2022 Research Report

& Fiscal Year Annual Report

PENNSYLVANIA SOYBEAN BOARD

Here's How the Soy Checkoff Works

The national soy checkoff was created as part of the 1990 Farm Bill. The Federal Act & Order that created the soy checkoff requires that all soybean farmers contribute 0.5% of the market price per bushel to the soy checkoff at the first point of sale of the soybeans. These funds are used for promotion, research, and education. Led by volunteer farmers, the United Soybean Board and the Pennsylvania Soybean Board invest and leverage soy checkoff dollars to MAXIMIZE PROFIT OPPORTUNITIES for all U.S. soybean farmers.

Checkoff Works for You

As a soybean grower, have you ever wondered: "What does the checkoff do for me? How does it put more money into my pocket? "

Those are the very questions we consider any time a research, educational or promotional proposal is presented to the Board for checkoff funding.

Every one of us on the Board is a soybean grower. Every one of us pays into the checkoff. We evaluate all proposals strategically to make sure there's the promise of a solid return on investment. At both the state and national level, we take seriously our responsibility to make sure checkoff dollars are spent wisely and will yield a payoff to our fellow growers in terms of information and insight that will promote their continued success.

Whether the project is to help sustain the animal ag industry, the largest consumer of soy meal; research into best management practices; weed and pest control; biodiesel or other alternative uses for soybeans, our goal is the same. We want to see the soybean industry – and the soybean grower – continue to thrive in Pennsylvania.

This report shows the results of some of the research done on behalf of our growers during the 2022 Fiscal Year. We hope you'll read it and follow up with your Extension educator, or on our online Soybean Research & Information Network, if you'd like additional details about any of these research projects.

Best wishes for your continued success in 2023.

John Harrell
Chair, Pennsylvania Soybean Board

Oct. 1, 2021-Sept. 30, 2022

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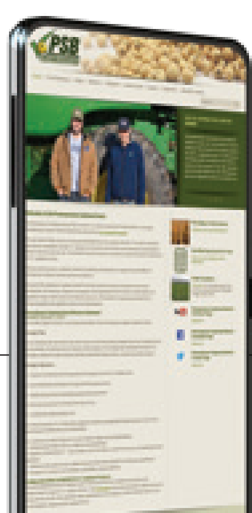

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Bringing Research Findings to Farmers

The articles in this research report summarize the checkoff-funded research being conducted in Pennsylvania. But checkoff-funded research goes far beyond the state.

Check out the findings from the research projects the soy checkoff invests in at the national and state levels on the Soybean Research & Information Network (SRIN) website.

SRIN was launched to communicate checkoff-supported research projects to soybean farmers across the country and be a virtual resource full of information and toolkits for more efficient soybean production.

Each article on the SRIN website provides insight and explanation on the research findings and links directly to the study in the research database for further exploration.

Follow SRIN on social media:

Facebook.com/SoybeanResearchInformationNetwork

Twitter.com/SoyResearchInfo

soybeanresearchinfo.com

Pennsylvania Soybean Board Annual Financial Report

Fiscal Year 10.1.21 to 9.30.22

CASH & ASSETS	
Operating Funds	$643,348
Emergency Preparedness Fund	$399,407
Dissolution Fund	$269,942
Equipment, Net	$1,354
Less: Liabilities	-
Net Assets at 9.30.22	$1,314,051
REVENUE:	
Assessment Income	$1,314,697
Less Assessments Paid to USB & Other State QSSBs	$(970,182)
Other Revenue	$8,508
PROGRAM EXPENSES:	
Communications	$(63,720)
Promotion & Education	$(288,408)
Research*	$(151,678)
Administration/Audits/ Compliance/Insurance/Other	$(81,824)
Increase/(Decrease) in Net Assets	$(232,607)

* This amount reflects the actual disbursement of the funds allocated for research as of September 30, 2022

Pennsylvania Soybean On-Farm Network

Principal investigator & co-investigators:

Dr. Paul Esker, PSU Extension Plant Pathologist & Associate Professor

Dr. Terrance Bell, Assistant Professor

Dr. Liz Bosak, PSU Extension Field and Forage Crops Educator

Dr. Daniela Carrijo, PSU Extension Agronomist & Assistant Professor

Dr. Alyssa Collins, PSU Extension Plant Pathologist & Associate Research Professor

Del Voight, PSU Extension Field and Forage Crops Educator

Andrew Frankenfield, PSU Extension Field and Forage Crops Educator

Anna Hodgson, PSU Extension Field and Forage Crops Educator

Dwane Miller, PSU Extension Field and Forage Crops Educator

Dr. Adriana Murillo-Williams, PSU Extension Field and Forage Crops Educator

Dr. Heidi Reed, PSU Extension Field and Forage Crops Educator

Dr. John Tooker, PSU Extension Entomologist & Professor

Dr. John Wallace, PSU Extension Weed Scientist & Assistant Professor

FUNDED AMOUNT: $255,490

PROJECT SUMMARY

Pennsylvania soybean production has increased approximately 30% since 2009 when the Pennsylvania Soybean On-Farm Network conducted the first set of trials.

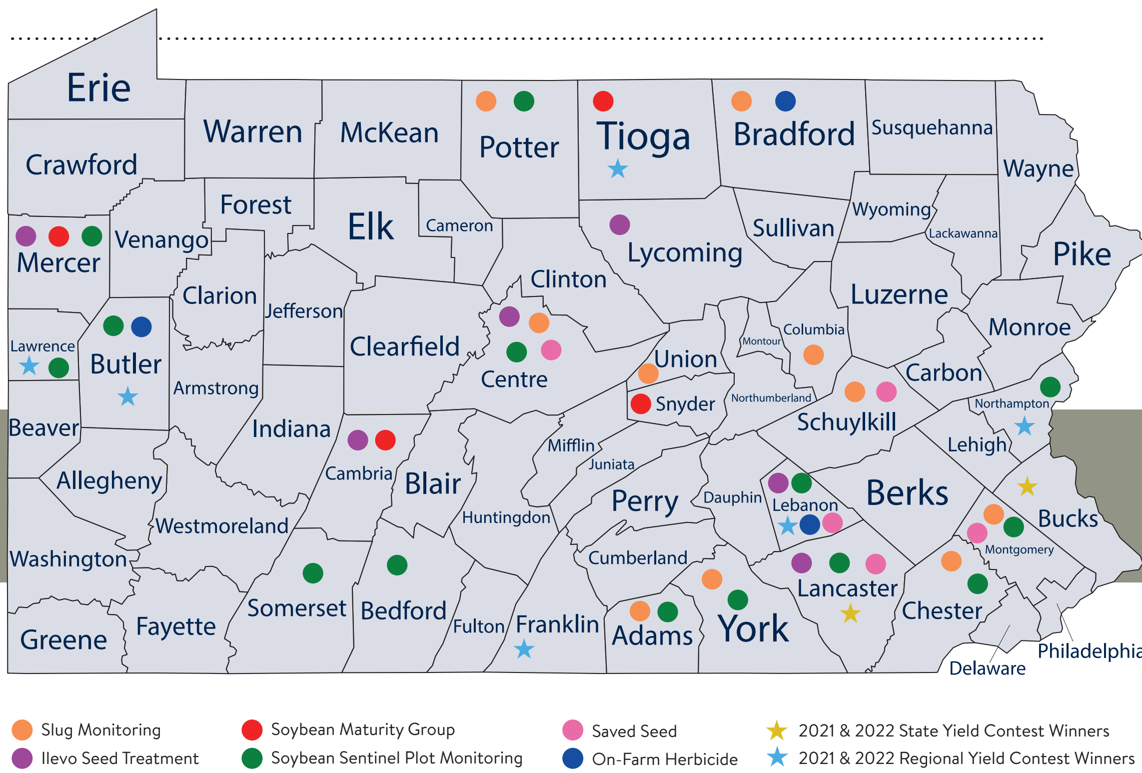
The Pennsylvania Soybean On-Farm Network focuses on conducting field trials on Penn State University Research Farms that are then validated on-farm using grower production practices. This two-tiered approach has been very valuable to show that the results obtained using small plot trials correlated with those on-farm, using long strips. Furthermore, current results based on Pennsylvania production practices also correlate closely with trials conducted in other states across the soybean production region.

