COLLEGE OF AGRICULTURE & NATURAL RESOURCES
MAES | MARYLAND AGRICULTURAL EXPERIMENT STATION

LESREC
Poplar Hill and Salisbury Facilities

ROOTS IN RESEARCH

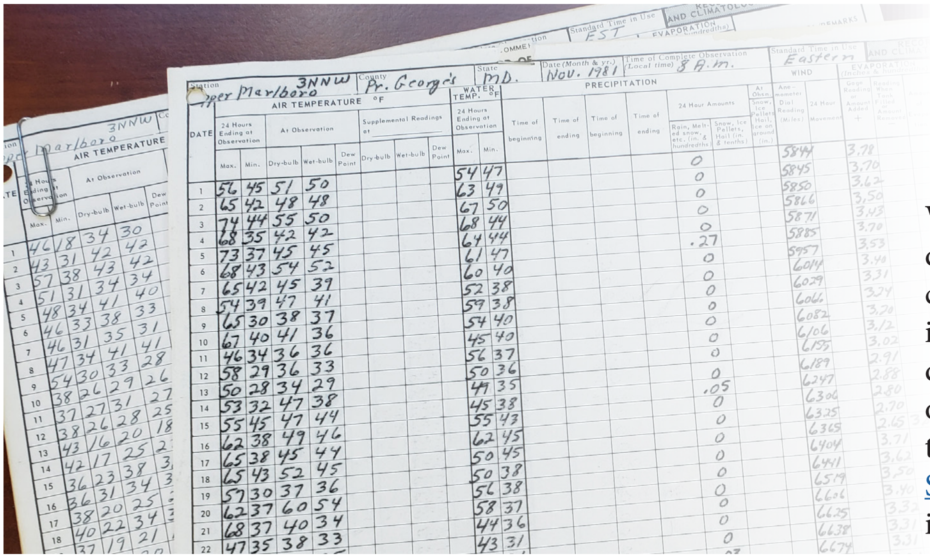
Yield of 2023

The 2023 growing season can be summed up in a single word: "dry." Changes in rainfall patterns and hot, dry summers are just one of the stresses that MD farmers can expect to face under a changing climate. Many of the research projects carried out at the UMD RECs are helping to find solutions to help farmers cope with drought stress and other climate change factors. From genetic improvements to crops and alternative crop rotations, to cover crop management and climate monitoring, the studies carried out at our RECs are designed to ensure the success of MD agriculture through adaptive and resilient cropping strategies. Enjoy this summary highlighting the hard work that UMD researchers are doing in pursuit of solutions to agriculture's most pressing problems.

Alan Leslie
MAES Center Director
WMREC | CMREC | LESREC

To view this newsletter electronically, scan the QR code!

In This Issue:



Poplar Hill and Salisbury 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.

EPA/USDA Tour at LESREC

June 21st was the EPA/USDA Tour which included a stop at LESREC. We hosted a well- rounded tour including researchers in Delaware, Maryland and Virginia as well as a Maryland farmer's market that grows and sells their own produce. We heard from the farmers what some of their challenges were. This was a tour to remember because on that day there was torrential rain and winds gusting to 40 miles per hour. The show went on though with lots of scrambling to keep participants relatively comfortable and dry. It is regrettable that many of the activities had to be replaced with indoor presentations. Nevertheless, plenty of educational material was offered to personnel of EPA and USDA.

Above: Alan Leslie and Puneet Srivastava speaking the crowd at LESREC. Photo by Megan Hickman

On left: A UMD motor coach (used on tour day) outside of the Deli at Pecan Square who catered lunch. Photo by Marylee Ross.

