative humidity, and leaf wetness; 3) Determine the spatial and temporal dynamics of Asian soybean rust in sentinel and field plots; 4) Link disease forecast and crop growth models that will tie early-planted sentinel plot detections with commercial field management needs; and 5) Present a class on Asian soybean rust identification and management for industry and researchers.

Participating Universities: *University of Florida.*

Soybean Rust



Sentinel plots to monitor the spread of Asian soybean rust to North Central states

Once again NCSRP and USB partnered to establish sentinel plots in 16 states throughout the U.S. to provide a critical early-warning system for soybean producers. These plots expand and complement those established by the USDA. Results from the observations of the sentinel plots can be found at www.sbrusa.net.

Participating Universities: *University of Nebraska, University of Kentucky, The Ohio State University, USDA/ARS/University of Illinois, USDA/ARS/Purdue University, Iowa State University, Kansas State University, Michigan State University, University of Minnesota, University of Missouri, North Dakota State University, South Dakota State University, University of Wisconsin, Oklahoma State University, Penn State University and Texas A&M University.*

Plant Health Initiative

The Plant Health Initiative creates a private/public consortium in the North Central region focused on issues related to improving the health of the soybean plant. The Web site www.planthealth.info is a clearinghouse of soybean management information and is considered a valuable resource that researchers, breeders and producers can depend upon.

Thank you for your support of NCSRP!

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The North Central Soybean Research Program (NCSRP) was established in 1993 by state checkoff organizations in the North Central states. The program's mission is to maximize producer returns by coordinating research efforts across state boundaries, minimizing regional duplication of research expenditures and assuring regional research projects are targeted at problems of the North Central soybean producer.