The soybean on-farm network increased significantly in 2018 and 2019 incorporating several new projects that address questions and comments from producers. Plans for 2020, while impacted by the COVID-19 pandemic, were still successful as the team continued research efforts although Extension efforts were limited to virtual methods. In 2021, we established new research lines built on knowledge generated in earlier on-farm trials.

During the 2022 trial year, we expanded the on-farm network with new project areas in production agronomy and weed science. We incorporated the soybean sentinel plot and nematode monitoring programs and resumed on-farm summer and winter workshops. The combination of research, education, and Extension creates a unique team approach that includes approximately 20 PSU campus-based faculty and Extension educators located around the state.

2022 On-Farm Trial Sites by County

Locations of the 2022 Pennsylvania Soybean On-Farm Network trials and monitoring programs.



Scan this QR code to learn more.

soybeanresearchdata.com

Ilevo Seed Treatment Trials and Microbiome/Soilborne Research

PROJECT SUMMARY

Sudden death syndrome (SDS) is one of the significant yield-limiting soil-borne diseases of soybean in North America. For example, in 2020 and 2021, SDS caused approximately $11.6 million in economic losses in the Northeastern U.S..

Ilevo seed treatment has emerged in other parts of the U.S. as a promising control for SDS. However, before recommendations could be made for Pennsylvania, it is essential to conduct multi-year, multi-location trials to quantify the efficacy of Ilevo.

The study design was based on an on-farm methodology that we used in trials that started in 2021. The 2022 trials were established in farmer fields with a history of SDS in six counties of Pennsylvania: (1) Cambria County, (2) Centre County, (3) Lancaster County, (4) Lawrence County, (5) Lebanon County, and (6) Lycoming County.

The variety P2721RXF with and without the Ilevo seed treatment was used for the treated and control plots. Farms followed used seeding rates that ranged from 140,000 to 180,000 and row spacings of 15 or 30 inches. Any standard farm-specific crop production practices, such as fertilizer and herbicide use, were recorded.

Prior to planting, bulk soil samples were collected from each site to determine the density of four important soilborne fungal pathogens: Pythium spp., Phytophthora spp., Fusarium spp., and Rhizoctonia spp. Plant parasitic nematode density and soil nutrient profile for each site were also determined. The normalized difference vegetation index (NDVI) was recorded at the R2 growth stage using the "GreenSeeker" handheld crop sensor to measure crop health. The initial plant stand of each plot was recorded at the same growth stage, and fifteen plants per plot were collected for destructive measurements. Collected plants were evaluated in the laboratory to quantify disease incidence for any noticeable disease and crop growth parameters. At harvest, the yield from each plot was collected separately for yield comparison between the two treatments.

We also collected root ball samples at emergence (VE), unrolled unifoliolate leaves (VC), and first trifoliolate (V1) growth stages for the microbiome portion of this study. Sampling was done for Ilevo treated and control plots within a selected block. The reason for choosing these three sampling stages was to determine if Ilevo seed treatment has contributed to any noticeable changes in the soil microbial profile and composition.

FINDINGS

Across trial locations and years, we have not observed any differences between the Ilevo and the Control treatments for any of the parameters measured.

Given the late harvest in 2022, we are still receiving the yield data from several Ilevo trial sites. However, similar to 2021, the yield data obtained has not indicated any significant differences between the Ilevo treated and Control plots.

Though many different types of nematodes were found in the soil samples collected from these trial fields, none of the sites were positive for soybean cyst nematodes or root rot nematodes. Soil nutrient profiles for the sites did not show any significant nutrient deficiencies.

Soil pathogen density determination and the microbiome portion of this study are in progress. We expect those results to help guide our understanding of the potential efficacy of using Ilevo seed treatment in protecting soybean seed against SDS and other soilborne pathogens in Pennsylvania.

Root ball samples for microbiome analysis were taken at three different growth stages: VE (left), VC (middle), and V1 (right).

Sudden death syndrome symptoms observed in farmer fields during 2022.

Broadcasting Cover Crops into Standing Soybeans

Drone seeding black oats and hairy vetch into standing soybeans at the Lancaster County cooperator site in October 2021.

PROJECT SUMMARY

This project aims to compare how several different cover crop species perform when broadcast seeded into soybeans just before soybean leaf drop. We measured soil nitrate in the fall and spring to see if cover crops tie up or supply nitrogen for the next crop. Additionally, plants were counted, ground cover was measured in the fall, and repeated measurements were made in the spring. Lastly, dry matter for each cover was estimated, along with how well the cover crops were established.

This research is important to farmers because many struggle to get cover crops planted after soybean harvest. The results from this study will help farmers decide whether broadcasting into standing soybeans might be a worthwhile practice on their farms. Broadcasting cover crops can open the planting window to species other than winter cereals or allow a farmer who usually doesn't have enough time to plant cover crops in the fall to grow a winter cereal.

Potential economic impacts

- Lowered cost of cover crop establishment by broadcasting into standing soybeans instead of drill seeding after harvest
- Reduced herbicide cost with improved weed control from earlier-seeded, higher biomass cover crops
- Reduced N fertilizer cost if legume cover crops can supply some N for the next crop

This photo, taken in May 2022, shows the meager cover crop establishment at Rock Springs resulted in heavy winter annual weed pressure at spring sampling, even in wheat and cereal rye plots.

FINDINGS

As in year one of the experiment (2020-2021), dry matter production was low (<1,000 lb/ac) in this experiment in 2021-2022. Clovers did not establish at any of the three sites where it was planted, producing a maximum of 200 lb/ac biomass only when termination was delayed into June at SEAREC.

Small grains were once again the most productive species at all four sites but grew less than 700 lb/ac everywhere except at SEAREC, where wheat reached 4,805 lb/ac., likely due to the late cover crop termination.

Hairy vetch performed marginally well at SEAREC and the Lancaster County cooperator site, producing an average of 462 lb/ac; however, the establishment was very patchy, and weeds outweighed the vetch in most plots. The NRCS recommends at least 2,700 lb/A of cover crop dry matter to see cover crop benefits, so we likely did not see significant benefits from the cover crops at most sites.

Groundcover and plant density counts followed similar trends to spring biomass, and even the highest spring density was less than half the plants/A recommended by NRCS. Soil nitrate was not significantly impacted by the cover crops, likely due to the very low biomass produced.

These data add evidence to what we learned last year—that broadcasting cover crops into standing soybeans provides inconsistent establishment. It is best suited for fields where cover crop termination is delayed into late May or June. After two years and 9 site-years of data, we can recommend small grains or annual ryegrass with some confidence, hairy vetch and rapeseed in the southeast especially, and avoiding clover species for this practice. Planting should be done as soon as possible when leaf yellowing begins, and success depends significantly on timely rainfall.

The next phase of this trial, established at 5 sites in Fall 2022, compares broadcasting the most successful species into soybeans (cereal rye, winter wheat, annual ryegrass, hairy vetch, and rapeseed) with drill-seeding the same species after soybean harvest.

Refining 2-Pass Herbicide Programs for Horseweed Management

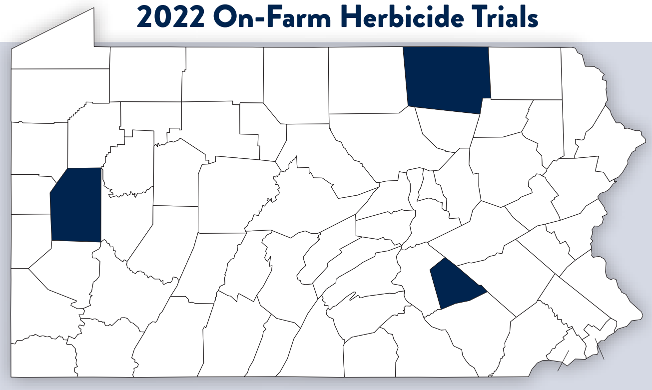
PROJECT SUMMARY

Glyphosate-resistant horseweed populations are becoming more widespread in the state and are now a significant management issue in western Pennsylvania and the Northern Tier. In addition to varying levels of resistance throughout the state, including glyphosate- or glyphosate and ALS resistant biotypes, horseweed is challenging to control because of variable emergence patterns. Understanding regional (i.e., environmental) or management-driven trends in emergence patterns is the first step at designing more effective herbicide programs for horseweed control. In 2022, we conducted trials in Butler, Bradford and Lebanon counties.