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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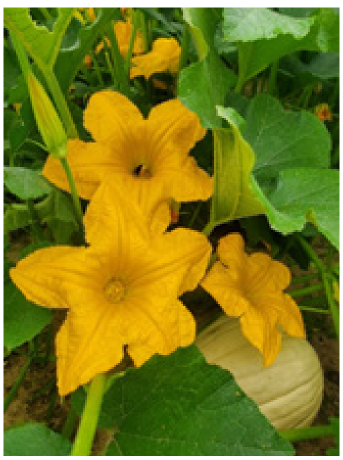
Findings from 2023 at UMD-LESREC

David Armentrout, Facility Manager

Annually, at the UMD Lower Eastern Shore Research and Education Center located in Salisbury, MD and in Quantico, MD I believe it is important to implement trials to better the practice of producing popularly grown crops of the region. In doing so, I as the Facility Manager, can increase my team's knowledge and experience in successfully perfecting the cultural practices needed for crop production. In 2023, I specifically looked at demonstrating Pumpkins ('Pumpkin Variety Trial'), Sweetcorn ('Sweetcorn Comparison, Seeding Date and Insecticide Timing Trial') and Cantaloupe/Watermelon ('Transplant timing of Cantaloupe and Watermelon'). In 2023, I also continued working with Dr. Jeff Pettis looking at 'Strategies and Evaluation of Honeybee Survival at LESREC'.

Like most years there were some challenges in crop production in 2023. However, our demonstration trials performed exceptionally well producing very respectful yields of sweetcorn, pumpkin, cantaloupe and watermelon. Honeybee winter survival was below average going into the 2023 growing season but our hives rebounded well. The experience and knowledge gained in implementing such demo-trials allows myself to better suit the needs of researchers in growing similar or related crops in future trials. In addition, such demo-trials are an added bonus during Facility tours.



Summer Squash Organic Insecticide Trial

Emily Zobel - UMD Extension Educator, Dorchester County
Haley Sater - UMD Extension Educator, Wicomico County

Many small organic farms struggle to control common insect pests on their summer squash plants, such as squash bugs and squash vine borer. A pesticide trial was conducted to determine if Neem oil or insecticide soap effectively controlled common insect pests on summer squash. Small plots of 12 plants were planted in a random block design, with 4 replications. Treatments included neem oil, insecticide soap, water, and a control. Plants were sprayed weekly and inspected for insects. Once fruit was produced, plots were harvested. The fruit was inspected, sorted, and weighted. Due to the field flooding, there was widespread plant death halfway through the season, so no outcome or conclusion has been made. However, this experiment will be repeated in 2024.

Dr. Haley Sater, Ag and Food Systems agent for Wicomico County, weighting harvested squash. Squash fruit was sorted into marketable, damaged, and cull. The number of fruit and weight for each plot was recorded.

The Importance of Tidal Marshes to Bat Foraging Habitat and Diversity

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Biological Sciences Department
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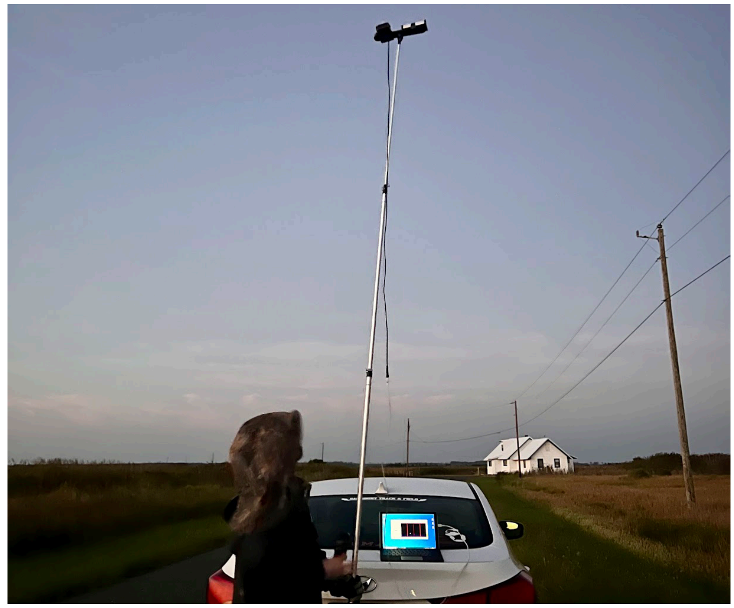
Abstract

