MARYLAND SOYBEAN BOARD

Soybean Sampler

2023 RESEARCH REPORT

Photo credit: United Soybean Board

Working for Your Bottom Line

In the 2023 fiscal year, the Maryland Soybean Board (MSB) approved $194,550 in funding for research projects addressing farmer needs. Project selections are made by the farmer-leaders who volunteer their time to serve as Directors on the Board.

MSB administers soybean checkoff funds for soybean research, marketing and education programs in the state. It is funded by farmers through an assessment of one-half of one percent of the net market value of soybeans at their first point of sale. One-half of the checkoff funds stay in Maryland for programs; the other half is sent to the United Soybean Board.

Maryland farmers grow about half a million acres of soybeans, producing more than 20 million bushels of beans each year. With a value of nearly $200 million to the state's economy, soybeans are one of Maryland's top crops.

> "Priority areas for the board include variety development, nematodes, weed and pest control, drought management, cover crops, and disease control. However, any projects aiming to boost production of Maryland soybean growers are considered."
>
> - Maryland Soybean Board Research Committee Chair Dale Brown.

For more information visit **www.mdsoy.com**.

Summaries in this Issue:

University of Maryland Soybean Variety Trials, Check Varieties

Nicole Fiorellino, University of Maryland

Producers are often "sold" a number of different products, seed varieties, herbicides, insecticides, or growth promotion products, which are pitched as yield maximizers. The ability of these products to increase yield may be questionable, as companies do not typically utilize acceptable statistical practices and field trial design to produce repeatable conclusions. What is additionally questionable is the profitability of these products. Producers need an unbiased source to compare the performance and profitability of these products, namely seed varieties, to make decisions that maximize profitability on their operations.

Varieties tested in 2023 were entered by participating seed companies that were solicited for submission of varieties. These varieties represented those currently available for purchase to experimental lines still under evaluation. Select Pioneer, Agrigold, and Mid-Atlantic Seeds varieties were identified for use as checks in the test. The inclusion of the performance data for check varieties that are proven performers in the Mid-Atlantic region allows comparisons of newer varieties to proven varieties.

During 2023, 85 varieties were tested using four maturity groups: MG 3, early MG 4, late MG 4, and MG 5. Check varieties were included in each of the tests. Each variety was replicated three times per location. The team aimed for a seeding rate of 6-7 seeds/foot and plot harvest length was approximately 20 feet, but harvested plot length varied slightly across locations. Center two rows (~5 ft. swath) were harvested, and grain yield, harvest moisture, and test weight were measured for each plot.

The selection of a variety based solely on performance at one location is not recommended. It is better to select variety based upon performance over a number of locations and years, if possible. Relative yield is the ratio of the yield of a variety at a location to the mean yield of all the varieties at that location expressed in percentage. A variety that has a relative yield consistently greater than 100 across all testing locations is considered to have excellent stability.

Scan the QR code to learn more about this project.

Participation in National Evaluation of Soybean Biological Seed Treatments

Nicole Fiorellino, University of Maryland

Biological seed treatments are a growing market in the U.S., and soybean growers are interested in understanding the benefits of applying biological products to the seed. Often, farmers are bombarded with marketing claims about biological seed treatments and other novel products. In many cases, there is little or no third-party evidence regarding the ability of these biological seed treatments to improve soybean yield and profitability. This project collaborated with the nationwide Science for Success team of agronomists to evaluate situations where biological seed treatments improve soybean grain yield.

The study was established following the national protocol at the Lower Eastern Shore Research and Education Center (Poplar Hill) and the Wye Research and Education Center. Pre-plant soil samples, leaf samples at ~R2, and grain samples at harvest were collected and processed for shipping to project organizers at the Ohio State University.

Overall soybean yields were greater at Poplar Hill than Wye in 2023, likely due to less precipitation at Wye in 2023 than the is typical for the location (data not shown). Within each location, there was no significant difference in yield across the treatments (P=0.7153 at Poplar Hill; P=0.2795 at Wye). The lack of significant treatment differences in yield results align with all but one location nationally in 2023.