The objective of this project is to conduct coordinated on-farm trials across distinct Pa. production regions to:

- Describe horseweed emergence patterns relative to soybean planting dates
- Evaluate preemergence herbicide programs for horseweed control, including single- and multiple-active ingredient programs
- Quantify the length of residual activity across production regions of soil applied herbicides for control of small-seeded annual weeds (e.g., horseweed, waterhemp, Palmer amaranth) using bioassays from field-trial soils

2022 On-Farm Herbicide Trials



FINDINGS

A key management goal for effective control of horseweed is to target populations with pre-plant herbicide applications prior to the bolting stage because the efficacy of commonly used burndown products [saflufenacil (i.e., Sharpen), 2,4-D, dicamba or paraquat] decreases after horseweed bolts.

Horseweed populations were characterized by growth stage just prior to the time of pre-plant burndown applications by growers. As expected, later planted soybean fields (mid- to late- May) were more likely to have horseweed plants that had already bolted. One noteworthy finding was that the Northern Tier location was the only population that appeared to have a significant early-spring flush of horseweed.

Additional horseweed emergence occurring after typical soybean planting dates is becoming more common and understanding this pattern can help design effective tactics for managing horseweed in crop. Monitoring results showed significant horseweed emergence after planting.

Though additional sites will be needed, our first-year results suggest that the Northern Tier and western locations were more likely to have significant flushes of horseweed after planting. This finding suggests that soil-applied herbicide programs will be a key component of horseweed management in these regions.

Herbicide trials consisted of single- and multiple- active ingredient preemergence programs, including two ALS Inhibitors (Group 2; chlorimuron and cloransulam), metribuzin (Group 5) and flumioxazin (Group 14). Effective burndown applications were applied at each location but varied depending on the soybean trait. Treatment varied at each location to include each grower's program that was applied in the rest of the field.

Horseweed control 35 days after planting is reported in the table below. The efficacy of single active ingredients varied across locations. The lack of control from Group 2 herbicides may be an indicator of ALS-resistant populations, though additional studies will be needed to verify. In general, Group 2/5 mixtures provided the most consistent control.

Horseweed control (% population reduction) 30-35 d after application.

PRE application	Bradford (35 DAP)	Butler I (35 DAP)	Butler II (30 DAP)	Lebanon I (35 DAP)	Avg.	Range
S-metolachlor +	------------- % reduction in horseweed population -------------					
chlorimuron (0.03 lb ai; Classic)	--	87	70	95	84	70-95
cloransulam (0.04 lb ai; FirstRate)	66	99	99	95	90	66-99
metribuzin (0.2 lb ai; Tricor)	99	99	91	70	90	70-99
flumioxazin (0.06 lb ai; Valor)	96	94	--	75	86	75-96
chlorimuron + metribuzin	--	--	99	95	97	95-99
cloransulam + metribuzin	--	98	99	95	97	95-99
cloransulam + flumioxazin	85	89	--	90	88	85-90
metribuzin + flumioxazin	99	99	--	70	89	70-99

If you have questions or would like to participate in 2023 field trials (horseweed, waterhemp, or Palmer amranth infestations), please contact: John Wallace, jmw309@psu.edu, phone: 814-863-1014, text: 208-874-2887

Sentinel Plot Program for Detection of Insect Pests and Diseases

PROJECT SUMMARY

This project involved establishing sentinel soybean plots in 16 Pennsylvania counties that were scouted weekly for insects, slugs, and diseases by Penn State Extension Educators. The project was run collaboratively between Penn State's Department of Entomology and Penn State Extension to provide soybean growers with regional assessments of insects and diseases active in soybean fields.

We expected that an unbiased view of insect and disease populations in typical fields would reveal to soybean growers that pest populations in most soybean fields tend to be mild, and do not threaten yield, therefore they do not usually require management with insecticides and fungicides. The ultimate goal of our project is to demonstrate the value of scouting and encourage growers to adopt Integrated Pest Management.

FINDINGS

In 2022, like past years, our scouting efforts discovered a narrow range of insects, slugs, and only a few diseases infesting soybean fields. The main pests we encountered were bean leaf beetles, Japanese beetles, grasshoppers, Septoria brown spot, and frogeye leaf spot. Importantly, however, none of the pest populations exceeded economic thresholds, thus they did not require rescue treatments of insecticides or fungicides.

This outcome has been common over the past 13 years that we have conducted this program, and it is an important message for growers to hear: insect, slug, and disease populations in Pennsylvania soybean fields are not pervasive and always threatening yield. In fact, most fields in most years do not develop economically damaging pest populations; thus, insecticide and fungicide use should provide no advantage.

Pennsylvania Slug Monitoring Project

PROJECT SUMMARY

Slugs can be a problematic pest when they occur in large numbers during spring and fall planting seasons. Replanting fields due to slug damage is often unsuccessful and results in multiple re-plantings. Managing slugs with molluscicides can be challenging because slug damage typically occurs during cool, wet weather, and finding a dry gap in the weather for application can be difficult.

Since 2018, Extension Educators across Pennsylvania have assessed slug populations and crop damage each week at 20 to 30 sites. Each site is a problem slug field identified by the farmer cooperator. Educators scout for slug eggs in each field at the beginning of the season. Ten shingle traps are installed randomly over the field. The traps are installed prior to planting, removed during planting, and replaced after planting. Each week, or more frequently after crop emergence, the traps are checked for slugs. Crop damage is measured for 21 days after emergence.

Shingle slug trap.

FINDINGS

Each week during the planting season, a report is published in Penn State's Field Crop News. Scouting for slug eggs in the springs of 2018 to 2022 did not predict the juvenile and adult slug population. The two most abundant slug species were marsh and gray garden slugs. From 2018 to 2020 and 2022, most sites reported low slug numbers and minimal crop damage. In 2021, higher slug numbers and significant crop damage were reported at some sites.

We have learned that scouting for slug eggs is not a good way to assess slug populations. Slug populations vary each year, and in the first five years of the monitoring project, we have built a good base of data that can be used to establish whether slug populations follow a predictable pattern.

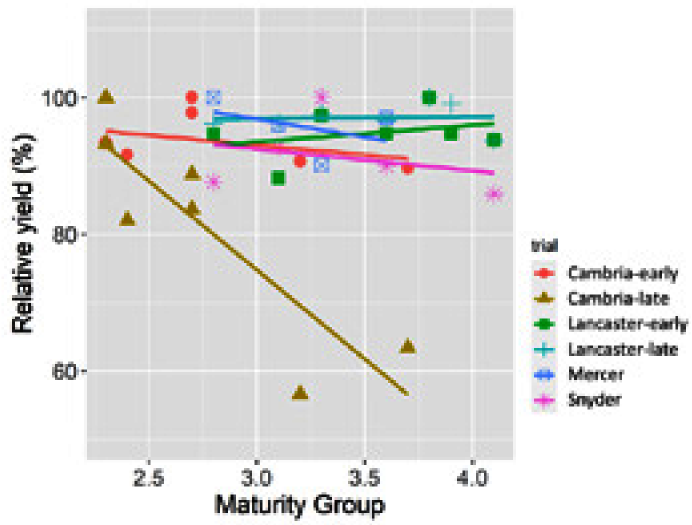
Updating Pennsylvania Soybean Maturity Zones

PROJECT SUMMARY

The purpose of this project is to provide farmers with an updated map of soybean maturity zones in Pennsylvania. As the climate changes over time, maturity groups that used to be adequate for a region may not perform as well anymore. Also, as cropping systems have become more complex and diverse (e.g., cover crops, double cropping, no-till), a wider range of planting dates have been practiced, and producers want to know the best combination of planting date and maturity group for their region.

To answer this question, we set up replicated, randomized trials at four on-farm locations (Cambria, Snyder, Mercer, and Tioga counties) and one on-station (Lancaster County) trial. The Tioga location had severe deer damage and was discarded. We planted 4-7 soybean varieties of different maturities in each location. In Cambria and Lancaster only, we planted the same varieties at two planting dates (one trial planted early and another trial planted late). Therefore, a total of six trials are reported here.

Relative yield (% of maximum yield at each location) across the maturity groups tested



FINDINGS

As expected, the vegetative (emergence to flowering) and reproductive (flowering to senescence) phases were generally shorter in the earlier maturing varieties. While this trend was always consistent within seed companies, there were slight inconsistencies when comparing varieties from different seed companies. For example, in one trial, the varieties 2721RFX (maturity group 2.7) and C3255XF (maturity group 3.2) flowered on the same day and senesced practically on the same day. These slight inconsistencies in maturity group ratings across varieties from different seed companies were expected and reinforced the importance of local variety testing when switching to a new seed brand.