Bats are a species that are rapidly declining through the United States due to multiple threats like White-nose syndrome (WNS), wind turbines, and habitat destruction. Recent studies suggest that wetlands may be an unrecognized habitat that support a large abundance of bats with drinking water and prey availability. However, few studies have assessed the value of tidal marshes, in particular, in supporting bat populations. The purpose of this study is to fill this gap by using acoustic monitoring in a mixture of driving transects and long-term passive monitoring to directly compare habitat use and diversity of bats in tidal marshes compared to forests and cropland habitats on the Delmarva Peninsula. Additionally, a novel approach of using boat transects to compare bat activity and diversity between tidal marsh interior and marsh-exterior (open water) habitats was completed. In total, we recorded 11,106 bat passes and documented the presences of at least 7 species: *Lasiurus borealis* (Eastern Red Bats), *Eptesicus fuscus* (Big Brown Bats), *Nycticeius humeralis* (Evening Bats), *L. cinereus* (Hoary Bats), *Perimyotis subflavus* (Tri-colored Bats), *Lasionycteris noctivagans* (Silver-haired Bats), *Myotis septentrionalis* (Northern Long-eared Bats), and possibly additional species in the genus *Myotis*. Overall, we found significantly less bat activity and diversity in tidal marshes compared to forest edges as expected, and no significant difference in bat activity and diversity in tidal marsh habitats compared to that of cropland habitats. Furthermore, riparian edge transects (open water) had significantly more bat activity than marsh interior transects as expected, but the degree of significance was much more profound than anticipated, strongly indicating the importance of marsh-exterior habitats and open water areas for maintaining healthy bat populations in the local region. This study provides further implications that can aid management agencies in supporting coastal bat populations and help influence where environmental resources may be directed.



Sweet Corn Sentinel Monitoring Network: 2023 Results and Trends

Galen P. Dively, Department of Entomology, University of Maryland

Collaborators: Terry Patton, Kristian Holmstrom, David Owens, Michael Crossley, Helene Doughty, Sean Malone, Tom Kuhar, Daniel Gilrein, Shelby Fleischer, Timothy Elkner, Jared Dyer, Brian Nault, Kelsey Fisher, Jocelyn Smith, Holly Byker, Julien Saquez, Jason Wells, Kelley Tilmon, Chris DiFonzo, Amy Raudenbush, Bill Hutchison, Fei Yang, Robert Wright, Craig Abel, Decker Ashley Lynn, Christian Krupke, Nicholas Seiter, Bradley McManus, Anthony Zukoff, Brian McCornack, Dominic Reisig, Steven Roberson, Anders Huseth, Francis Reayjones, Tom Bilbo, Dave Buntin, Katelyn Kesheimer, Whitney Crow, Huang Fangneng, Pat Porter, Dalton Ludwick, Yves Carriere, Kelly Hamby

Starting in 2017, the sweet corn sentinel monitoring network has been tracking changes in corn earworm (CEW) susceptibility to Cry and Vip3A toxins expressed in Bt corn and cotton. Each year, Syngenta and Bayer-Seminis provided sweet corn seed that is repackaged and distributed to volunteer collaborators to establish sentinel plantings of Bt hybrids (expressing Cry1Ab, Cry1A.105+Cry2Ab2, and Cry1Ab and Vip3A) planted side by side with non-Bt isolines. All collaborators used the same sampling and data collection protocol to generate metrics showing differences in control efficacy between Bt and non-Bt plots, expressed as the percentage of ears damaged, density of surviving larvae per ear, and the amount of kernel area consumed per ear. To estimate the range of allele frequencies for CEW resistance to each Bt toxin, the phenotypic frequency of resistance (PFR) was calculated as the ratio of larval density in Bt ears relative to the density in non-Bt ears. Using this approach, a significant reduction in control efficacy coupled with an increased PFR was viewed as a genetically based change in CEW susceptibility and confirmation of field-evolved resistance.