Earlier Planting Date and Decreased Population Impacts on Full Season Early Maturity Soybeans

Nicole Fiorellino, University of Maryland

With interest in pushing planting dates earlier, other management decisions must be changed to accompany the earlier planting date to maximize yields. While nationally research has not demonstrated a clear trend to shifting maturity groups with shifting planting dates, generally, it has been shown that an earlier maturity variety should be used for earlier planting, to ensure flowering while daylight is lengthening, and reproductive development takes place before the hottest temperatures of the summer. This management scenario presents risks though, as earlier harvest may be necessary to prevent yield losses from shattering or grain damage due to lower moisture content. While early- to mid-MG 4 soybeans generally yield well in Maryland, a shift to a MG 3 soybean may be necessary in this early planting scenario. Therefore, the first year of this study evaluated MG 3, to hone in on where in the MG 3 continuum would yield be optimized at early planting across multiple populations.

To complete the evaluation, an early and late MG 3 of three popular seed brands and three seeding rates (80k, 100k, and 120k seeds/acre) were utilized, at two locations (Wye Research and Education Center in Queenstown, MD and Central Maryland Research and Education Center – Beltsville in Beltsville, MD). Each replicate was split, with one half randomly selected to be planted early and the other half planted at recommended timing.

Small plots were established using a no-till planter with 30” row spacings at both locations. Early planting was April 18, 2023, at Wye and April 19, 2023, at Beltsville while the second planting was May 8, 2023, at Wye and May 11, 2023, at Beltsville. Stand count and branching were evaluated in season and yield was collected via harvest of the center two rows of each on November 7, 2023 at Beltsville and October 24, 2023 at Wye. Grain yield, harvest moisture, and test weight was measured for each plot. Data was analyzed using a mixed model analysis of variance by location, initially evaluating a potential interaction between brand, maturity group (early or late), planting date, and seeding. When interactions were not significant, significance of treatment effects were considered.

The preliminary results of Year 1 of the evaluation indicate that early planting of early MG 3 varieties (< 3.4) planted early at low seeding rates (80k seeds/ac) may decrease soybean yield. As farmers are considering shifting planting dates earlier, they may want to avoid shifting to maturity groups that are too short for our region or planting these at too low of a population. The team plans to strengthen these results with another year of data collection.

Evaluating Deer Preferences for Soybean Varieties and other Divisionary Food Plot Crops

Luke Macaulay, University of Maryland Extension

Deer are the leading cause of crop damage by wildlife in Maryland, with most recent government estimates showing 77% of losses attributable to deer. Maryland in particular faces greater challenges than many other soybean growing areas in the country due to smaller field sizes that are more often interspersed with and bordered by forested areas that provide refuge for deer, which emerge to graze highly palatable and nutritious soybeans. Farmers have regularly identified deer and wildlife damage as one of their top concerns, and frustrations by farmers are well documented in news media articles.

In 2021 and 2022, University of Maryland Extension engaged in research to better understand deer preferences and plant response in heavily damaged agricultural fields.

The results of 2023 study are forthcoming, which include analyzation of deer grazing patters against weather variables to try to predict the spikes in deer grazing observed in fields. Initial analysis suggests rainfall in the prior 1-2 days is a significant predictor of deer grazing activity, and the team plans to augment the analysis to incorporate wind and other factors.

Identifying and Culturing Slug Parasitic Nematodes in Maryland

Michael Crossley, University of Delaware

Slugs are a persistent threat to Maryland soybean, typically infesting < 20% of soybean acreage but causing significant yield loss when populations reach high densities. The sporadic-but-severe nature of slug damage makes management frustrating. Ironically, insecticides make slug problems worse by killing predators but leaving slugs unharmed. Molluscicides (e.g., metaldehyde or iron phosphate, applied as a bait) can be effective, but are too costly and prone to washing away with rain to be relied upon as a preventative treatment. By the time slug damage is evident, though, it may already be too late to achieve control with a molluscicide. This is a classic "damned if you do, damned if you don't" conundrum.

Natural predators and parasites (enemies) of slugs are a perhaps underappreciated ally in our battle against slugs. Previous research by Dr. Crossley and his team at University of Delaware examined the natural enemies that could make a dent in slug populations and the factors that promote these natural enemies. At least two types of slug parasitic nematodes were collected (with obvious morphological differences), one type was from marsh slugs, the other from leopard slugs. This study continued Dr. Crossley's work collecting and identifying slug parasitic nematodes from Maryland soybean fields, and developing a liquid culturing technique to maintain slug parasitic nematode colonies in the lab.

