College of Agriculture & Natural Resources
MAES | Maryland Agricultural Experiment Station

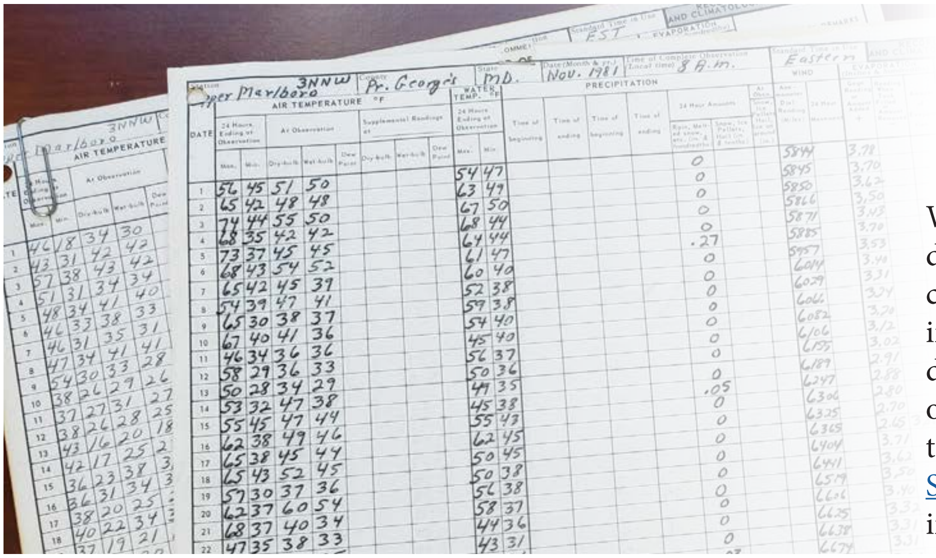
# CMREC Headquarters Clarksville Facility

# ROOTS IN RESEARCH

## Yield of 2022

We are proud to present you with the first edition of a series of annual newsletters showcasing the university of applied research and hands-on educational programming that happen at the University of Maryland Research and Education Centers across the state. These facilities provide a living-laboratory space to carry out research addressing the real-world problems facing our farmers from issues like invasive species, climate change, economics, and environmental conservation. The information produced from these research projects is shared with the scientific community and directly to the public through journal articles, extension newsletters, and many other formats, but compiling summaries of all of the work done at each facility in one publication here gives a snapshot of how many projects are carried out at each research farm every year. Here, we have compiled reports on the 2022 projects at the Central Maryland Research and Education Center (CMREC) in Clarksville. CMREC-Clarksville is unique among the RECs, because it is home to the UMD dairy herd, a working dairy milking around 75 cows, 7 days a week, 365 days a year. This facility was historically known as the forage research facility, but now supports research in the areas of dairy nutrition, nutrient management, grain crop production, wheat breeding, and even commercial horticulture, among others. This research facility continues to see transformation with new partnerships and growth of research and extension activities. We hope you enjoy reading about the breadth of different projects, and gain some insight on the value of the work carried out at the RECs each year.

## In This Issue:




## Clarksville Weather Station

Weather data for Poplar Hill and Salisbury are displayed on our website. The information can be displayed by month, or by the year in a printable format. To compare weather data averages by the month or year, check out our website! If your research requires this data in a different format, please contact Sheila Oscar and she will help to get the information you are requesting.

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## MARYLAND FARM & HARVEST
## Episode 1004

**Season 10 Episode 4**

**Video has closed captioning.**

**Click here to watch**

The Dirt! USDA-NRCS soil scientist, Annie Rossi-Gill, PhD., CPSS show how farmers adapt to different soil types, including MD State soil, Sassafras.

**Aired: 12/06/22**

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Cover photo: Silver-spotted skipper (Epargyreus clarus) caterpillar, a common defoliating insect on soybean in Maryland. Photo credit: K.

Roots in Research
CMREC Beltsville, Clarksville, Turfgrass and Upper Marlboro, LESREC Poplar Hill and Salisbury, and WMREC Keedysville are published by the University of Maryland Extension

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# CMREC Turfgrass Evaluation Trials

**David L. Clement, Ph.D.**
**Extension Specialist, Plant Pathology**
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One of the most crucial decisions made during the establishment of a turf is the proper selection of seed or seed mixtures. Turfgrasses must be selected according to their adaption to the particular site and intended use. Improper seed selection and/or poor seed quality will lead to poor turf. Use of a turfgrass species or variety that is not adapted to your site conditions will result in a weak, thin, and unattractive turf that is subject to soil erosion and weed encroachment. Consequently, a higher level of maintenance will be necessary to maintain a desirable lawn.

Incorporating compost is one of the best ways to improve existing soil for the long-term no matter the soil type. Compost increases water and nutrient holding capacity in sandy soils. In clay soils compost improves drainage. It is a common practice to apply compost just before seeding a new lawn or laying sod. An additional need is to reduce nutrient pollution to the Chesapeake Bay watershed and public scrutiny of lawn maintenance practices and the nutrient management laws in Maryland justify turfgrass trials with minimal maintenance practices.

Turf plots were established at CMREC, Clarksville in 2009 with compost additions and no compost additions to observe long term effects of low maintenance practices on standard turfgrass cultivars used for home lawns. These plots continue to be maintained and observed for practical quality performance under low maintenance regimes.

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# Role of Rhizobial Diversity for Drought and Herbivory Tolerance in Soybean

**Authors: Brendan Randall (PhD student), Kelsey McGurrin (Faculty Specialist), and Karin Burghardt (Assistant Professor)**

**Research team: Burghardt lab members from the Department of Entomology in collaboration with Smithsonian Environmental Research Center and UNC-Greensboro researchers, and Dr. Nicole Fiorellino (Director of the UMD soybean variety trial).**


Fig 1. Soybean plants growing in plots at the LESREC Poplar Hill facility. Photo credit: K. McGurrin

Increasing the diversity of soil bacteria interacting with a plant may help decrease insect herbivory, especially during droughts (link). To follow up on this work, our team collected data within the University of Maryland Soybean Variety Trial from 2019-2022 at four UMD RECs (Fig 1. Poplar Hill, Clarksville, Wye, and Keedysville). We are interested in measuring traits and yield of soybean plants from the same varieties growing across a wide range of environmental conditions (Fig 2. drought, flooding, insect herbivory) and determining how that relates to the diversity of the nitrogen-fixing bacterial partners (rhizobia) associated with the plant (Project BeanDIP).

As an additional question in this field study, we investigated whether commonly applied soybean seed treatments that include fungicides, insecticides, and often a rhizobial inoculum decrease herbivore damage on soybeans or increase yield. While we occasionally see early season decreases in piercing-sucking insect damage, we found no evidence that seed treatments lead to higher bean yield across three years of the replicated study for the soybean varieties tested (Fig. 3) across the REC farms.

Fig 2. Silver-spotted skipper (Epargyreus clarus) caterpillar, a common defoliating insect on soybean in Maryland. Photo credit: K. McGurrin

Data from the field trial on rhizobial diversity, herbivory, plant traits, and yield will be paired with ongoing experiments at the UMD greenhouse, manipulating the strain identity and diversity of rhizobial partners to determine if this can help soybean plants be resilient to the multiple stressors likely to increase with climate change in MD. Preliminary results indicate that the strain identity of the rhizobial partner can differentially alter the level of chewing insect herbivory and trait expression related to growth and drought resistance depending on the watering conditions (drought or ambient). Therefore, some rhizobia strains are more effective at enhancing resistance traits in soybean plants than others. Harnessing rhizobia partners that fix large amounts of nitrogen as well as partners that may enhance resistance traits in the plant through seed inoculums or liquid culture spraying, may improve grower outcomes while also contributing to higher levels of soil diversity. Future work in the field will examine the role of targeted rhizobia partner diversity in driving resistance to herbivory and drought stress through rainfall manipulation experiments in experimental soybean plots at UMD REC facilities.

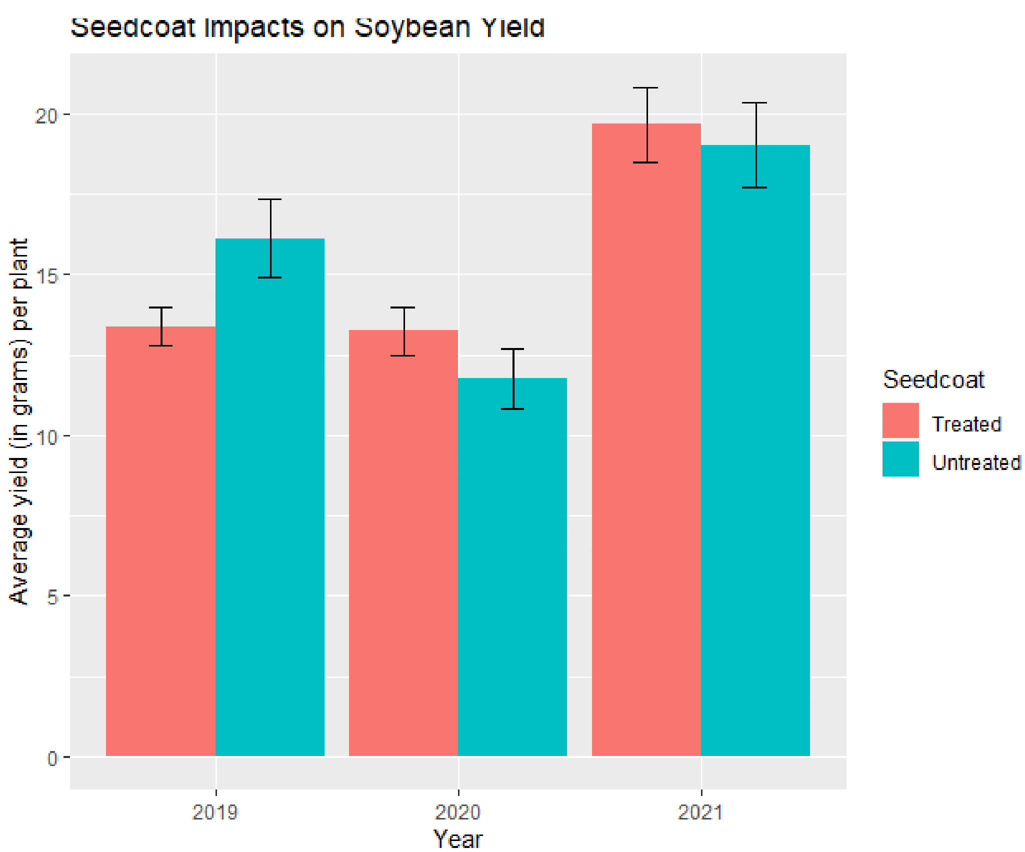


Fig 3. Preliminary results indicate no difference in yield between soybean plants treated with a seed coat seed treatment vs. untreated seeds of the same variety in any year measured (seed treatment effect: $F_{1,304}$=0.0004; p=0.98).