The 2023 network involved 62 sentinel plantings in 25 states (TX, LA, AL, MS, AZ, GA, SC, NC, VA, MD, DE, PA, NJ, NY, CT, OH, IN, IA, IL, NE, SD, KS, WI, MN, MI) and 4 Canadian provinces (ON, QC, NS, NB). Collaborators in 12 states and ON established multiple plantings at different times and/or locations. Most plantings included five sweet corn hybrids: Attribute 'BC0805' expressing Cry1Ab, Attribute II 'Remedy' expressing Cry1Ab and Vip3A, and their near non-Bt isoline 'Providence' (Syngenta Seeds); and Performance Series 'Obsession II' expressing Cry1A.105+Cry2Ab2, and its non-Bt isoline 'Obsession I' (Bayer-Seminis Seeds). In addition, 11 sentinel locations established plots of the Milky Way hybrid (Syngenta Seeds) expressing Cry1Ab and Vip3A. Altogether, a total of 29,821 ears were examined to record the location and amount of kernel consumption, larval density by instar, and presence of exit holes. Complete data sets of 56 sentinel plantings were submitted and analyzed, whereas 5 plantings were not sampled due to poor plant growth and ear formation. High CEW infestations caused kernel damage to >70% of the non-Bt ears in 36 plantings. Summed over all sentinel plantings, 76.3% of the non-Bt ears were damaged, with 1.28 larvae and 6.41 cm2 of kernel consumption per damaged ear. In comparison, the percentage of CEW-damaged ears expressing Cry1Ab, Cry1A.105+Cry2Ab2, and Cry1Ab+Vip3A averaged 70.7%, 64.9% and 0.61%, respectively. The number of larvae and kernel consumption averaged 1.27 and 5.28 cm2 in damaged Cry1Ab ears, and 1.13 and 4.77 cm2 in damaged Cry1A.105+Cry2Ab2 ears, respectively. Collaborators sampled a total of 12,247 Cry1Ab+Vip3A ears to detect changes in CEW susceptibility to the Vip3A toxin. Only 17 of the 69 Remedy and Milky Way plots had live larvae feeding at the ear tip, which were mainly 2th and 3rd instars, averaging 0.004 larvae per ear and usually associated with < 1 cm2 of kernel injury. Forty-two of the 68 Remedy and Milky Way plots were uninfested and undamaged.

The network also monitored susceptibility changes and regional differences in European corn borer (ECB), fall armyworm (FAW), and western bean cutworm (WBC) populations. Ten sentinel locations recorded FAW ear damage in non-Bt plots, ranging from 2-24%. Four locations (NE, ON, NB, and QC) recorded WBC damage in non-Bt ears (ranging from 15- 32%), BC0805 ears (ranging from 4-25%), and Obsession II ears (ranging from 1-60%). Twelve trials recorded ECB ear damage in non-Bt plots (ranging from 2-30%), primarily at locations with low adoption of Bt corn. Most noteworthy, the CT sentinel planting reported the first occurrence of live ECB larvae and tunneling damage in plants of Cry-expressing sweet corn in the US. The following summarizes the ECB infestations in each sweet corn hybrid: 20.5% of the Obsession II (Cry1A.105+Cry2Ab2) plants had either shank and/or stalk tunneling, with 12.4 live 5th instar ECB per 100 plants; 33.0% of the Obsession I (non-Bt) plants had either shank and/or stalk tunneling, with 38 live 5th instar ECB per 100 plants; 17.0% of the Providence (non-Bt) plants with either shank and/or stalk tunneling, with 17 live 5th instar ECB per 100 plants; 34.5% of the Remedy (Cry1Ab + Vip3A) plants with either shank and/or stalk tunneling, with 15 live 5th instar ECB per 100 plants; and 13% of the BC0805 (Cry1Ab) plants with either shank and/or stalk tunneling, with 3 live 5th instar ECB per 100 plants. Follow-up sampling of all ears at the CT sentinel location was conducted to collect surviving larvae for laboratory analysis.