A total of 17 fields were regularly sampled, yielding a total of 1,531 slugs (1,043 marsh slugs, 488 gray garden slugs). Only about 2% of marsh slugs melted and produced nematodes, a low but typical proportion (~3% of slugs melted in 2022). These slugs originated in just two sites. No gray garden slugs were infected with nematodes. Identification is ongoing, but so far the team has identified three of the nematode species. One of them, Panagrolaimus detritophagus, is not considered a strict parasite, but instead uses slug hosts to disperse and feeds on bacteria in the host and environment. The other, Pristionchus pacificus, is an obscure species that has only been recorded parasitizing scarab beetles. Finding it in a slug is exciting, but warrants further investigation to determine pathogenicity. The third species was identified to the genus Oscheius, which includes species that are known slug parasites. The team is most excited about finding this nematode. They plan to continue identifying these nematodes, and to eventually conduct pathogenicity tests to verify the potential of these nematodes to serve as effective slug parasites.

Also ongoing is the work to maintain these nematode colonies in the lab, by occasionally replenishing them by infecting live slugs and collecting emergent nematodes. However, the goal is to be able to maintain nematodes without slugs and to ramp up numbers to be able to do pathogenicity tests. To do so, they have begun isolating bacteria from slugs and culturing them on agar petri dishes. The next step is to identify these bacteria, and then get them into liquid culture to feed nematode colonies. Toward this end, the team acquired an incubated orbital shaker, a necessary piece of equipment to maintain these bacterial cultures (they need to be kept cool and aerated by continuous shaking, using other funding. They plan to continue this work to the point of being ready for pathogenicity testing.

Soybean fungicide efficacy, profitability, and pest resistance over time

Andrew Kness, University of Maryland Extension

Fungicides are becoming increasingly popular in full season soybean production. Land grant institutions across the US and in surrounding states have robust applied research programs where industry ag chemical companies submit new products and formulations for testing for the management of soybean diseases; such a project has been absent in Maryland for several years, creating a dearth in knowledge of fungicide efficacy for our soybean producers in Maryland. This project aimed to provide data that soybean producers would benefit from, such as fungicide efficacy for managing common fungal diseases of soybean, monitoring of fungicide resistant pest populations, and tracking the economic impact of foliar fungicide applications over multiple years and environments unique to Maryland.

Field trials were established at three University of Maryland Research farms: Western Maryland Research & Education Center in Keedysville, MD (WMREC), Wye Research and Education Center in Queenstown, MD (WYE), and Central Maryland Research & Education Center (CMREC). Plots were arranged in a randomized complete block design with five replicates. Plots were planted behind soybeans in order to create conditions conducive for developing foliar diseases on soybean.

Fungicides were applied at the R3 growth stage (August 9, 2023, at WMREC and CMREC and August 2, 2023, at WYE). Some plots had two fungicide treatments, the first at R3 and the second 14 days later with (R3+14 days). These applications were made on August 16, 2023, at WYE and August 23, 2023, at WMREC and CMREC. Yield data were collected by harvesting the center 5 feet of each plot. Statistics related to profitability and economics were calculated using the local cash market price for soybeans of $13.05 per bushel at the time of analysis.

During the 2023 growing season, none of the treatments tested yielded significantly different than the non-treated control. This is likely due to the fact that no ratable foliar fungal diseases were present in the plots this year. Without the presence of a pathogen, fungicides have reduced odds of improving yields over non-treated plots.

When net profit was analyzed by treatment timing (R3, R3 + 14, and none) across all years (2021-2023), the single R3 application was provided a significantly greater profit margin ($29/acre) than two treatment program (-$26/acre) and the non-treated control (P=0.0231; Figure 4). These data indicate that a single fungicide application at R3 provides the greatest yield increase and profit margin compared to a two-pass program.

Understanding the Farm Estate Planning and Succession Planning Needs in Maryland

Paul Goeringer, University of Maryland

University of Maryland Department of Agricultural and Resource Economics (AREC), University of Maryland Extension (UME), and the Agricultural Law Education Initiative (ALEI), conducted a needs assessment to gather information on the estate planning needs of Maryland agricultural producers and identify gaps of knowledge, and to develop and improve workshops and educational resources in the future.