# Efficacy of Organic Turf and Landscape Herbicides in Montgomery County, Maryland

**Kelly Nichols | kellyn@umd.edu | University of Maryland Extension**

## Background

In 2019, a law went into effect in Montgomery County in central Maryland which prohibited the use of synthetic pesticides on home lawns. In order to provide additional information to the lawn care industry in the county, a preliminary study was conducted in the fall of 2022 to compare the efficacy of a few organic herbicides.

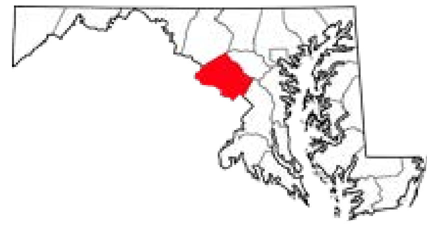

Figure 1. Montgomery County, Maryland.

## Methods

*Study Design*

Five organic treatments were included, along with one synthetic treatment for comparison (Table 1). Treatments were placed in a randomized complete block design with four replications. Individual plots measured 1.5 m by 2.4 m. The plot area consisted of strips of turf species established in 2009. Each replication of the current study was placed within one of these strips. Turf species in the strips were Kentucky bluegrass (Poa pratensis L.) + perennial ryegrass (Lolium perenne L.); tall fescue [Lolium arundinaceum (Schreb.)] + Texas bluegrass (Poa arachnifera); tall fescue + Kentucky bluegrass; and creeping red fescue (Festuca rubra) + annual ryegrass (Lolium multiflorum) + perennial ryegrass + intermediate ryegrass (Lolium hybridum) + Kentucky bluegrass.

Table 1. Treatment list.

| Herbicide(s) | Rate | |
|---|---|---|
| ammoniated soap of fatty acids | 30 | L ai $ha^{-1}$ |
| chelated iron (FeHEDTA) | 8.6 and 10.6 and 21.3 | L ai $ha^{-1}$ |
| caprylic acid + capric acid | 10.8 + 8.8 | L ai $ha^{-1}$ |
| 2,4-D ester + mecoprop-p (MCPP) + dicamba + carfentrazone-ethyl | 400 + 150 + 40 + 30 | g ae or ai $ha^{-1}$ |

*Applications & Data Collection*

The first application was made on September 16, 2022. A second application of the organic herbicides was made four weeks later on October 14, 2022. Dandelion (Taraxacum officinale F.H. Wigg) and buckhorn plantain (Plantago lanceolata L.) were the two most prevalent weeds. Weed counts were taken three days before the first application and two weeks after the second application (beginning and end of study). Visual ratings were taken three days after each application as well as weekly up to one week after the second application.

Figure 2. An overview of the plots three days after the first application.

## Results

*Buckhorn Plantain*

The organic herbicides provided 20% or less control of buckhorn plantain throughout the study.

*Dandelion*

The middle and high rates of FeHEDTA provided 71 and 86% control, respectively, of dandelion at three days after the first application (3 DAT; Figure 2). However, this quickly dropped to 3 and 35% at one week after the first application (1WAT). At three days after the second application (3DAT2), all rates of FeHEDTA provided significantly similar control (61-99%). At one week after the second application, all rates of FeHEDTA, along with the synthetic treatment, provided significantly similar control (65-99%).

Figure 3. Dandelion control data.

The same letters within an application timing are not significant using Tukey-Kramer HSD at P<0.05. Only one letter was added when data points were clustered together. (For example, at 1WAT, all ratings below the letter "B" have the letter "B".)

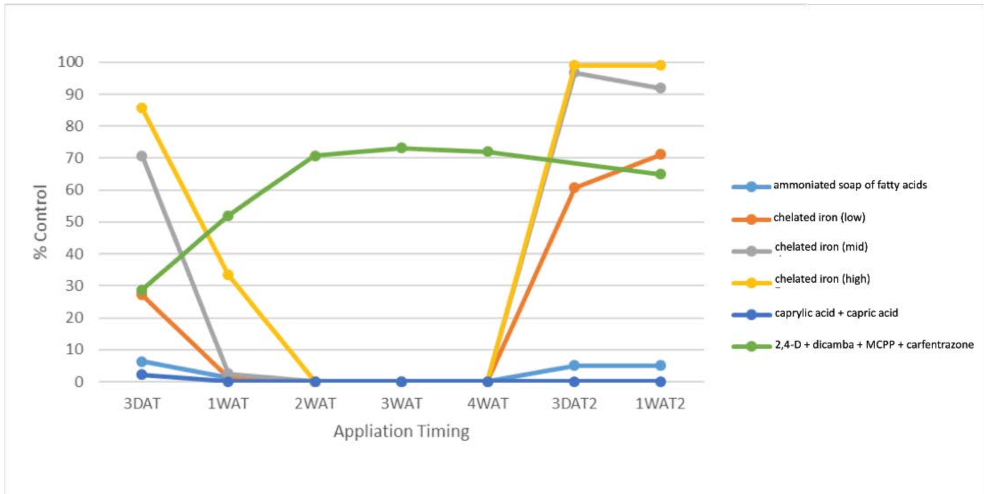


Figure 4. Pictures of the FeHEDTA high rate plots three days after the first application (3DAT), one week after the first application (1WAT), and at the end of the study (two weeks after the second application, 2WAT2).

3DAT

1WAT

2WAT2

*Change in Weed Counts*

Weed counts indicated a similar or increased number of dandelion and plantain across most plots. The high rate of FeHEDTA and the synthetic treatment were the only two treatments that decreased the number of buckhorn plantain; however, none of the weed counts were significantly different across treatments.

## Discussion

While fall applications are not ideal for contact herbicide applications on perennial plants, FeHEDTA may have a role as a part of an organic weed control program for lawns. Future research will be expanded to include additional herbicides, rates, and spring and summer application times.


Source

Figure 1: Montgomery County, Maryland. (2023, January 9). Wikipedia. Retrieved January 23, 2023 from https://en.wikipedia.org/wiki/Montgomery_County,_Maryland.

# Rose Rosette Disease Trial

**David L. Clement, Ph.D.**
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**University of Maryland Extension**

Rose rosette disease (RRD) was first identified in the 1940s in the Rocky Mountains. Rosa species and hybrids are the only known hosts for the disease. Multiflora rose (Rosa multiflora) is a common wild host of RRD and the disease has spread throughout much of the U.S. on multiflora and other wild roses. The disease has been found in cultivated roses in Maryland and in many other states in the mid-Atlantic region. There is no cure and RRD is lethal to almost all cultivated roses. To prevent disease spread all symptomatic roses should be destroyed. Despite challenges, roses are irreplaceable and should continue to be used in landscape plantings.

In 2018 a rose was observed in the median along route 40 near Catonsville, MD that was still alive despite all surrounding roses having succumbed to RRD. The rose was subsequently dug up and transplanted to the CMREC farm in Clarksville for further observation and testing. All tests have proven negative to date and this rose is being saved for possible future breeding and release as a resistant rose choice for Maryland landscapes.

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# Assessment of ecosystems services provided by arthropods on farms: Preliminary use of sticky traps to sample flying insects

**Helen Craig, Anthony Righter, and Bill Lamp**
**Department of Entomology, University of Maryland**

**Background:**

Insects are responsible for many ecosystem services, such as pollination, biocontrol, decomposition, nutrient cycling, water filtration, bioturbation, habitat formation, food production, pharmaceuticals, cultural services, and more. It has been calculated that insects have an annual value of at least $70 billion for their ecosystem services (Losey and Vaughan, Bioscience 56 311-323, 2006). However, recent research published in 2017 described an “insect apocalypse” that brought signs of general, unexplained reductions in insect abundance to the public and suggested a catastrophe awaits our planet (Hallmann et al., PLoS One, 12 (2017), p. e0185809). Scientists have long documented the loss of species of insects at a rate exceeding the extinction rates associated with the major geological events in the Earth’s history, but the loss in abundance was surprising to entomologists (currently at a rate of 1-2% loss each year) (Wagner, Annu. Rev. Entomol. 2020. 65:457–80).

As a part of a large nation-wide USDA Resilience CAP grant, we are studying on farm management of plant diversity, crop perenniality, and circular economic systems (DPCS) as potential catalysts for improved ecosystem services, in part by enhancing insect biodiversity. A diverse agroecosystem includes diversity in crops over time, like crop rotations, and space, like intercropping. Perenniality involves including perennial crops such as alfalfa and other crops to provide soil cover and nutrient retention. Circularity in an agroecosystem enables recycling nutrients as opposed to losing them to air or water as pollution (i.e., animal manure). We hypothesize that increasing diversity, perenniality, and/or circularity will improve insect biodiversity and their ecosystem services on farms. Here, we investigated the use of sticky traps to assess the flying insects on farms towards documenting the ecosystem services that DPCS farms can provide. Our goal is to determine if this sampling approach will be useful in our nation-wide assessment of farm insect biodiversity.