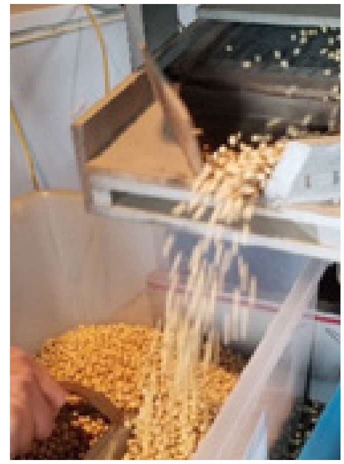
There was not a significant trend between yield and maturity group, except at the Cambria location when planted late (Cambria-late, planted on June 1), where yield decreased approximately linearly with the maturity group. In this trial, the yield was 40% lower with a maturity group 3.7, compared to a maturity group 2.3. This trend was not observed in an adjacent trial planted early (Cambria-early, planted on May 17). The Cambria location experienced high white mold pressure, and there is strong evidence that the lower yields observed with the later maturing varieties in Cambria-late were due to white mold infection, which was a result of high disease risk coinciding with flowering time for these later maturing varieties planted late. Because there are no clear seasonal patterns of white mold risk, likely, this relationship between yield and maturity group in the Cambria-late trial is an exception rather than the rule.

Average yields for each trial were: 69 (Cambria-early), 55 (Cambria-late), 74 (Lancaster-early, planted on April 25), 73 (Lancaster-late, planted on May 11), 56 (Mercer), and 63 bushels per acre (Snyder). The lack of a significant trend between yield and maturity group in five out of six trials could indicate that the maturity ranges tested in these trials were near optimal. Data from more years are needed to confirm this. These results suggest that wider maturity ranges are possible in these locations. We plan to continue this work in 2023 to account for year-to-year variability and include a larger range of maturity groups within each trial.

Varieties tested at each location

Variety	Maturity group	Cambria (early and late)	Lancaster (early and late)	Mercer	Snyder
2321RXF	2.3	x			
C2355XF	2.4	x			
2721RFX	2.7	x			
XO 2832E	2.8		x	x	x
XO 3131E	3.1		x	x	x
C3255XF	3.2	x			
XO 3341E	3.3		x	x	x
XO 3651E	3.6		x	x	x
C3755XF	3.7	x			
XO 3861E	3.8		x		
XO 3922E	3.9		x		
XO 4132E	4.1		x		x

Return on Investment for Saved Seed in a Full Season and Double Crop Environment



PROJECT SUMMARY

Off-patent Roundup Ready One soybean seed was purchased in 2019. In 2019, the seed was used as part of the "good inoculation practices" trials at $26 per unit. In 2020, 2021, and 2022 a residual herbicide followed by an in-season application of glyphosate was utilized to manage weeds, adding costs to the saved seed practice.

Seeds were saved from the original lot, cleaned, and bagged at $4 per unit, then used for planting in 2020, 2021, and 2022. The maturity groups 2.9, 3.1, and 4.0 were compared with the original seed lot (2019) at the end of 2021. In addition, the saved seed was entered into the Pennsylvania Soybean Variety Trials to determine performance compared to current releases. Farms in Schuylkill, Lebanon, Lancaster, Centre and Montgomery counties were provided cleaned, saved seed. They were asked to compare to their commercial offering to see if any yield differential existed between the saved seed and their selections.

FINDINGS

The 2019 original lot showed no differences in yield between commercial offerings. However, the results of the Pennsylvania Soybean Variety Trials placed this material in the middle of the current releases for that year. Farmers that used the seed to compare with their typical variety reported no differences in performance except at one location in Lebanon, where the grower felt he lost approximately 5 bushels per acre compared to his selection.

In 2020, yields for saved seeds were compared to the original lots. No statistical differences were noted, with the average yield for the saved seed at 86 bushels per acre.

In 2021, results showed that the saved seed performed as well as the original and new seed lots. Yields averaged 82 bushels per acre. Growers conducting on-farm trials reported no differences between their selections in yield but noted having to apply an additional herbicide to control weeds.

In the 2022 growing season, all three maturities and saved seed lots performed similarly. It was also found that the longest saved seed lot appeared to outperform the original lot of seed and have the best germination. Growers in the five counties reported similar yields in full and double-crop scenarios to their seed selections. A marked difference in seed germination was observed, with the saved seed lots having a 95% germination test prior to planting.

When considering the return on investment, the saved seed lot performed well and can be viewed as a viable option for marginal fields that are not prone to high yields or for production in a double-crop soybean scenario. Preliminary results suggested a $60 savings per acre in seed savings. Our data indicate that newer releases will need at least a difference of 5 bushels per acre to compete with saved seed methods economically.

Looking forward to the 2023 growing season, we have 2.9, 3.1, and 4.0 maturities (20 acres each) available for additional comparisons. Please contact Del Voight (dgv1@psu.edu) for more information.

THANK YOU! A sincere "thank you" to the grower cooperators who participated in the 2022 On-Farm Network trials and to the entire Penn State Extension Field and Forage Crops Team for making this research possible.

Conducting on-farm research requires additional time and effort from our growers, but it yields great results. Since 2017, participants in trials and workshops have indicated that a considerable amount of knowledge has been gained from the program.

When the research is shared with our workshop participants, most indicate that they would adopt a new practice on their farm during the next one to two growing seasons based on the results of the on-farm research.

The grower cooperators also appreciate the value of the network and the importance of testing ideas at the farm scale since there are always new issues to figuring out what works and what doesn't under real-life production conditions.

We value the participation of our grower cooperators in testing new and novel ideas on their farms and look forward to continued collaborations in 2023.

If you would like to participate in the 2023 On-Farm Network Trials, contact Paul Esker (pde6@psu.edu) or your local Penn State Extension educator.

Evaluating the Effects of Intense Precipitation on the Efficacy of Weed Management in Soybeans

Principal investigator & co-investigator: Dr. Carolyn Lowry, PSU Weed Ecologist & Assistant Professor; Dr. John Wallace, PSU Extension Weed Management & Assistant Professor

FUNDED AMOUNT: $25,453

PROJECT SUMMARY

The Northeast is experiencing a 71% increase in extreme precipitation events, which can increase soil-applied herbicide leaching and runoff, thereby decreasing preemergent residual herbicide efficacy. Cover crop surface residues can suppress weeds, thereby providing backup weed control when residual herbicides fail. However, cover crop surface residues increase soil moisture, which may exacerbate the loss of residual herbicides in response to extreme rain events.

Research objectives: 1. Evaluate how variable precipitation influences the efficacy of residual herbicides varying in solubility. 2. Evaluate whether cereal rye surface residues can enhance weed control efficacy when used in combination with either Group 14 or Group 15 herbicides when extreme rainfall events occur.

To address these objectives, in Fall 2021 we established a research experiment at PSU's R.E. Larson Research Center in Rock Springs, Pa., comparing the following treatments in all combinations:

1. Cover Crop (with and without a cereal rye cover crop)
2. Group 15 (None, Dual II Magnum, Outlook, and Zidua) and Group 14 (Valor and Spartan) residual herbicides.
3. Precipitation manipulation treatments were imposed with rainfall simulators constructed by our group and included
   - Ambient rainfall (0 inches of added precipitation, "0")
   - Intense precipitation (5 inches of rain in a single day event, "5x1")
   - Frequent precipitation (2 events of 2.5 inches of rain in one week)

FINDINGS

Without any herbicides, we saw the highest pigweed density in the precipitation treatment in which we added 2 events of 2.5 inches of precipitation, and we also saw a trend for cereal rye suppressing pigweed emergence, this difference was not significant.

Both Group 14 herbicides (Valor and Spartan) remained effective (greater than 99% control) regardless of cover crop or added precipitation treatments.

Compared to the no herbicide control, all group 15 herbicides reduced the density of emerged pigweeds. However, we did find variation in pigweed control among the Group 15 herbicides in response to both cover crop and added precipitation treatments.