To complete the assessment, a voluntary online survey was created asking a series of questions related to succession and estate planning. Nearly 130 responses to the survey were received. The survey highlighted farm owners' concerns about estate and succession planning and identified knowledge gaps. Owners expressed a need for more information to overcome obstacles. From the responses, it was determined that tools like fact sheets, seminars, or programs should be developed to enhance chances of success.

While participants acknowledged the importance of estate and succession planning, there is room for improvement. Many farmers delay planning until older or when an heir is chosen, assuming their health will suffice. However, challenges and concerns emerge during plan development and future farm management. Therefore, educating owners about early succession planning methods is crucial to ensure a smooth transition of the estate to the next generation.

Evaluation of Burndown Treatments for Herbicide Resistant Weeds in Full and Double Crop Soybeans

Ben Beale and Alan Leslie, University of Maryland Extension

A common question asked by farmers dealing with herbicide resistant Palmer amaranth is, “what are the most effective burndown options in situations where Palmer amaranth is larger then the ideal 3-4 inch control range?” In addition, farmers are often confronted with several weed species, such as herbicide resistant Palmer amaranth, common ragweed and/or marestail in conjunction with grass or perennial weeds. Often, herbicides effective on one species may not be effective on another. Farmers often ask what is the best tank mix for these situations that may allow for a single application, and will tank mixing these products in a single application result in reduced control (antagonism). In the summer of 2022, Ben Beale and his team undertook a study evaluating eight different treatments for control of larger Palmer amaranth in Southern Maryland. With funding from the Maryland Soybean Board, an expanded study was conducted in the summer of 2023, adding 4 new treatments for a total of 11 treatments.

The studies compared the efficacy of burndown options for Palmer amaranth, grass and other weeds with single or tank mix applications of Roundup, Liberty, Enlist and Gramoxone with non-ionic surfactant or crop oil as the adjuvant. It should be noted that other research has shown that separate applications or sequential applications can be effective in controlling larger weeds. The study focused on a single application with a tank-mix of multiple herbicides made at planting.

Any treatment containing Gramoxone either with crop oil or a non-ionic surfactant provided very good control of Palmer amaranth with over 90% control. The tank mix treatment of Liberty and Enlist One also performed well with 85% control. Roundup by itself provided no control. Liberty applied either with non-ionic surfactant or crop oil, and Liberty with Roundup only achieved around 40-50 % control of Palmer Amaranth. It is notable that all Liberty treatments saw a reduction in the level of control as the season progressed. This was evidenced in the field by Palmer amaranth plants suckering out from the base and re-growing approximately 2 weeks after the application. The team did not observe suckering with the Gramoxone treatments or Liberty+Enlist treatments. They also noted that new Palmer amaranth seedlings began to emerge just 20 days after the burn down treatments. Palmer amaranth continues to germinate throughout the summer, especially in open areas where sunlight reaches the soil. Controlling this weed takes a season long approach.

The study site had large 8-10 inch fall panicum present at time of application which can be challenging to control with best treatments. While Roundup didn’t have any efficacy on resistant Palmer amaranth, the enduring benefit of this product can clearly be seen in control of other tough weeds, such as grasses with 100% control in our study. The team saw a slight reduction in control of the grasses present when Roundup was tank mixed with Liberty. The Gramoxone + NIS and Gramoxone + Crop Oil treatments had lower grass control at 69% and 84% respectively and both treatments were significantly lower than Roundup treatments. Tankmixing Roundup with Gramoxone reduced grass control from 100% with Roundup alone to 76% when tank mixed with Gramoxone. The Liberty treatment performed better than expected in this study with grass control around 90%. Enlist only has activity on broadleaf and was omitted in the analysis for grass control.

Spring Management of Cover Crops, How Termination Timing Effects Soybean Growth and Yield

Raymond Weil, University of Maryland

Many farmers who use cover crops terminate them as early as possible in spring to get this task out of the way well before planting to ensure that the cover crop residue will be completely dead and dry and easy to cut through without causing hair pinning.