**Methods**
Starting in June, 2022, and continuing through 2023, we used 9x11” yellow sticky traps (see Images 1 and 2) set up in five distinct locations on two University of Maryland farms (Western Maryland Research and Education Center and Central Maryland Research and Education Center-Clarksville). With two traps at each location, the five locations were labeled as center, northwest, northeast, southwest, and southeast. Sticky traps were set out five times during the summer season in May, June, July, August, and September. Each month the traps were left out for one week before collection. Crop, vegetation, and weather data were documented at each collection period. The sticky traps were transported back to the lab for identification, which included the number of arthropods for each family, and their association with the ecosystem services that they provide.

Image 1: Assembled sticky trap in soybean field (Anthony Righter ‘24, Lamp Lab)

**Discussion**
Although we have not finished collecting and processing the samples, there is a lot of potential in the data we have collected thus far. Using these data sets, we can compare the different locations on each farm, and their respective crop types, to the number of individuals in various functional groups collected from that area (example in Figure 1) or the composition of insect orders over time (example in Figure 2). This information can provide insight into the types of crops that contribute to a variety of ecosystem services present in an agroecosystem. Over the course of this project we will continue to keep track of the diversity, perenniality, and circularity of each farm’s agroecosystem over time and relate farm characteristics to the ecosystem services provided by the presence of flying insects and other arthropods.

Image 2: Sticky trap close up (Anthony Righter ‘24, Lamp Lab)

Figure 1. Preliminary biodiversity sampling data showing the average number of individuals per location in June, 2022. NW was near a soybean/alfalfa intercropped field, soybean/rye cover crop field, and a wheat field. NE was near a mixed grass pasture field and a corn field. SW was near a soybean field and a corn field. SE was near a soybean field and cut lawn. Finally CN was near an unmanaged area, a wheat field, and a corn field.

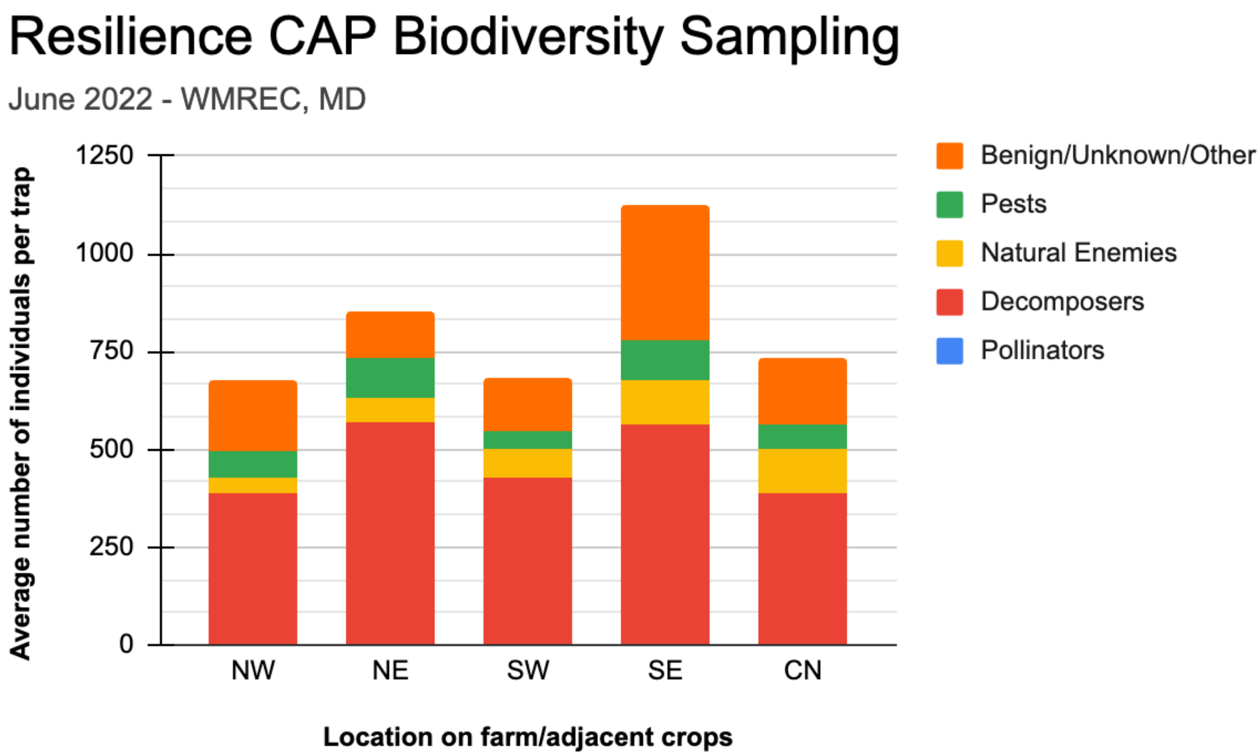
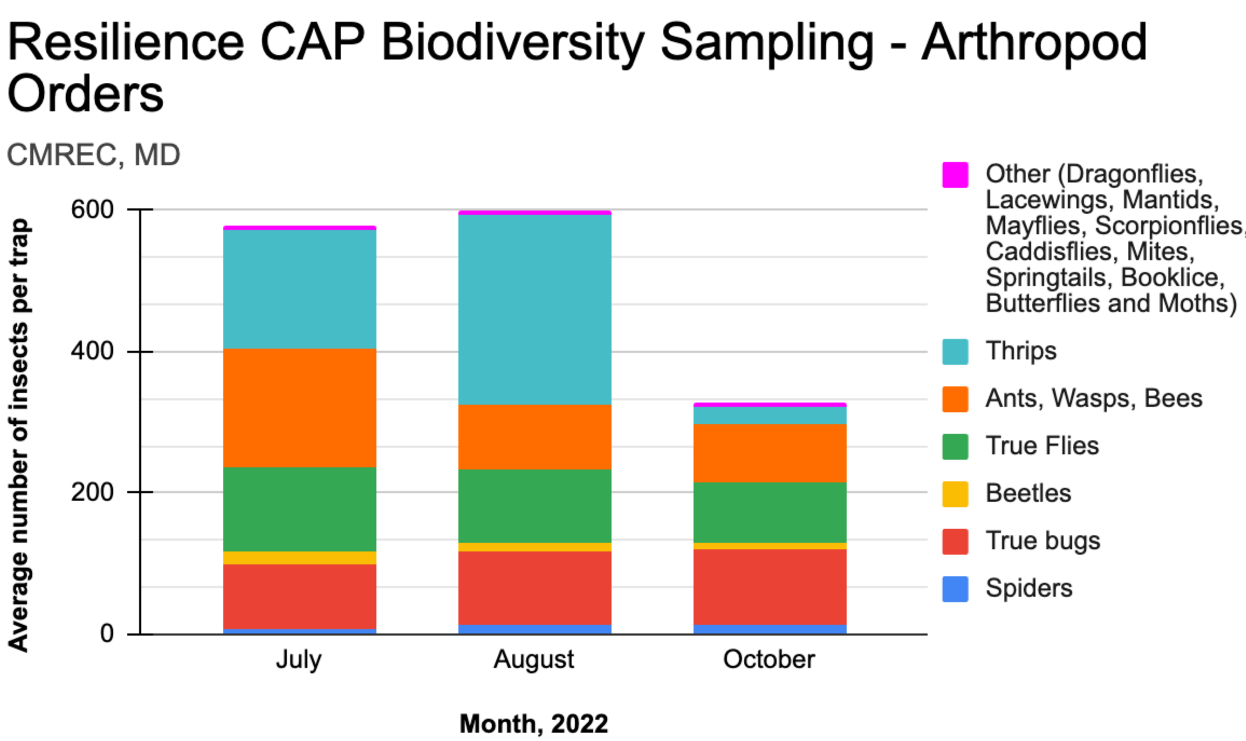



Figure 2. Preliminary arthropod sampling data showing the average number of individuals per trap across 10 traps at CMREC-Clarksville, and 3 sample dates.




# 2022 Maryland Soybean Fungicide Efficacy Trials

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## JUSTIFICATION

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 provides data that soybean producers can benefit from, such as: fungicide efficacy for managing common fungal diseases of soybean, monitor fungicide resistant pest populations, and track the economic impact of foliar fungicide applications over multiple years and environments unique to Maryland.

## RESEARCH OBJECTIVES

1. Evaluate the efficacy of select foliar fungicides on full season soybeans grown on two research farms in Maryland by measuring foliar disease incidence and severity.
2. Determine any greening or green stem effects of the fungicides.
3. Monitor fungicide active ingredient efficacy over time and identify any fungicide insensitive foliar fungal pathogens.
4. Determine the yield impact of foliar fungicides and their economic impact.

## METHODS

*Plot Design*

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 11’x30’ arranged in a randomize complete block design with five replicates. Planting details are outlined in Table 1. Plots were planted behind soybeans in order to create conditions conducive for developing foliar diseases on soybean.