Without any added precipitation (0 inches), both Zidua and Dual effectively controlled pigweed. Added precipitation had no effect on Zidua control of pigweed; however, both extreme precipitation treatments (2.5x2 and 5x1) decreased Outlook and Dual control regardless of cover crop treatment. Cereal rye increased the density of emerged pigweed seedlings when Outlook, the more water-soluble Group 15 herbicide, was used.

This work shows that out of the Group 15 herbicides, the less soluble herbicide (Zidua), provided the greatest level of control in response to extreme precipitation events. Cereal rye did not improve weed control when combined with residual herbicides, but may have decreased herbicide efficacy for the more soluble herbicide, Outlook.

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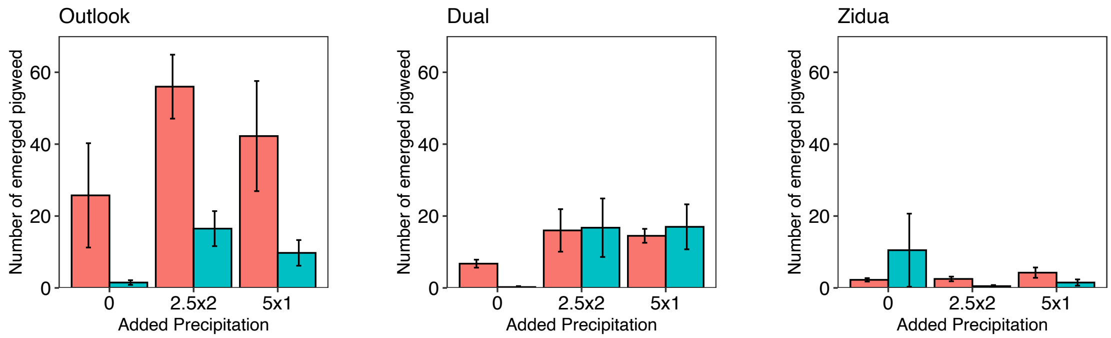


Group 15 herbicide effects on the number of pigweed seedlings in response to cover crop (cereal rye or none) and added precipitation treatments ("0"= ambient rainfall, no added precipitation; "2.5x2"= 2 events of 2.5 inches of precipitation added per event); "5x1"= five inches of added precipitation in a single day event). Bars represent means and standard errors.

Best Management Guidelines for White Mold in Pennsylvania

Principal investigator: Dr. Paul Esker, PSU Extension Field Crops Plant Pathologist & Associate Professor; Co-investigators: Dr. Alyssa Collins, PSU Extension Plant Pathologist & Associate Research Professor; Dr. Beth Gugino, PSU Extension Plant Pathologist & Professor; Karen Luong, Plant Pathology Graduate Student; Tyler McFeaters Research Technologist – Plant Pathology and Environmental Microbiology

FUNDED AMOUNT: $39,167

PROJECT SUMMARY

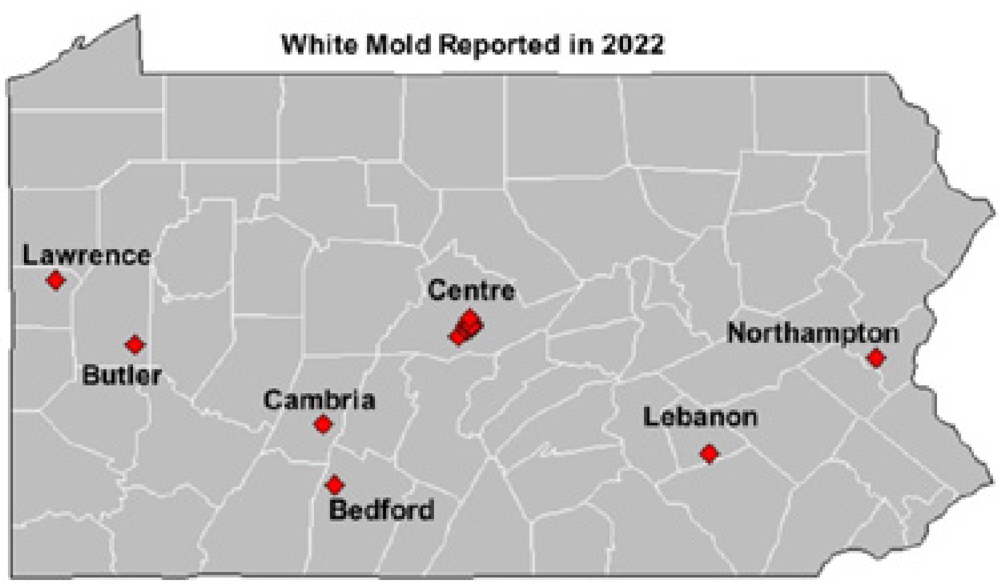
Since 1996 in Pennsylvania, white mold has caused soybean yield loss equivalent to an average of $62 per acre. This disease is caused by the fungus Sclerotinia sclerotiorum and thrives in cool, wet conditions. Weather conditions during flowering, soybean variety, row spacing, and soybean management practices influence white mold disease development. S. sclerotiorum infects many other hosts and survives in the soil for five or more years as sclerotia (black overwintering structures). Given the variability of microclimates and production practices across Pennsylvania, targeted risk assessments and management strategies are needed.

Our research aims to improve white mold disease management by studying the diversity of the pathogen at the regional and field scales, determining how widespread white mold is in Pennsylvania, and understanding current effective management practices and their limitations. Our approach will improve the development of targeted management strategies for farmers in the state.

To study the S. sclerotiorum genetic diversity at the field scale, eight fields were divided into 35 plots, and soil was sampled from each section during the spring of 2020 and 2021. To study the genetic diversity at a regional scale, white mold-infested soybeans and soil were collected throughout Pennsylvania during the summer of 2019 through 2022. In addition, we received isolates from New York from our collaborator, Dr. Sarah Pethybridge (Cornell University), to use for a comparison study. In the laboratory, S. sclerotiorum was isolated from samples. DNA was extracted, from which ten different genes were amplified using PCR and sent to the Penn State Huck Genomics Facility to distinguish unique groups (multilocus genotypes).

Isolates from our collection will be screened to capture the current status of the pathogen's fungicide sensitivity, reduced sensitivity, and resistance. High throughput methods are being designed and tested to increase the time and efficiency of the fungicide sensitivity screening. Lastly, grower discussion meetings and one-on-one interviews have been planned to survey the current effective management practices, limitations of each management tool, and factors that influence the adoption of specific management strategies.

White mold signs: black sclerotia and white mycelia on soybean stem and pods



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FINDINGS

Genetic diversity studies at the field and regional level: Across the eight field scale locations, 286 isolates were analyzed, revealing 83 unique multilocus genotypes. Each of the populations within a field showed evidence of clonality. At the regional level, 257 isolates were analyzed, and 41 multilocus genotypes were found, of which 27 were unique to Pennsylvania. While many multilocus genotypes were shared between Pennsylvania and New York, the southcentral Pennsylvania subpopulation was found to be separated from the other regional subpopulations. Compared to other S. sclerotiorum population studies in the literature, the Pennsylvania population was more diverse than observed elsewhere. The diversity studies showed that S. sclerotiorum populations at the field scale were mainly clonal, which means individuals within a field will react similarly to management tools like fungicides. In addition, unique subpopulations may be due to differing management and field histories and may need different management strategies compared to other regions.

High throughput fungicide sensitivity method testing: Five isolates from six different production regions in Pennsylvania and New York (a total of 30 isolates) were selected. A 24-well tissue culture plate was used to test 22 treatments, four fungicides at five different concentrations, negative control (no fungicide and no pathogen), and positive control (pathogen growing in no fungicide). Isolates in the tissue culture plate had comparable growth rates to those on Petri plates. A significant reduction in growth inhibition occurred in two fungicides that have been out on the market longest. This method will undergo more optimization and validation.

Monitoring for white mold: Biweekly throughout the summer, we published articles in the Field Crop News about the current white mold risk. During the soybean flowering period, there was a high risk of white mold in the northern and central regions of Pennsylvania.. The risk in south-central and southeast regions ranged from 27-40% in mid-July, which is considered moderate. Rainfall during this period was below average, which we hypothesized would reduce likely white mold development.