In the Mid-Atlantic, this often means terminating cover crops in late March or early April, some two to four weeks before cash crop planting. But for cool-season species like those used for winter cover crops, April represents ideal growing conditions during which they may be able to double or even quadruple their biomass. Many of the benefits derived from cover crops are directly related to the amount of biomass produced. On the other hand, many farmers fear that allowing cover crops to grow large will make the planting process difficult and may provide conditions favorable to pests such as slugs.

This research project compared three cover crop termination timings: Early (several weeks before cash crop planting), Mid (termination simultaneous with planting green into the living cover crop at the normal crop planting time), and Late (one to two weeks after planting green when the cash crop has already emerged). The field experiments applied these three termination dates to three cover crop treatments: NC - no cover crop control containing only winter weeds, Rye - a pure stand of rye established in the fall, and 3-way - a mixed species cover crop established in the fall with radish + rye + crimson clover. The latter cover crop normally would have only two species in the spring (plus any weeds that might be present) since the radish normally freeze-kills during the winter. Researchers studied a factorial combination of three termination times and these three cover crops against the background of either corn residue or soybean residue from the previous cropping season.

The team found that letting cover crops grow longer in spring increased the biomass and carbon returned to the soil, but the increase varied by species. Termination time had little effect on clover biomass or weeds, but later termination significantly increased the dry matter of the cereal Rye in the mixture. The three-species mixture when planted early enough by interseeding into the cash crop in late summer, is usually dominated by radish in the fall and by clover in the early spring.

The above-ground biomass of cover crops was not well correlated with below-ground biomass, hence the shoot/root ratio varied greatly by growth stage and species, making most carbon models poorly suited to predict below-ground carbon.

Letting a lush cover crop with legumes grow several weeks after cash crop planting may have reduced stands or delayed crop emergence in some cases. In 2023 with little moisture stress during summer, neither rye or multispecies cover crops reduced corn or soybean yields as compared to no cover crop in a long-term no-till system. In the previous year with drought at critical periods, cover crops increased corn yield significantly at all nitrogen levels.

Field plot of 3-way cover crop with kill date subplots.

Integrating Flame-Weeding for Early Season Weed Control in Soybean

Kurt Vollmer, Alan Leslie, and Dwayne Joseph, University of Maryland Extension

Flame weeding is a non-chemical tactic that has been shown to control several grass and broadleaf weed species. The majority of flame weeding treatments are applied to emerged weeds; however, studies also show flame treatments to have detrimental effects on the seeds of certain weed species post-dispersal.

This study hypothesized that integrating flame weeding with the stale seedbed approach will improve control by stimulating weed emergence for early flaming postemergence, burning weed seed on or near the soil surface, and minimizing soil disturbance and additional weed germination.

Sites in Caroline and Kent County evaluated flame-weeding as an integrated tactic for early-season weed control in soybean. All plots were flamed immediately after planting followed by 1 or 2 additional flame treatments or flame treatments integrated with a cultivation treatment when weeds reached 3" in height. In addition, different walking speeds (1 and 2 mph) were tested to determine if longer flame exposure improved weed control. Results from both studies showed that flame treatments affected overall broadleaf density, but cultivation was needed to attain higher levels of control. Flame treatments alone helped to reduce weed density at the Kent County study relative to the untreated check, with three subsequent flame treatments showing a reduction in broadleaf weed density compared to one or two flame treatments. While a diversity of species were present at the Kent County site, Palmer amaranth was the dominant species at the Caroline County site. At this site both treatment and walking speed had an effect on Palmer amaranth density 4 weeks after planting. While the majority of flame treatments did not differ from one another, Palmer amaranth density was lower with 3 subsequent flame treatments at 1 mph compared 3 subsequent flame treatments at 2 mph.

A flame treatment is applied to control emerged weeds in soybean.

Similar results were observed with the flame followed by cultivation followed by flame treatment suggesting that longer flame exposure may be needed for effective Palmer amaranth control. It should also be noted that Palmer amaranth varied in height at the time of postemergence applications, with flame treatments having a reduced effect on larger weeds.

While results from both sites showed that flame treatments can reduce weed density, weed control was not maintained at acceptable levels throughout the growing season. In the case of the Caroline County site, the level of the Palmer amaranth infestation was too high to produce a viable crop. These results suggest that preemergence flame treatments are not a viable option for weed management compared to postemergence flame treatments. However, additional research is needed to determine how postemergence flame treatments may be better integrated into a more comprehensive weed control program.