Project supported by the Maryland Soybean Board

Table 1. Planting and harvest specifications.

| | WMREC | CMREC | WYE |
|---|---|---|---|
| **Seed:** | **-------------------------Soybean, Mid-Atlantic Seed 3521E3--------------------------** | | |
| **Previous Crop:** | **------------------------------------------Soybean------------------------------------------** | | |
| **Tillage** | **-------------------------------------------No till-------------------------------------------** | | |
| **Plant Date:**<br>**Planter:**<br>**Row Spacing:**<br>**Population:** | **6/1/2022**<br>**John Deere 1750**<br>**30"**<br>**150,000 seeds/acre** | **5/31/2022**<br>**John Deere 1590**<br>**7.5"**<br>**150,000 seeds/acre** | **5/31/2022**<br>**Great Plains EWNT-10**<br>**7.5"**<br>**150,000 seeds/acre** |
| **Harvest Date:** | **11/22/2022** | **11/18/2022** | **11/8/2022** |
| **Harvester:** | --------------------------------Almaco R1 research combine-------------------------------- | | |
| **Harvest Area:** | ---------------------------------30' from Center 5' of plot------------------------------------ | | |

*Fungicide Applications*

Fungicides (Table 2) were applied at the R3 growth stage (August 8 at WMREC and CMREC and August 5 at WYE) using a CO 2 powered backpack sprayer equipped with TeeJet 8003 nozzles calibrated to deliver 20 GPA at 35 psi to the center 80 inches of each plot. Treatments with R3+14 days applications were made on August 19 at WYE and August 22 at CMREC. Second applications were not made at WMREC until September 2 due to an equipment failure that required sourcing parts.

Table 2. Fungicide treatments.

| Treatment | Product Name<br>Active Ingredient(s) | Application Rate<br>(& Timing) |
|---|---|---|
| Non-treated Control | None | N/A |
| Headline | Headline 2.09 EC/SC<br>*Pyraclostrobin* | 6.0 fl oz/A (R3) |
| Veltyma | Veltyma<br>*Mefentrifluconazole + Pyraclostrobin* | 7.0 fl oz/A (R3) |
| Miravis Top | Miravis Top 1.67 SC<br>*Pydiflumetofen + Difenoconazole* | 13.7 fl oz/A (R3) |
| VJR90* | VRJ90<br>*Azoxstrobin + Fluindapyr + Flutriafol* | 8.0 fl oz/A (R3) |
| Revytek | Revytek<br>*Fluxapyroxad + Pyraclostrobin + Mefentrifluconazole* | 8.0 fl oz/A (R3) |
| Revytek @R3+14 days | Revytek<br>*Fluxapyroxad + Pyraclostrobin + Mefentrifluconazole* | 8.0 fl oz/A (R3 and R3+14 days) |
| Lucento | Lucento 4.17 CS<br>*Bixafen + Flutriafol* | 5.0 fl oz/A (R3) |
| Lucento @ R3+14 days | Lucento 4.17 CS<br>*Bixafen + Flutriafol* | 5.0 fl oz/A (R3and R3+14 days) |
| *VJR90 is an experimental product from FMC | | |

*Disease Rating*

Foliar diseases were rated prior to fungicide application at R3 and approximately every two weeks following until approximately R6. Disease severity from frogeye leaf spot (FLS; Cercospora sojina) was visually rated as the percent leaf area infected in the upper canopy from the center four rows of each plot, as it is typically the most prevalent foliar fungal disease in Maryland soybean production.

*Harvest and Statistics*

Yield data were collected by harvesting the center 5 feet of each plot using an Almaco R1 research combine. All yields reported are adjusted to 13% moisture. Harvest dates are shown in Table 1. Statisticsrelated to profitability and economics were calculated using the cash market price for soybean of $14.60 per bushel at the time of analysis. Data were analyzed using ANOVA and significant differences between treatments were separated using Fisher's Least Significant Difference (LSD; α=0.10).

## RESULTS & DISCUSSION

*Disease Rating*

Growing conditions were generally very favorable and we did not observe any ratable fungal diseases at any of the three trial locations. This is likely due to the weather conditions around pod fill, as well as the resistance package in the soybean variety; Mid-Atlantic Seed '3521E3' has a frogeye leafspot resistance rating of 7 on a 10-point scale (10 being the most resistant). Furthermore, due to a wet spring, plots had delayed planting by about 2-3 weeks. This delay in planting results in slower canopy closure, which promotes air movement between rows and thus reduces leaf wetness, likely contributing to reduced foliar disease pressure.

*Yield*

Yields (Figure 1 and Table 2) were above average at WMREC, with a trial average of 84.7 bushels per acre. Yields at CMREC were about average and yields at WYE were at or just below average, with 67.0 and 60.2 bushels per acre, respectively. Statistically, there were no significant differences between fungicide treatments and the non-treated control at any of the trial locations (P=0.6583 at WMREC, P=0.7095 at CMREC, and P=0.3133 at WYE). There were also no significant differences in grain moisture or test weight.

| | WMREC | | | CMREC | | | WYE | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatment | Yield (bu/A) | Moisture (%) | Test Wt. (lbs) | Yield (bu/A) | Moisture (%) | Test Wt. (lbs) | Yield (bu/A) | Moisture (%) | Test Wt. (lbs) |
| Control | 78.4 | 10.6 | 54.7 | 72.1 | 12.6 | 56.3 | 52.0 | 10.7 | 54.3 |
| Headline | 91.0 | 10.5 | 54.7 | 74.0 | 12.2 | 56.5 | 59.8 | 10.5 | 54.4 |
| Veltyma | 90.3 | 10.5 | 54.2 | 72.0 | 12.5 | 56.5 | 70.9 | 10.5 | 54.3 |
| Miravis Top | 86.5 | 10.6 | 55.4 | 63.0 | 12.2 | 54.0 | 59.2 | 10.5 | 54.3 |
| VRJ90 | 84.6 | 10.5 | 54.9 | 58.0 | 12.7 | 55.4 | 58.0 | 10.5 | 54.7 |
| Revytek | 82.3 | 10.6 | 54.9 | 76.1 | 12.4 | 55.2 | 62.9 | 10.4 | 54.3 |
| Revytek @ R3+14 days | 83.6 | 10.6 | 54.8 | 58.9 | 12.7 | 55.4 | 60.9 | 10.5 | 54.2 |
| Lucento | 83.4 | 10.5 | 54.6 | 67.2 | 12.4 | 55.4 | 62.6 | 10.5 | 54.4 |
| Lucento @ R3+14 days | 81.9 | 10.6 | 54.6 | 64.0 | 12.4 | 55.7 | 55.5 | 10.5 | 54.4 |
| P Value | 0.6583 | 0.8716 | 0.2440 | 0.7095 | 0.3464 | 0.7375 | 0.3133 | 0.7067 | 0.9531 |

Table 2. 2022 Harvest Data.

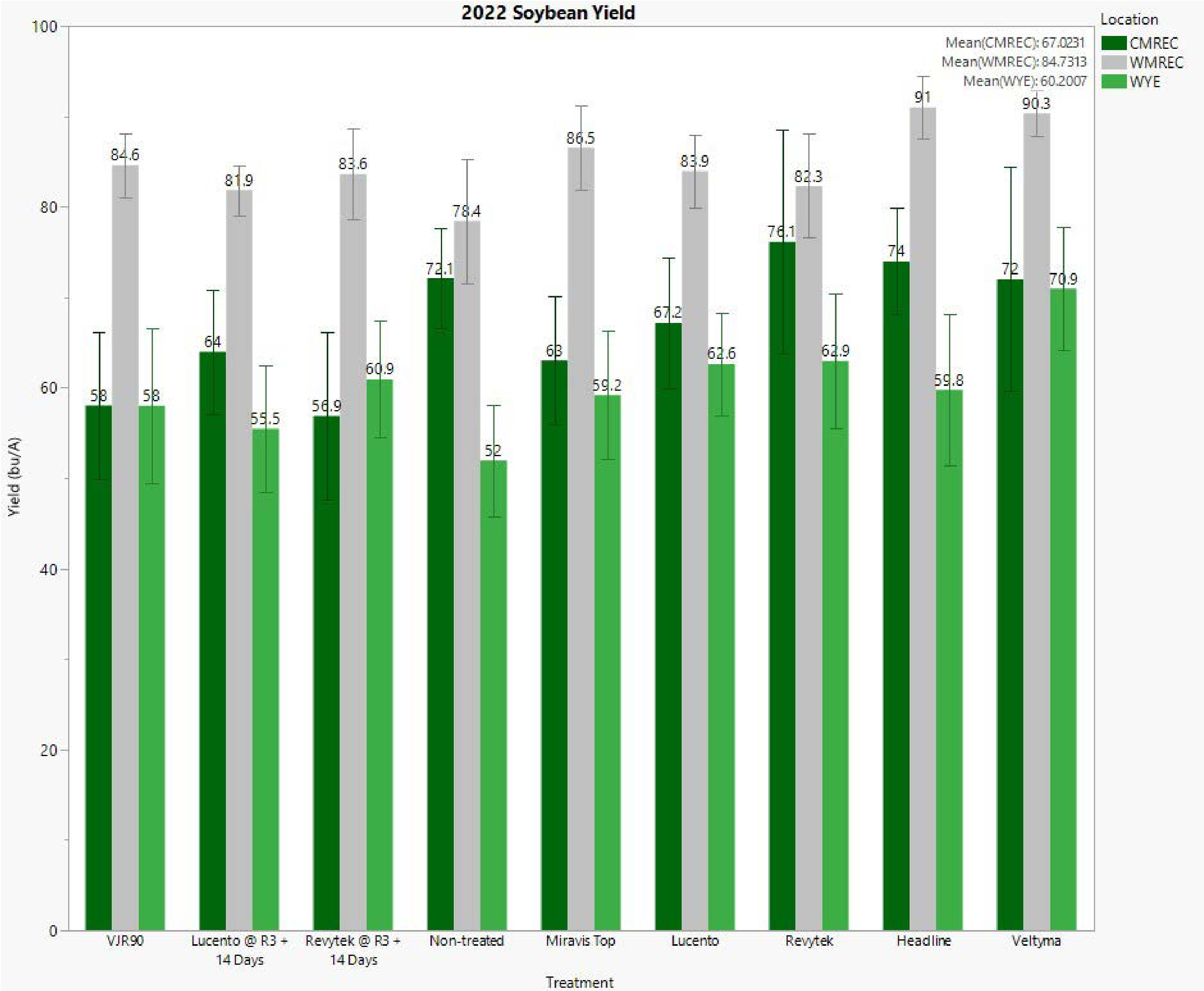


Figure 1. Soybean grain yield. Each error bar is constructed using 1 standard error from the mean. No significant differences between treatments at each location (α=0.10).