At the end of the season, 7 monitored counties reported white mold: Bedford, Butler, Cambria, Centre, Lawrence, Lebanon, and Northampton. The monitored field in Cambria County showed up to 25% disease incidence in some locations. The Lebanon County field was around 17% disease incidence. Significant yield loss begins to occur at above 40% disease severity index, yet low levels of white mold allow inoculum to build up in the soil. In locations with moderate risk, white mold was present with low incidence and did not significantly impact yields. While the Sporecaster mobile app can be a helpful tool for forecasting risk, other factors should be considered when making fungicide application decisions, especially given the variable results we have seen in the past three years.

Establishing an Herbicide Resistance Monitoring Program for Pennsylvania Soybean Growers

Principal investigator: Dr. Caio Brunharo, PSU Weed Physiologist & Assistant Professor

FUNDED AMOUNT: $10,181

PROJECT SUMMARY

Herbicide resistant weeds in soybean have become an important consideration when designing a weed control program. One of the pillars of herbicide resistance management is timely detection of resistant populations. The long-term goal of this project is to establish an herbicide resistance monitoring program to provide timely detection of resistant weeds for soybean farmers in Pennsylvania.

FINDINGS

As the first step towards this goal, we are currently conducting a survey to assess the current state of resistance distribution in the Commonwealth. In the 2022 growing season, we focused on sampling annual ryegrass, Palmer amaranth, and waterhemp, as these species were commonly observed in the sampled fields. We also collected giant foxtail, barnyardgrass, yellow foxtail, and marestail when populations likely escaped herbicide treatment.

We are currently conducting greenhouse studies to verify the presence of herbicide resistance in the sampled populations, where each will be exposed to lethal doses of soybean herbicides commonly used in Pennsylvania, such as Callisto, Classic, Pursuit, FirstRate, EnlistOne, Roundup Powermax, Rely, among others. Once this initial herbicide resistance screening is completed, potentially resistant populations will be further characterized to quantify resistance levels and patterns.

In addition, in growing season 2023, the survey will be repeated, where new populations will be sampled, as well as the sites from the 2022 collection to understand year-to-year variations in infestation. After gaining a better understanding of the herbicide resistance scenario, we will develop quick tests for herbicide resistance, and farmers will be able to submit their weed samples for testing. With this information in hand, farmers will be able to design more efficient weed control programs.

Scan this QR code to learn more.

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Proactive Monitoring and Management of Soybean Cyst Nematode

Principal investigator: Dr. Paul Esker, PSU Extension Plant Pathologist & Associate Professor; Co-investigators: Dr. Alyssa Collins, PSU Extension Plant Pathologist & Associate Research Professor; Dr. Adriana Murillo-Williams, PSU Extension Field and Forage Crops Educator; Dr. Dilooshi Weerasooriya, Postdoctoral Scholar – Plant Pathology and Environmental Microbiology; Mariah Kidd, Plant Pathology Graduate Student

FUNDED AMOUNT: $11,272

PROJECT SUMMARY

Soybean cyst nematode (SCN, Heterodera glycines) is North America's most damaging soybean pathogen. Yield losses associated with SCN damage can be greater than 50%. The nematode was first detected in 1954 in North Carolina and is currently found in almost every county where soybean is grown. In Pennsylvania, SCN was first detected in Lancaster County in 2002. Subsequent surveys did not report further findings of SCN.

Nonetheless, our initial stakeholder survey found a need to know the importance of SCN and soil sampling. As such, and considering increases seen in surrounding states, we created a free SCN testing program for farmers across the Commonwealth. Pre-labeled soil bags with soil sampling instructions and a field history form were sent to all Extension offices. They were also made available to participants at the PSU Ag Analytical Laboratory and were sent to farmers, industry representatives, and ag consultants when requested. Nematode identification and quantification were performed at the North Carolina Department of Agriculture and Consumer Services.

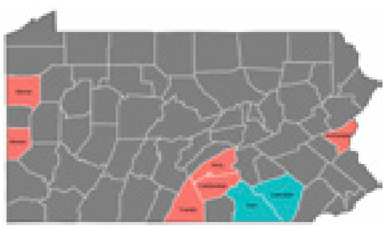


Figure 1. Current counties where soybean cyst nematode has been found. The light blue counties (York and Lancaster) are confirmed officially, while those in red require follow-up sampling in coordination with the Pa. Department of Agriculture.

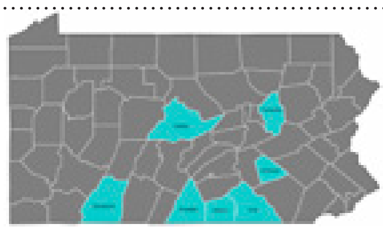


Figure 2. The current prevalence of root knot nematode from samples collected in Pennsylvania.

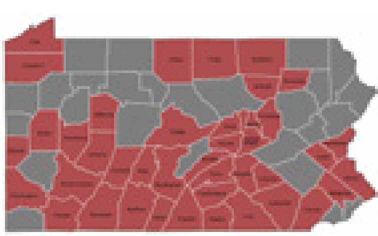


Figure 3. The current prevalence of lesion nematode from samples collected in Pennsylvania.

Learn more at thescncolation.com

FINDINGS

Approximately 700 soil samples from 46 counties have been tested for SCN. Soybean cyst nematode has been detected in at least one field in seven counties, in addition to Lancaster County (Figure 1). We have officially confirmed York County as SCN positive based on follow-up sampling of the original positive field. Based on our free testing program, we found that only 3% of the total samples tested positive for SCN. In the fields where SCN has been detected, infestation levels remain low (below 200 eggs per 100 cc).

For each sample, we also receive information about other plant parasitic nematodes. Two important ones include root-knot and lesion nematodes (Figures 2 and 3). Root-knot nematodes have been found in 7 counties, with test positivity of 2% across all samples. Root lesion nematodes have been found in 85% of samples and most counties sampled.

Recommendations: It is essential to sample for nematodes. Best management recommendations incorporate knowledge of PPN. Our current results suggest that we are doing many things correctly to limit the increase in PPN. But, we also receive reports from farmers that they have seen decreases in yield in time that they cannot easily explain. We need sampling and testing for nematodes to determine which factors explain the reduced yield. SCN is known to reduce yields without causing any symptoms in the above-ground part of the plant. In the meantime, SCN populations continue to grow below ground until they reach levels that cause stunting or yellowing and, finally, plant death. By the time symptoms are noticeable, SCN populations can far exceed the damage threshold for yield, and management becomes more challenging.

Those who detect SCN in their fields early have the greatest chance of deploying the most effective strategies to protect their yield (including crop rotation and genetic resistance) at the lowest cost to the grower.

Contact Paul Esker (pde6@psu.edu), Alyssa Collins (acc18@psu.edu), or Adriana Murillo-Williams (axm1119@psu.edu), office phone: 814-355-4897, txt 814-360-5517) if you have any questions about our free SCN testing program or would like to participate.

Studies of Effects of Novel Avian Reovirus Variants of Egg-Laying Hens and Non-Metallic Disinfectant Control Strategies

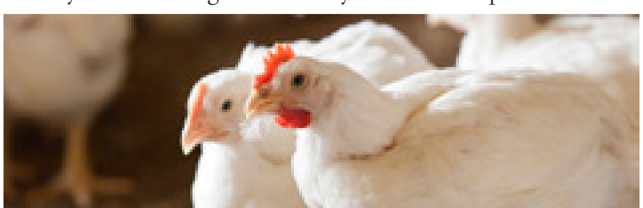
Principal investigator: Dr. Huaguang Lu, PSU Avian Virologist & Clinical Professor

FUNDED AMOUNT: $33,844

PROJECT SUMMARY

In this two-year project, we studied the effects of novel avian reovirus (ARV) variants on egg-laying hens to determine effective control strategies to keep chickens healthy. Newly emerging ARV variants and novel strains have been causing major poultry disease issues and economic losses in Pennsylvania. High mortalities of 10-20% were often present in ARV-affected broiler flocks by emerged ARV variants strains.

Soybeans are the major protein component in poultry feed. Effective control and prevention strategies for avian virus infections in poultry flocks are critical to keeping poultry healthy and ensuring constant soybean consumption.



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FINDINGS

The study looked at infectivity, transmission, immune response, length of infection and effects on egg production for three index strains of layer ARV and tested the efficacy of non-metallic or "soft" disinfectants in laying hen flocks. Data was developed on the most effective control strategies to prevent ARV infections and recommendations were created for soft disinfectant use in poultry production flocks.