Phosphorus Runoff from No-Till Soils, Do Cover Crops Make it Better or Worse?

Raymond Weil, University of Maryland

While cover crops can provide many benefits to the farmer, the Maryland cover crop program is primarily focused on the reduction of nitrogen loading to the Chesapeake Bay. Research studies, including our work sponsored by the Maryland Soybean Board, have clearly shown that cover crops can be very effective in reducing nitrogen leaching and that their effectiveness is dependent on early cover crop establishment in fall. However, there is little research on how cover crops impact phosphorus losses. Some studies suggest that cover crops might increase soluble phosphorus at the soil surface where it would be susceptible to becoming dissolved in runoff water. In fact, cover crops can be an important tool for increasing P availability and crop yields in phosphorus deficient soils. Cover crop mechanisms that cycle P and make soil P more soluble and plant–available may also allow high productivity on Maryland farms with lower levels P fertilization. This could be part of a long-term strategy to make farming more sustainable both economically and environmentally. The goal of this research is to provide data on how a range of cover crop practices impact the loss of phosphorus by surface runoff.

In the fifth and final year of this project, researchers continued to work with two contrasting soils (one sandy and one silty clay) with plots of three basic cover crop treatments: no cover control (weeds only), rye cover cop, and a 3-way mix of radish, rye and crimson clover. The team collected runoff samples from natural rainfall during April and from simulated rainfall during April and part of May 2023. Also, during April and May 2023, they sampled the near-surface soil around each of the erosion weirs and separated the samples into the upper 2.5 cm (or 1 inch) and the next 12.5 cm (or 5 inches). The upper 2.5 cm of soil represents the layer most likely to interact with rainfall. This soil was then extracted to determine the easily soluble phosphorus that is likely to desorb from the soil into runoff water.

In general, the nutrient levels in the runoff from both fields were quite low and within EPA guidelines.

Student Camille Calure assisted in measuring infiltration and collecting runoff samples.

Although the team is continuing to analyze data from our runoff samples, it appears that in general runoff from no-till fields with a history of cover cropping but not a history of manure application is quite low in nutrients. While some cover crop effects were statistically significant there was no evidence that cover crops made the loss of nutrients greater. In some cases, cover crops reduced the concentration of nutrients in the runoff. In some cases, there were significant differences in nutrient concentrations in the runoff between corn and soybean residues.

Continued Assessment of Soybean Foliar Fungicide Efficacy when Applied Through Irrigation

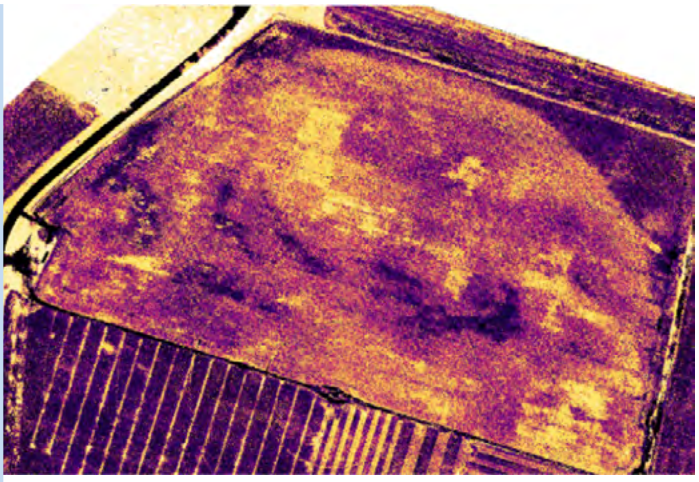
Alyssa Koehler, University of Delaware

Irrigation research has historically been conducted in the semi-arid Southwest US, but research from other areas of the U.S. often has limited adaptability to Maryland and Delaware due to climate and soil differences. In recent years there has been an effort to optimize irrigation practices specifically for the Mid-Atlantic. As improvements are made in irrigation timing and nutrient management, new questions, such as the addition of fungicides to irrigation, can be addressed.