Since there was a significant difference in yield between locations ($P<0.0001$), relative yield was calculated and used as a way to compare yields across locations. Relative yield was calculated by dividing the plot yield by the non-treated control plot yield and reported as a percent. When data were combined this way, no significant differences were observed between treatments ($P=0.4285$, Figure 2).

## CONCLUSIONS, IMPLICATIONS, AND FUTURE WORK

In previous years of this study, foliar fungicide applications with the selected products tested here provided some benefit related to improved seed quality and yield in situations where FLS disease pressure was present at measurable levels. Fungicides also significantly increased plant greenness and delayed senescence. During the 2022 growing season, however, 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.

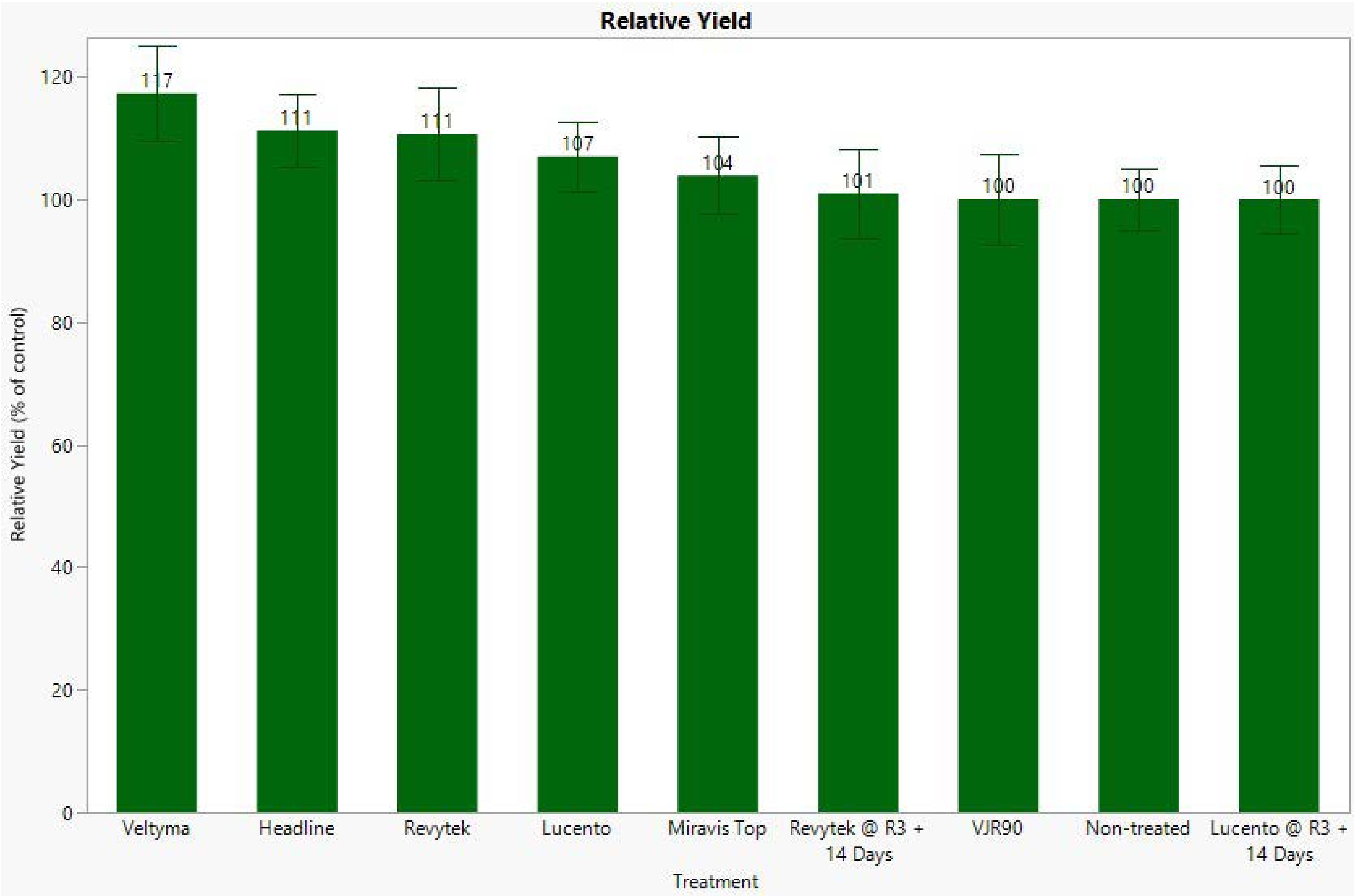


Figure 2. Relative grain yield of all site locations combined. Each error bar is constructed using 1 standard error from the mean. No significant differences between treatments (α=0.10).

Relative net profit was calculated by multiplying the bushel increase over the non-treated control by the cash market price for soybean at the time of analysis (14.60/bu for 2022) and subtracting the cost of application. A flat rate of $26.00 per acre was used for 2022 data; for plot with two applications, $52 was used. This metric, net profit, was used to compare the economics of the fungicides while accounting for yield and market prices. Figure 3 shows net profit for each treatment; there are no significant differences (P=0.2997).

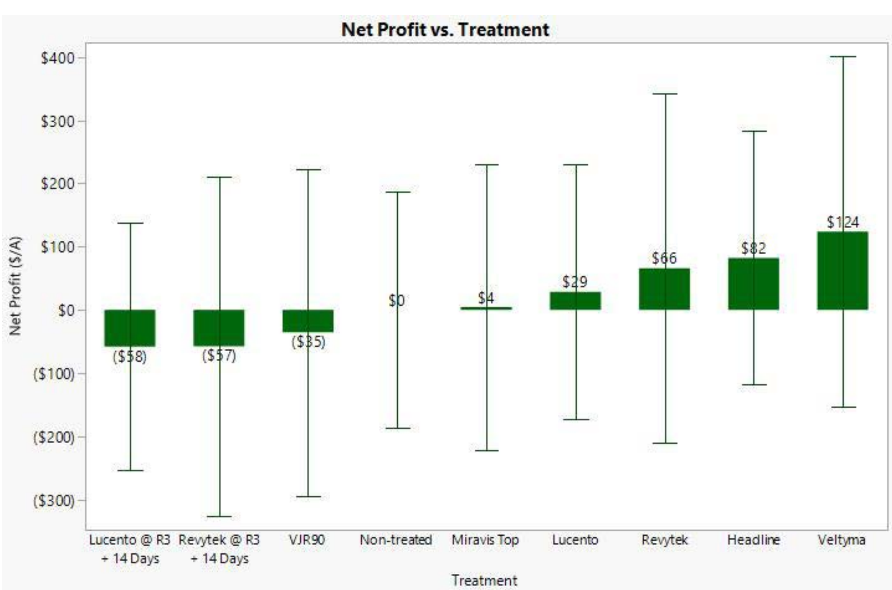


Figure 3. Net profit of 2023 fungicide treatments. Each error bar is constructed using 1 standard deviation from the mean. No significant differences between treatments (α=0.10).

When net profit was analyzed by treatment timing (R3, R3 + 14, and none) across all years (2022-2023), the single R3 application was provided a significantly greater profit margin ($38/acre) than two reatment program (-$26/acre) and the non-treated control (P=0.0878; 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.

a

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ab

b

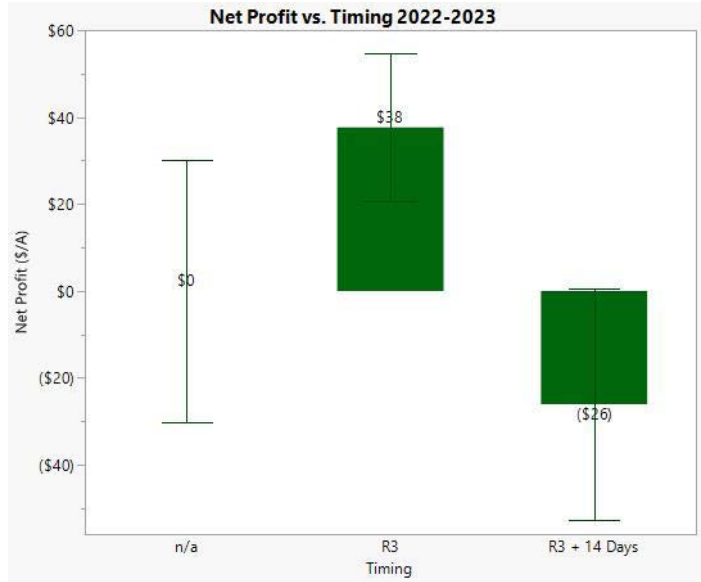



Figure 4. Net profit by fungicide timing of 2022-2023 treatments combined. Each error bar is constructed using 1 standard error from the mean. Treatment timings connected by the same letter are not significantly different (α=0.10).