Research findings indicated that about 80%t of the isolates were newly emerging field variants. The ARV infection in adult layer chickens is usually present without clinical symptoms. High rates of virus shedding and vertical egg transmission have been severe problems in causing disease in progeny or young chicks.

In this project, researchers focused on applying "soft" disinfectants against avian enteric virus infections in poultry flocks. This is an effective and economic approach for enhancement of the routine control measures (diagnostic surveillance, virus isolation and identification and vaccination strategies) to prevent poultry from viral pathogen/variant infections.

Two non-metallic or "soft" disinfectant products -- Shield Plus and Assist NPS's solution -- were evaluated for their effectiveness on avian virus inactivation and disinfections. The soft disinfectants effectively inactivated or killed ARV under laboratory conditions.

In each ARV variant-infection experiment, the ARV infected hens were given a second ARV challenge at 3-4 weeks pi. Swab and manure samples were collected in the same fashion as the first inoculation. The research findings indicated that the hens previously exposed to ARV were all 100% protected, without virus shedding.

Genome Characterization and Evolution Studies on Avian Coronavirus Variants (Research period: 2022 - 2023)

Principal investigator: Dr. Huaguang Lu, PSU Avian Virologist & Clinical Professor; Co-investigator: Dr. Anthony Schmitt, PSU Professor of Molecular Virology

FUNDED AMOUNT: $35,000

We retrieved 264 avian coronavirus (or infectious bronchitis virus, IBV) or IBV field isolates from Pennsylvania poultry during the last 30 years (1990 – 2020) and conducted both gel RT-PCR and real-time RT-PCR tests to confirm positive for IBV. Of 264 isolates, 154 isolates were selected (yielded clear PCR bands and ct-values <35) and processed for S1 gene sequencing analysis.

The IBV S1-gene sequencing results shows that all the 154 IBV isolates fall into GI lineage among the five group lineages of IBV sequencing results. Within GI lineage, there are further 27 sub-lineages. The 154 isolates belonged to six sub-lineages of 1, 3, 9, 17, 25 and 27. Distribution of the 154 IBV isolates to the IBV sub-lineages are: 121 for GI-1, 3 for GI-3, 5 for GI-9; 19 for GI-17, 1 for GI-25, and 5 for GI-27.

For the next research period, we will conduct full genomic sequencing test. We will extract IBV viral RNAs for full genomic sequencing analysis by using the Illumina MiSeq system, conduct assembling full genome sequences, complete sequencing data analysis and document the full genomic data to Genbank.

Regional and National Checkoff Supported Research

Principal investigators: Dr. Paul Esker, PSU Extension Plant Pathologist & Associate Professor; Dr. John Wallace, PSU Extension Weed Management & Assistant Professor; Dr. John Tooker, PSU Extension Entomologist & Professor

FUNDED AMOUNT: $50,000

The Pennsylvania Soybean Board is a member of the North Central Soybean Research Program (NCSRP). This farmer-led organization invests soybean checkoff funds in university research and Extension programs to better understand and manage plant stressors that reduce soybean yield and farmer profitability. Their mission is to maximize producer returns by coordinating regional research efforts, minimizing duplication of research, and assuring that regional research projects are targeted at problems of the soybean producer in member states.

For Pennsylvania soybean producers, participating in the NCSRP provides a tremendous opportunity to leverage their checkoff investment into new areas of research. Most projects are multistate, so results can be compared and integrated from across the region. This research can help farmers improve production and management decisions because they can see how various treatments or factors may perform in different soybean production areas.

The NCSRP is recognized as a leader in multi-state collaborative research and outreach efforts to support soybean farmers and drive the soybean industry forward. NCSRP's emphasis on enhancing and protecting soybean yield through genetics and agronomic practices contributes to soybean farmer success today and tomorrow.

NCSRP
NORTH CENTRAL SOYBEAN RESEARCH PROGRAM

Entomology

Co-principal investigator John Tooker is participating in a multi-state project to adapt a monitoring technology from fruit orchards – sticky cards baited with stink bug pheromones – as a sampling tool for stink bug thresholds in soybeans. Traditional scouting with a sweep net is very difficult in dense soybean vegetation. Sticky cards baited with pheromones can be mounted at field edges for quick monitoring. In this objective, we are building a dataset that will allow us to develop new economic thresholds using this easier monitoring device. This is a public/private partnership with the company Trece.

Using Data-Driven Knowledge for Profitable Soybean Management Systems

As part of a large team across the north-central soybean region, we have developed an alpha-version, cloud-based management decision support tool that provides a platform for in-field crop scouting and data collection that can be combined with crop production practices at the farm/field scale (www.soycropscout.info/index.html). Tools were developed from free tools (Epicollect5 app). In our year one launch across nine states, we generated nearly 4,000 observations (scouting events) and almost 3,500 images from the field. We have been working on developing the next-generation platform and app for 2023, which we have named "OpenCropManager."

Over the winter months, we will provide training sessions to stakeholders interested in collaborating with us on the tool and what it offers to the farmer. The project's overall goal is a new online cropping system optimization decision tool that combines the factors of soil, seed, weather, planting date, seeding rate, chemical inputs, and soybean prices that will help you make decisions to make you more profitable.

To accomplish this, we need your help, as the more data we have from a large variety of production scenarios, the more accurately we can develop the production models. There is extremely high value in working with farmer-centric data, representing real-world environments we cannot always replicate in our small plot research.

For further information about our project and the OpenCropManager, please contact Paul Esker (pde6@psu.edu) or Tyler McFeaters (tsm31@psu.edu).

Scan this QR code to learn more.

ncsrp.com

Planting Green: An IWM Tool for Multiple-Resistant Waterhemp?

Principal investigator: Dr. John Wallace, PSU Extension Weed Management & Assistant Professor; Co-investigator; Megan Czekaj, Agricultural and Environmental Plant Science Graduate Student

PROJECT SUMMARY

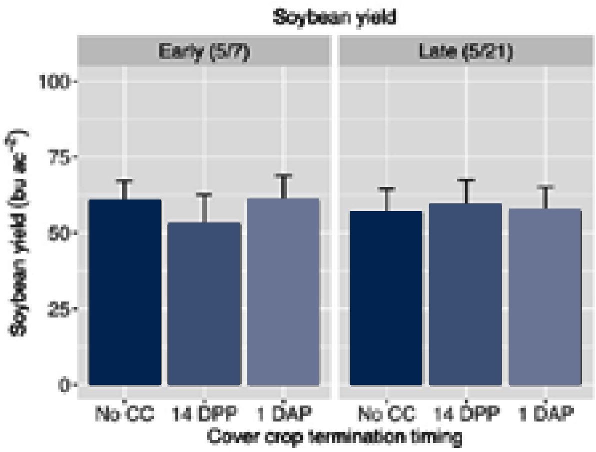
For the past two years, we have been participating in a multi-regional USB-funded experiment that is investigating the effects of planting green on no-till soybean production and management of multiple-resistant waterhemp populations. The coordinated field experiment focuses on no-till soybean (30” row spacing; Enlist system) preceded by cereal rye that was sown after field corn.

Treatments included: [1] early (May 7) vs. late (May 21) soybean planting dates; [2] no cover crop vs. standard cereal rye termination (14 d pre-plant; DPP) vs. planting green (cereal rye terminated 1 DAP), and [3] no residual herbicide inputs vs. PRE program (FierceÒ). We roll-crimped cereal rye as a residue management tactic using integrated ZRX roller-crimpers and employed minimal row cleaning at the late soybean planting date. Treatments received a POST application of Liberty/Enlist One when waterhemp reached a 4” height.

Here we briefly review key findings from our Pennsylvania location (Table 1). The story that emerged at Rock Springs, Pa., was about differences between years (2020-21 vs. 2021-22). In 2020-21, a very seasonable fall and spring resulted in significant cereal rye biomass production (> 4 tn/ac), whereas more typical cereal rye biomass production (1.5 - 2 tn/ac) was observed in 2021-22.

FINDINGS

Our results suggest that planting green can improve waterhemp management by reducing recruitment and delaying the timing of POST herbicide applications when high biomass levels are realized. However, planting green will need to be employed with 2-pass herbicide programs (PRE/POST) when more modest biomass levels (<2 tn/ac) are achieved. Soybean yielded similarly across early and late planting dates and across varying levels of cereal rye biomass production in our 2-yr study. However, it will likely be necessary to make planter modifications, including residue management tools, to consistently achieve adequate soybean stands in varying levels of cereal rye residues.