From 2019-2021, initial research on efficacy for management of foliar diseases in corn was conducted at the UD Warrington Irrigation Farm. This work has generated interest from growers to determine if fungicides applied via irrigation may also be viable in soybean production. This study aimed to quantify soybean foliar disease severity in response to fungicide treatments applied through irrigation, and compare the efficacy of soybean foliar disease management in ground rig versus irrigation applied fungicides.

Soybeans were planted at the University of Delaware's Warrington Irrigation Research Farm in Harbeson, DE on June 1, 2023, at populations of 140,000 seeds per acre. Using a combination of soil electro-conductivity mapping, aerial imagery, soil borings and historical yield maps, the field was divided into 5 tiers (replications) of varying soil type. Yield data were analyzed to determine treatment differences among fungigation and ground rig application methods and timings.

Fungicide applications were made at R1, R3, and R5. Root-knot nematodes were present in the field and there were spots where bean growth was restricted due to nematode pressure. From scouting plot edges, very limited foliar disease was present. Drone imagery was used to capture data on plot changes following fungicide application. Normalized Difference Red Edge (NDRE) images measure the amount of chlorophyll in the plants and can be used to detect variations in crop health. Across the season, the plots receiving ground rig applications had higher NDRE values indicating higher chlorophyll content and greener leaves. Each week, NDRE images were quite striking with individual plots visible. This was consistent with NDRE images in 2022. However, when plots were taken to yield, there was no statistical separation among treatments in either trial year. Ranking numerically, there was a 6 bu spread from the highest yielding treatment to the control plot in 2022. Wider numerical spread was observed in 2023, but yield potential was lower, largely due to the root-knot nematode pressure present.



Normalized Difference Red Edge (NDRE) images measured the amount of chlorophyll in the plants and can be used to detect variations in crop health.

Results of this trial show that fungicide in absence of disease will likely not contribute to significant yield protection. No significant differences among treatments were observed. If making a fungicide application, the recommendation remains to use a single R3 timing. Adding in R3+R5 or R1+R3+R5 did not lead to increased yield in either application method. While the NDRE indices seemed to favor ground rig application, notable consistent differences in yield were not present for fungigation v. ground rig plots. Fungicides work to protect yield, so in situations with low disease pressure, wide variation in yield is not expected. Although there were differences in NDRE values, the lack of yield response between fungigation or ground rig shows that application method is not driving significant yield change in low disease settings. In years with higher disease pressure, greater differences in yield would be expected. In low disease scenarios, if fungicides are applied, R3 remains the optimal timing and both fungigation and ground rig application methods are options.

Effect of Planting Date on Seasonal Timing of Pest Complexes and Insecticide Efficacy

Kelly Hamby, Lasair ni Chochlain, University of Maryland

Several changes in agronomic and preventative control practices have brought about the need to re-evaluate and improve insect pest management in Maryland soybean production.

In completing the second year of the two-year project, the team from University of Maryland replicated their study measuring timing, abundance, and economic impact of slugs, insects, and early-season pathogens across two planting dates (as early as possible and one month later) and two farms (Central Maryland Research and Education Center in Beltsville, MD and Wye Research and Education Center in Queenstown, MD). They also assessed the impact of planting date on the control efficacy and economic benefits of adding a pyrethroid insecticide to the post-emergence herbicide application. The experimental design was replicated in two fields at each farm with three replicates of each treatment combination (date*pesticide) per field. In 2022, no significant differences in yield or seed quality were found between post-emergence herbicide alone and post-emergence herbicide mixed with Warrior II across both planting dates, but as weather and pest populations can vary greatly from year to year, the experiment was repeated in 2023 to make conclusions about whether or not there is a pest control benefit more robust.

In summary, soybean planted in late April/early May could experience slightly higher pest pressure compared to June plantings, but generally not enough to warrant treatment. In the 2 years of this study, disease pressure was low at both sites, and planting earlier did not increase pathogen incidence. A yield benefit was not detected from using insecticides at the postemergence herbicide timing. In the years studied, yield limiting pests were not present at threshold abundances, making any reduction in pest damage have little impact on yield. In such situations, reducing chemical applications can reduce input costs and increase profits. An integrated pest management approach with regular scouting and dynamic response to pest pressure can help avoid losses due to unexpected pests and reduce unnecessary chemical inputs. There was also no evidence for secondary pest outbreaks; however, insecticides may still reduce natural enemy abundances and potential for biological control suppression of pests.

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