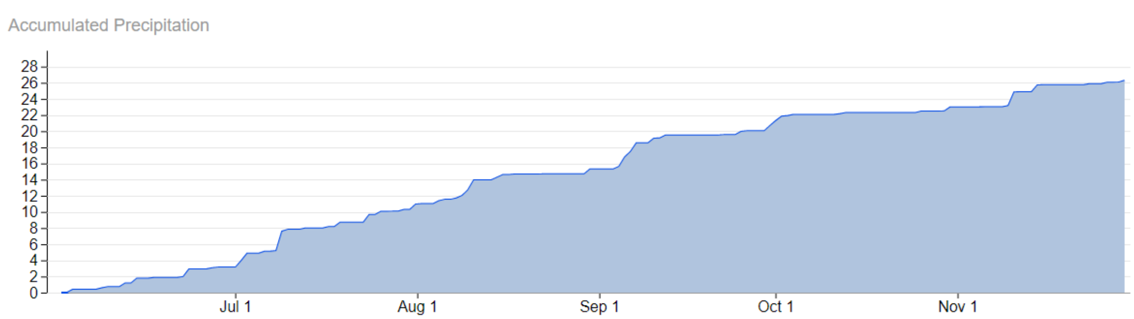
Future work will be focused on replicating similar experiments over more plot-years to gather more data for Maryland's unique growing conditions and to track pathogen resistance and fungicide profitability over time.

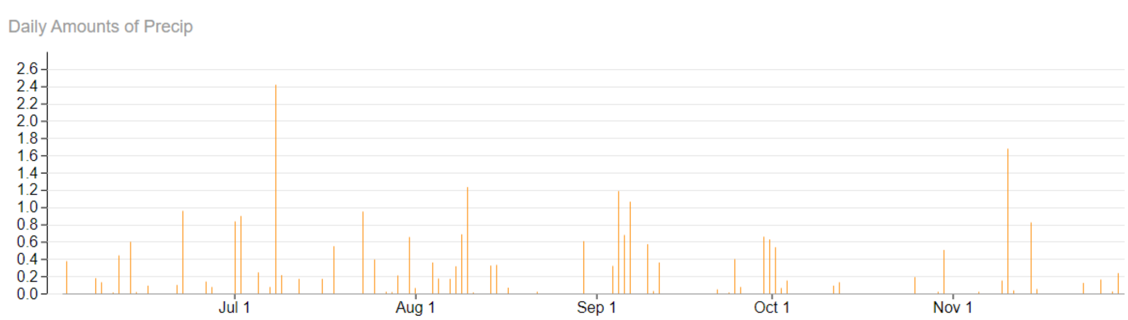
## ACKNOWLEDGEMENTS

This work is supported by grant funding through the Maryland Soybean Board and in-kind support from, BASF, FMC, and Syngenta. Special thanks to the Maryland Agriculture Experiment Station and research farm crew at the Western Maryland Research & Education Center, Central Maryland Research & Education Center, and the Wye Research and Education Center for making this research possible.

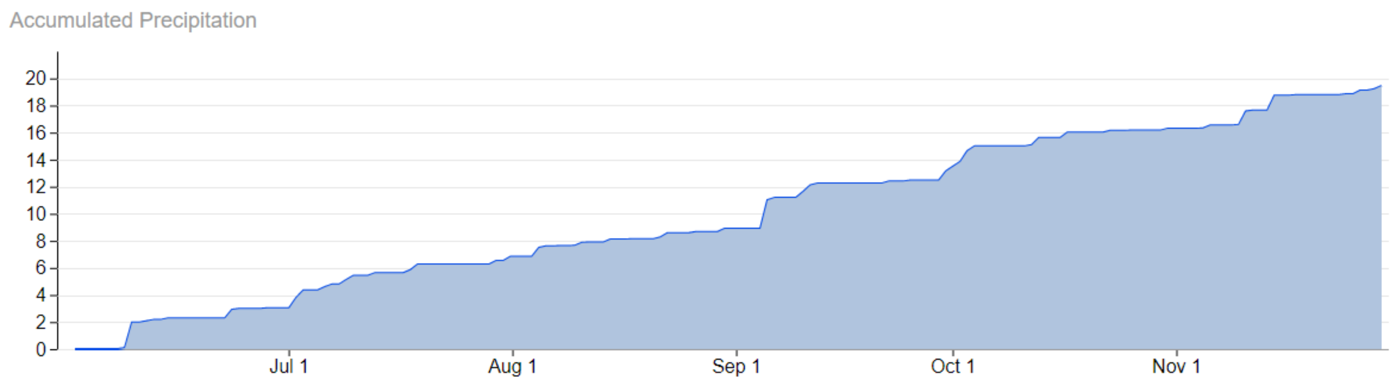
## APPENDIX

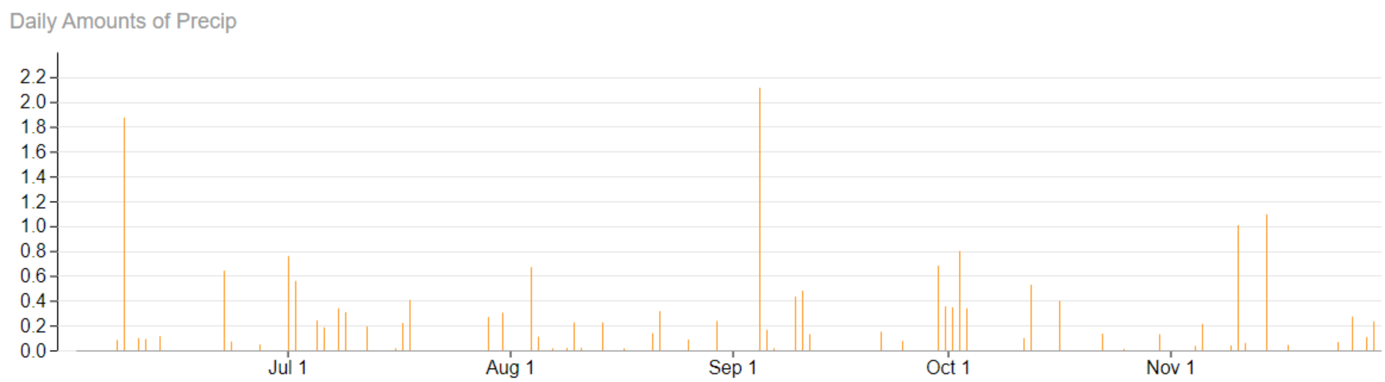
Precipitation WMREC



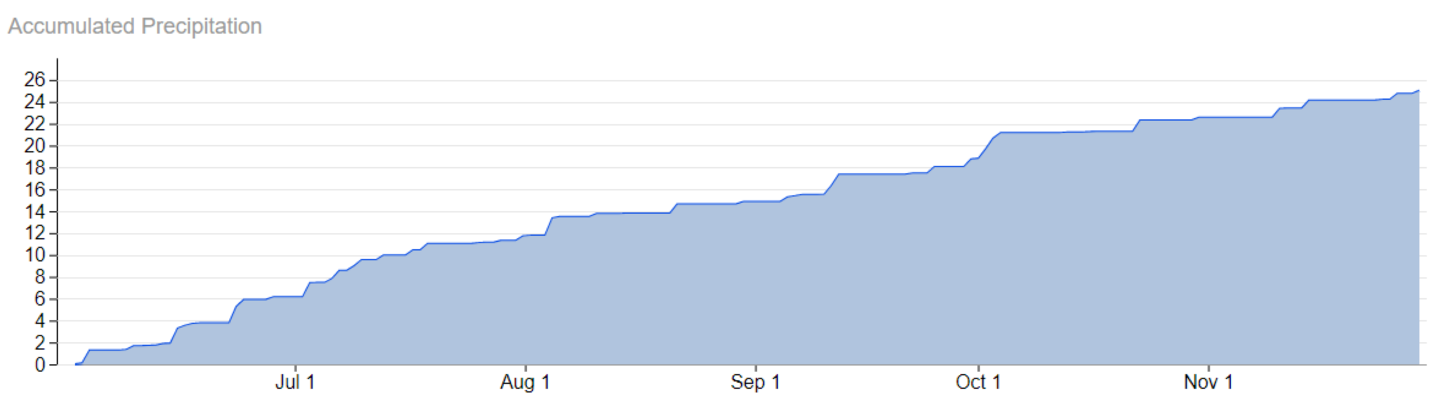



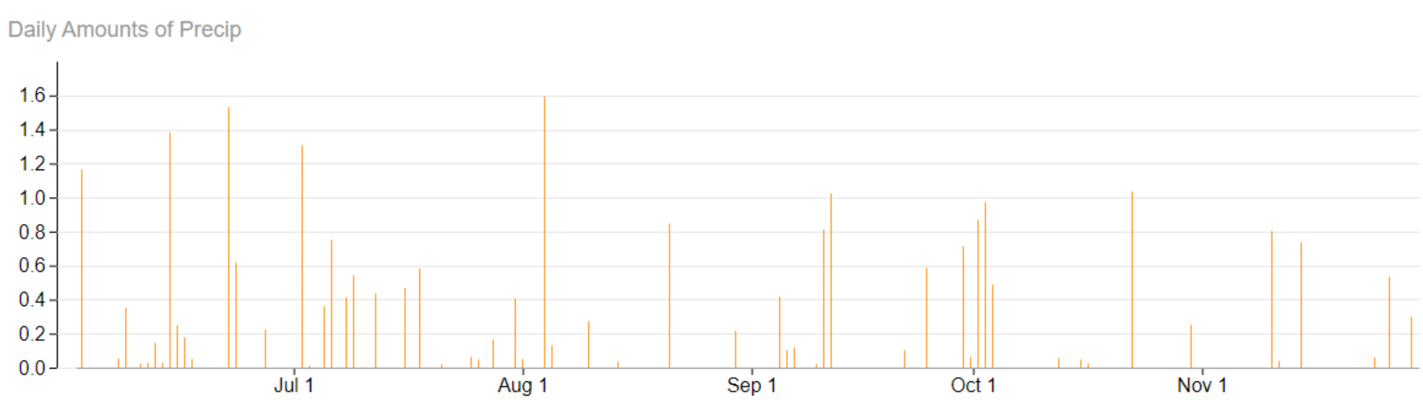
## Precipitation CMREC




## Precipitation WYE



# UMD Bee Lab and the New UMD Bee Squad

https://www.umdbeelab.com/ https://umdbeesquad.com/

**About The Lab**

The Honey Bee Lab at the University of Maryland has diverse personnel with multidisciplinary scientific backgrounds who bring a fresh perspective to solving problems. Research in the laboratory is focused on an epidemiological approach to honey bee health. We are proud to share our research into the major mechanisms that are responsible for recurring high loss levels in honey bee populations, such as pests and pathogens associated with honey bees, loss of natural forage habitat due to large monocultural croplands, and pressure from human induced changes in the environment.