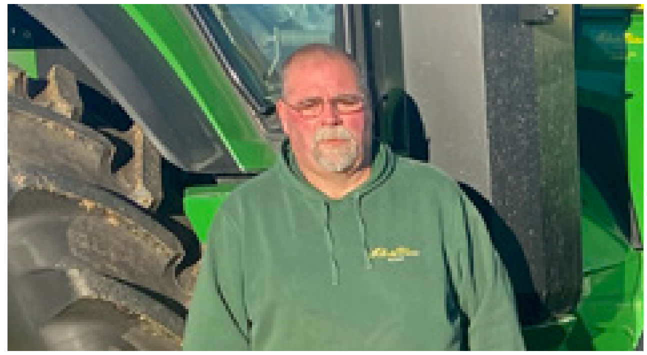


Summary of 2-yr experimental results at Pennsylvania (Rock Springs) location.

System performance	Compared to standard termination (14 DPP), planting green
Cereal rye biomass (tn/ac)	Resulted in large biomass gains (2-3 fold) for earlier soybean planting dates and modest gains (~50%) for late soybean planting dates
Waterhemp suppression *(cereal rye only)*	Resulted in >50% reduction in waterhemp populations at the POST timing in 2021; but no difference was observed in 2022
Days to POST application *(cereal rye only)*	Resulted in gain of 14 to 21 days before waterhemp exceeded 4” height and POST application was needed
Integration of tactics *(PRE residual + cereal rye)*	Significantly increased waterhemp suppression at POST timing in 2021; but high levels of residual control observed in both treatments in 2022
Soybean yield	No differences across planting date or cover crop management

Pennsylvania Soybean Yield Contest

The results of the 2022 Pennsylvania Soybean Yield Contest reflected the toll a cool spring and hot, dry summer took on soybean yields throughout Pennsylvania. Lancaster County farmer A. Dale Herr, Jr. was the commonwealth's top producer in this year's competition. His winning yield was 97.49 bu./acre.



A. Dale Herr, Jr., top grower in the 2022 Pennsylvania Soybean Yield Contest.

THE PENNSYLVANIA SOYBEAN CONTEST is designed to focus farmer attention on agronomic and management skills that will increase soybean profitability. The contest showcases crop management practices of some of the top soybean producers in the state. It recognizes not only the state-wide grand champion, but also the top growers in each of five production regions of Pennsylvania, based on maturity map.

ELIGIBILITY: Any bona-fide farmer who farms in Pennsylvania and grows 5 acres or more of soybeans within the state is eligible.

PRODUCTION: For the state-wide and regional yield contest winners, participants must use non-irrigated soybeans, but are not restricted as to variety, fertilization, spacing or other cultural practices.

PRIZES! In addition to bragging rights, the state champion receives an educational trip for two (the winner and one other individual* with a direct financial interest in their farming operation) to the Commodity Classic. (Up to $2,500.) The top yield winner in each region receives an educational trip for the winner to the Commodity Classic. (Up to $1,500.) Special awards are presented for irrigated bean yield and for oil/protein quality.

HOW TO ENTER: If you would like to enter the Pennsylvania Soybean Contest, you must register by September 1. Online registration is available at www.pasoybean.org. Harvest report forms must be postmarked by November 15.

You may also request a registration form from your local Penn State Extension Educator, or by contacting:

**Penn State Extension-
Lebanon County
PA Soybean Contest
c/o Del Voight
2120 Cornwall Road, Suite 1
Lebanon, PA 17042-9777
717-270-4391**

**Penn State Extension-
Montgomery County
PA Soybean Contest
c/o Andrew Frankenfield
1015 Bridge Road, Suite H
Collegeville, Pennsylvania
19426-1179
610-489-4315**

2022 Pennsylvania Soybean Yield Contest Winners

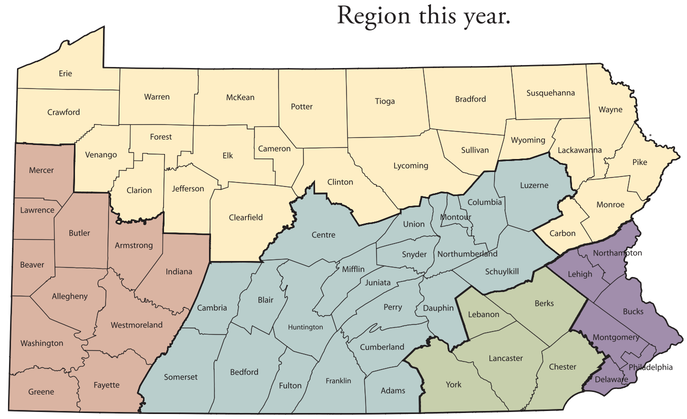
1ST PLACE STATE OVERALL & SOUTH CENTRAL REGION
A. Dale Herr, Jr.,
Kirkwood, Pa.
(Lancaster County)
97.49 bu./acre

1ST PLACE CENTRAL REGION
Eric Meyers,
Mercersburg, Pa.
(Franklin County)
85.05 bu./acre

1ST PLACE SOUTHEASTERN REGION
Brad Kiefer, Bangor, Pa.
(Northampton County)
93.38 bu./acre

1ST PLACE WESTERN REGION
Randal Smith, Petrolia, Pa.
(Butler County)
77.70 bu./acre

There were no contest entries in the Northern Region this year.



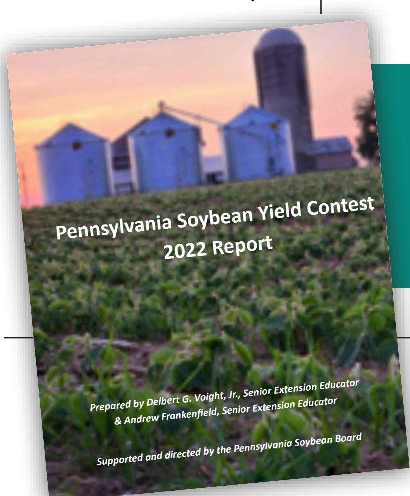
Scan the QR code to learn about the Pennsylvania Soybean Yield Contest

pasoybean.org

2022 YIELD CONTEST RESULTS

Soybean Management Practices - Regional Award Winners

Region	South Central	Central	West	Northern	Southeast
Winner	A. Dale Herr, Jr.	Eric Meyers	Randal Smith	-	Brad Kiefer
County	Lancaster	Franklin	Butler	-	Northampton
Previous Crop	Corn	Corn	Corn	-	Corn
Row Width	15”	30”	15”	-	15”
Tillage Type	No-Till	No-Till	No-Till	-	Min-till
Variety	Pioneer P32T26E	Pioneer P36A83	Pioneer P28A42X	-	Pioneer P38A54E
Seeding Date	4/28/22	3/21/22	5/13/22	-	5/5/22
Seeding Rate	150,000	110,000	190,000	-	140,000
Final Stand	118,320	27,840	93,960	-	110,000
Seed Treatment	Pioneer Premium	Pioneer Premium	None	-	Pioneer Premium
Inoculation	Dry	Pre	Pre	-	Pre
Fungicide	Trivapro	Priaxor, Miravis Neo, Miravis top	Priaxor	-	Miravis Neo
Insecticides	Sniper	Lambda	Lamcap II	-	None
Pre-Herbicide	Sharpen, Tribal	Gramoxone Solstice	Glyphosate, Xtendimax	-	None
Post-Herbicide	Glyphosate, Enlist One	Glyphosate	Glyphosate, Xtendimax	-	Glyphosate
Date of Harvest	9/28/22	9/29/22	10/25/22	-	10/21/22
Yield	97.49	85.05	77.70	-	93.38
Moisture %	12.73	16.40	12.00	-	13.30
Ave Pod Count	43	90	32	-	58
Harvest Loss	0.2 bu/a	0.5 bu/a	0.4 bu/a	-	1.0 bu/a
Biostimulant	Accomplish LM	No	No	-	Yes
Foliar Fertilizer	Yes	Yes	No	-	Optimum
Cover Crop	Rye	Wheat for grain	Wheat	-	No



To read the complete Pennsylvania Soybean Contest 2022 Report scan the QR code or request a copy from your local Penn State Extension Educator.

pasoybean.org

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