Our team has led and managed the USDA APHIS National Honey Bee Disease Survey since 2009. We are also a major partner and founding member of the Bee Informed Partnership (BIP), who collaborates closely with beekeepers from across the country to study and better understand the loss in honey bee colonies in the United States.

You can find Realtime results about these efforts at our database portals: https://research.beeinformed.org/state_reports/

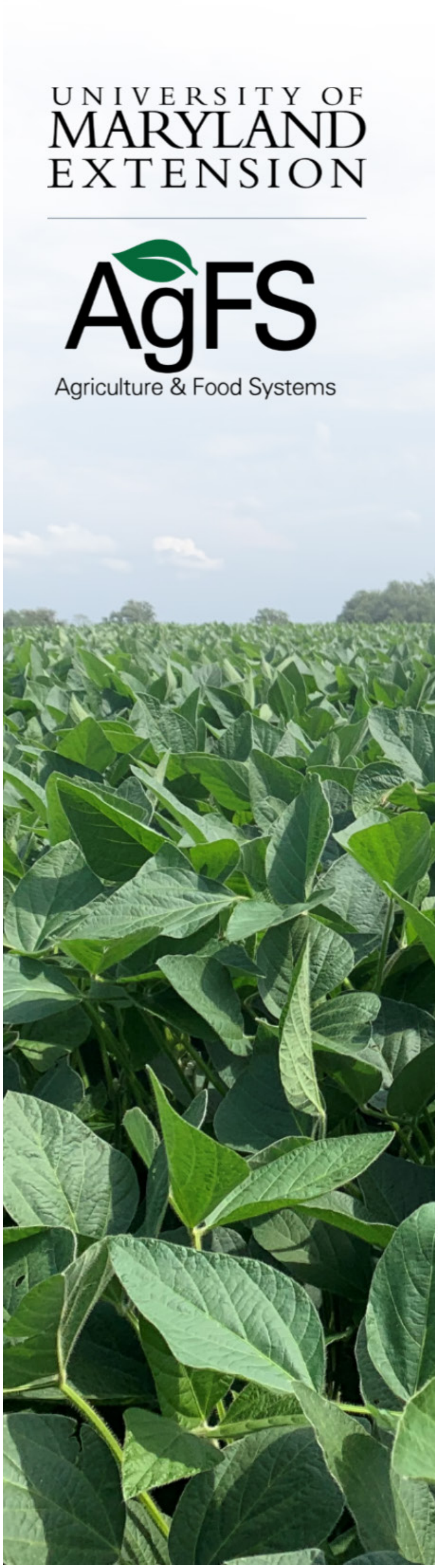
Click here to purchase UMD Honey

**Donations**

If you are able to help support our mission to improve honey bee health, we greatly appreciate whatever you can give.

You may donate online using the University of Maryland "Giving to Maryland" Honey Bee Lab Donation Site.

Thank you for your support!




# Evaluation of Growth-Promoting Products for Soybean Production

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## JUSTIFICATION

Soybean farmers have had many new products come on the market in recent years touted as growth-promoting products intended to help growers attain high-yielding soybeans. Many of these products contain growth regulators, hormones, humic acids, carbon, sugars, and/or fertilizer. Limited replicated university research has been done with these products to assess their application and utility in Maryland's unique climate and growing conditions. This project looks at one of these such products, Take Off ST.

## RESEARCH OBJECTIVES

1. Test Take Off ST treated seed at three planting dates to determine any agronomic benefits of the product against non-treated seed.

## METHODS

### Plot Design

Field trials were established at two University of Maryland Research farms: Western Maryland Research & Education Center in Keedysville, MD (WMREC) and Wye Research and Education Center in Queenstown, MD (WYE). Experimental design consisted of soybeans planted at three different planting dates (primary factor) with plots split by Take Off ST treated seeds and nontreated seeds (Table 1). Plots were 11'x30' and replicated 5 times at each location and arranged in a randomized complete block design. Treatments and planting dates are listed in Table 2.

**Table 1.** Seed treatment information.

| Seed Treatment | Trade Name *Active Ingredient(s)* | Application Rate (& Timing) |
|---|---|---|
| Non-treated Control | None | N/A |
| Take Off ST | Take Off ST *0.75% citric acid + 0.25% glutamate + 0.25% Proline (prothioconazole)* | 0.3 oz/140,000 seeds (seed treatment) |

**Table 2.** Treatment descriptions and plant dates.

| Treatment | Take Off ST | Plant Date WMREC | Plant Date WYE |
|---|---|---|---|
| Early, treated | Yes | 4/26/21 | 5/18/21 |
| Early, non-treated | No | | |
| Mid, treated | Yes | 5/11/21 | 6/1/21 |
| Mid, non-treated | No | | |
| Late, treated | Yes | 5/26/21 | 6/17/21 |
| Late, non-treated | No | | |

Project supported by the Maryland Soybean Board and Verdesian Life Sciences

**Table 3.** Planting and harvest specifications.

| | WMREC | WYE |
|---|---|---|
| Seed: | Soybean, Mid-Atlantic Seed 3720 E3/STS | |
| Previous Crop: | Corn | |
| Tillage: | No-till | |
| Planter: | John Deere 1590 | Great Plains EWNT-10 |
| Row Spacing: | 15" | 15" |
| Population: | 150,000 seeds/acre | 150,000 seeds/acre |
| Harvest Date: | 11/24/2021 | 11/23/2021 |
| Harvester: | Almaco R1 research combine | Almaco R1 research combine |
| Harvest Area: | 30' from Center 5' of plot | 30' from Center 5' of plot |

*Emergence*
Emergence ratings were conducted at each location approximately two weeks after planting by counting the number of emerged plants (plants at least VE growth stage) per 60 feet of plot row. Relative emergence was calculated by dividing plot emergence by the non-treated control and reported as a percentage for proper statistical comparison between treatments across locations.

*Statistics*
All data were analyzed in a mixed model ANOVA using JMP Pro 15 software (SAS Institute, Cary, NC). Year by location, as well as replicate, were treated as random effects in the model. Treatment effects were separated at α=0.10 and pairwise comparisons made using Fisher's protected LSD.

RESULTS

*Emergence*
Take Off ST treated seed did not provide significantly greater number of emerged plants relative to the control during any planting timing at either location and suppressed germination at the early plating at the WYE location (Table 4).

**Table 4.** ANOVA data table for emergence.

| Treatment | Emergence (plants/ft) | |
|---|---|---|
| | WMREC | WYE |
| Early, treated | 2.43 | 2.57 a |
| Early, non-treated | 1.97 | 3.01 b |
| *P>F* | *0.3495* | *0.0962* |
| Mid, treated | 2.72 | 2.72 |
| Mid, non-treated | 2.54 | 2.54 |
| *P>F* | *0.5355* | *0.5355* |
| Late, treated | 2.76 | 4.47 |
| Late, non-treated | 3.00 | 4.75 |
| *P>F* | *0.4626* | *0.4587* |

*Treatments with the same letters within the same column are not significantly different than each other (α=0.10).*

**Table 5.** Grain yield data by location for WMREC and WYE locations.

| Treatment | WMREC | | | WYE | | |
|---|---|---|---|---|---|---|
| | [1]Yield (bu/a) | Test Weight (lbs) | Grain Moisture (%) | Yield (bu/a) | Test Weight (lbs) | Grain Moisture (%) |
| Early, treated | 65.8 | 67.1 | 14.2 | 55.0 | 59.7 | 13.3 |
| Early, non-treated | 62.4 | 67.8 | 14.3 | 51.7 | 59.1 | 13.2 |
| *P>F* | *0.3556* | *0.6528* | *0.3416* | *0.3638* | *0.2007* | *0.4738* |
| Mid, treated | 67.1 a | 68.2 | 14.3 | 51.9 | 60.2 | 13.3 |
| Mid, non-treated | 58.7 b | 67.7 | 14.1 | 50.4 | 61.1 | 13.2 |
| *P>F* | *0.0511* | *0.5685* | 0.1982 | *0.6130* | *0.2318* | *0.6712* |
| Late, treated | 59.0 | 68.2 | 14.2 | 54.2 | 59.6 | 13.2 |
| Late, non-treated | 64.4 | 67.0 | 14.2 | 50.0 | 60.1 | 13.3 |
| *P>F* | *0.4423* | *0.1546* | *0.9794* | *0.2245* | *0.2326* | *0.3632* |

[1]*Grain yield reported in bushels per acre adjusted to 13% moisture. No significant differences (α=0.10).*

Overall, yields were higher at WMREC than WYE, with a trial average of 62.0 and 52.2 bushels per acre, respectively (Figure 1). Test weights were higher at WMREC than WYE (Table 5).

**b**

*NS

a NS

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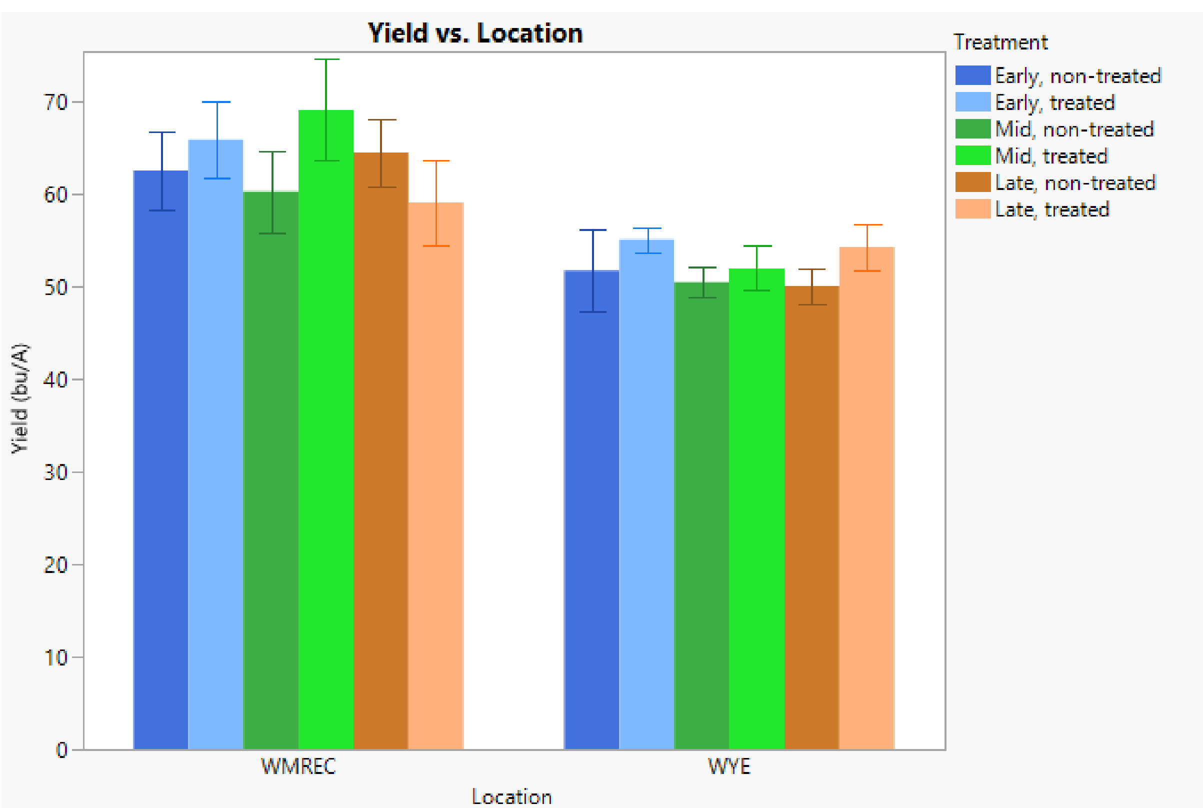


**Figure 1.** Treatment yield by location. Each error bar is constructed using one standard deviation from the mean. Treatments connected by the same letter are not significantly different (α=0.10).*NS= no significant differences

Comparing relative yield of the treatments as a percentage of the non-treated control is a way to statistically eliminate location as a variable in the dataset and allows for a stronger comparison due to an increased number of datapoints. When data for relative yield were combined for both locations, Take Off ST treated seed yielded 7.6% more than non-treated seed at early plantings (P=0.0934) and 8.6% more at middle plantings (P=0.0522, Figure 2).

**b** **b**

*NS

a a

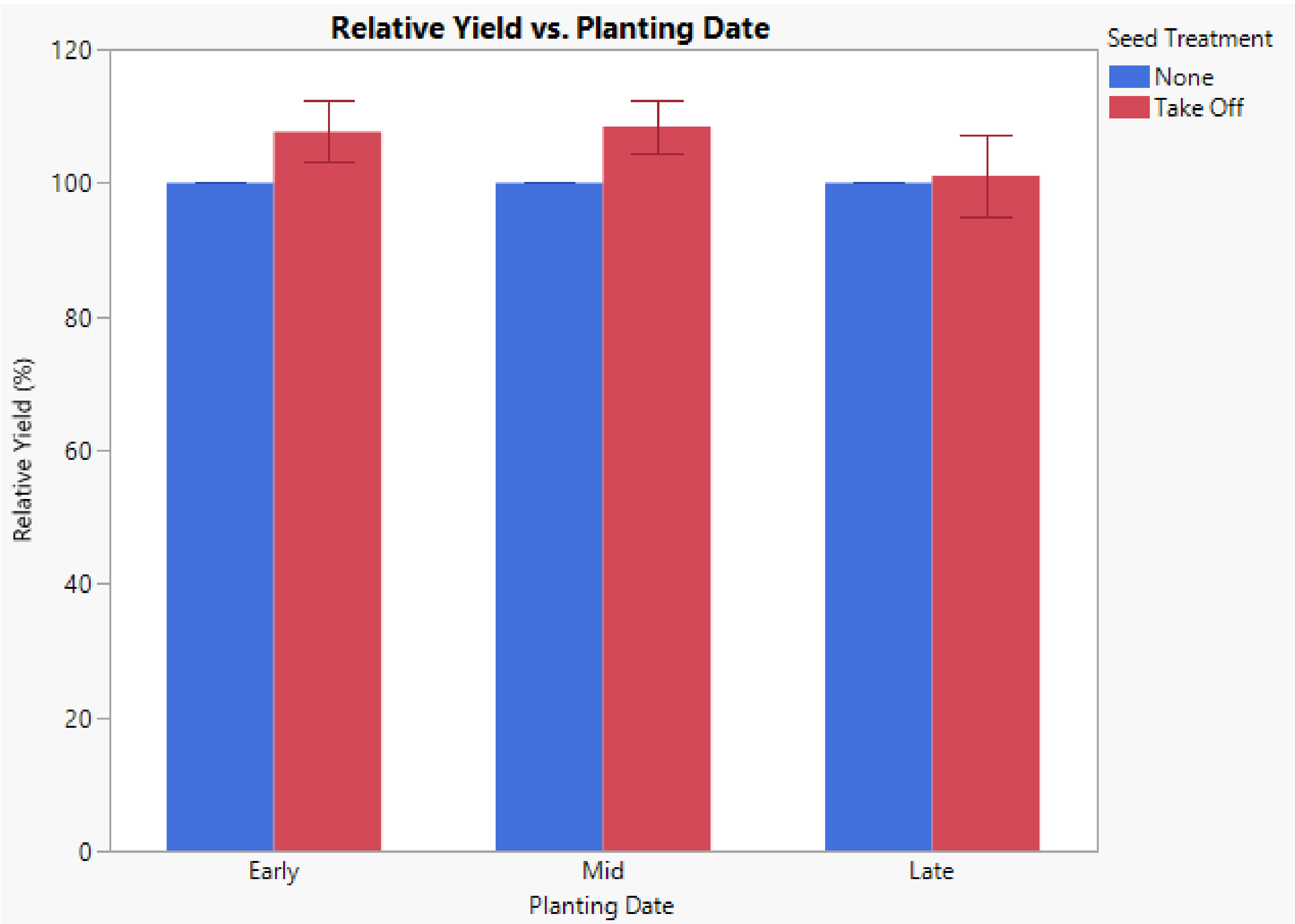


Figure 2. Relative yield vs. planting date. Each error bar is constructed using one standard deviation from the mean. Treatments connected by the same letter are not significantly different (α=0.10).*NS= no significant differences.

## CONCLUSIONS, IMPLICATIONS, AND FUTURE WORK

*Emergence*

Take Off ST did not provide improved emergence in the 2021 trials and actually suppressed germination at the WYE middle plating location. However, it should be noted that the planting dates for the WYE location were later than those at WMREC, which could have contributed to this observation. In the previous two years of study, emergence of early planted soybeans was increased with Take Off ST. Even when relative emergence data was calculated and combined across locations there were no significant differences (data not shown, P>0.10). This is in contrast to what we observed in 2019 and 2020, where our trials that were planted earlier in the year had significantly better emergence with Take Off ST. This may be explained by weather conditions; 2019 and 2020 was cooler and wetter at our early planted locations, especially during the month of April compared to 2021 where we experienced excellent planting conditions at both locations. Data from these three years suggest that Take Off ST may help soybeans emerge in soils that are cooler and wetter, but may have little benefit for later planted soybeans. This effect may be attributed to the prothioconazole, a fungicide seed treatment that prevents preemergence damping off caused by many soilborne pathogens that are common in cool, wet soils.

*Grain Yield*
Yields were slightly above average at WMREC and slightly below average at WYE; this difference is likely explained by planting dates. The WMREC plots were seeded approximately one month earlier than the WYE plots.

Individual plot yields varied more at WMREC than at WYE, which could be explained by significant groundhog pressure at WMREC. As a result, extreme outliers in the dataset for WMREC were excluded in the data analysis. The only statistically significant difference in yield was observed at WMREC, where Take Off ST treated seed yielded significantly more than the non-treated seed for the middle planting date. All other pairwise comparisons within planting date × location were the same.

In order to eliminate location as a variable in our combined data analysis, relative yield was calculated. When treated seed was compared to non-treated seed in this fashion, Take Off ST treated seed yielded significantly better than non-treated seed for early and middle plantings. These data coincide with our previous observations of improved plant emergence at earlier planting dates.

None the treatments affected grain moisture or test weight.

Future research should be focused on repeating these trials to understand the effect of Take Off ST on soybeans planted at different planting dates in comparison to non-treated seed.

**ACKNOWLEDGEMENTS**
This work is supported by grant funding through the Maryland Soybean Board and in-kind support through Verdesian Life Sciences. Special thanks to the Maryland Agriculture Experiment Station and research farm crew at the Western Maryland Research & Education Center and the Wye Research and Education Center for making this research possible.

## 2022 Maryland State Soybean Variety Trials Fact Sheet

**http://www.psla.umd.edu/extension/md-crops** ..

The University of Maryland offers a fee-based, soybean variety performance testing program to local and national seed companies. The results from these replicated trials provide agronomic performance information about soybean varieties tested at four locations in Maryland considered representative of the state's geography and weather conditions..

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**Agronomy Fact Sheet #32**

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# Central Maryland Research and Education Center Clarksville Facility

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