For CEW estimates of the PFR, it was assumed that any live 2th thru 6th CEW larvae that survived to cause kernel damage in a Bt ear indicates some level of resistance to the expressed toxins, that could result in mature larvae surviving to contribute resistance alleles in the next generation. Not all data sets were used to calculate PFRs for each sentinel planting, depending on whether all five hybrids were planted. Furthermore, only data from plantings reporting >50% damaged ears and infested with >50% 4th, 5th and 6th instars were used to calculate PFRs. Forty-five of the 56 sentinel plantings satisfied these criteria for one or both Cry toxins; the remaining plantings either had very low CEW infestations or the timing of ear sampling was too early to record the number of surviving late instars per ear. Forty-nine trials satisfied the selection criteria for the Cry1Ab+Vip3A toxins. The following summarizes the PFRs for each individual or pyramided Bt toxin(s), in comparison with previous sentinel monitoring results.

Cry1Ab (BC0805 vs Providence): The level of CEW phenotypic resistance has significantly increased, since Cry1Ab sweet corn was commercially introduced in 1996. PFRs estimated from sentinel plantings each year in Maryland averaged 0.28 during 1996-2003 and 0.64 during 2004-2016. Based on results of the expanded monitoring network, PFRs averaged 0.99 in 2017, 0.85 in 2018, 0.76 in 2019, 0.95 in 2020, 1.06 in 2021, 1.07 in 2022, and 1.09 in 2023. The percentage of damaged ears and kernel consumption per Bt ear, along with larval development delays, remained about the same during the last three years. However, the most noteworthy finding is that 22 of the 35 BC0805 plantings that satisfied the selection criteria in 2023 reported higher CEW densities per Cry1AB ear compared to densities per non-Bt ear (PFR>1). The difference in larval densities is the result of behavioral changes in sublethally intoxicated larvae. In a non-Bt ear, many early instar CEW can freely feed together initially, but then become cannibalistic once they reach the 4th instar stage.

Cry1A.105+Cry2Ab2 (Obsession II vs Obsession I): Phenotypic frequencies have steadily increased since 2010, averaging 0.19 during 2010-2013 and 0.41 during 2014-2016. Sentinel network results continue to show some evidence of further resistance development to the dual Cry toxins, with PFRs averaging 0.67 in 2017, 0.93 in 2018, 0.70 in 2019, 0.89 in 2020, 0.95 in 2021, and 0.92 in 2022. In 2023, the estimated PFR was 0.85, based on 31 of the 47 sentinel plantings of Obsession II vs Obsession I that satisfied the selection criteria. Eleven sentinel locations reported higher CEW densities in Obsession II, resulting in PFRs ≥ 1. However, over the last three years, there has been no consistent increase in phenotypic frequency, kernel consumption, or percentage of older instars surviving Cry1A.105+Cry2Ab2 ears. Pyramiding with other Bt toxins, particularly Vip3A, in field corn and cotton may have reduced the selection pressure on these two Cry toxins, thus resulting in a slower rate of resistance development.

Cry1Ab and Vip3A (Remedy/Milky Way vs Providence): Previous studies in MD and MN during 2013-2016 reported virtually no CEW survival or damage in Vip3A-expressing sweet corn. However, sentinel monitoring starting in 2017 began to report larval survival with expansion of the network to more southern locations. During 2017-2019, 0.72% of the 9,369 Vip3A ears sampled had minor tip damage associated primarily with 2thand 3rd instars. Furthermore, results by year show a small but noticeable increase in the number and age of surviving larvae. Of the 20,312 ears sampled during 2020-2022, 156 ears (0.77%) had minor damage (<0.5 cm2, primarily on the tip), but only 25 of these ears (0.12%) were infested with a total of 82 live larvae (78% early instars). Trials reporting most of the ear damage and older larvae in Vip3A ears were southern locations (TX, LA, MS, AL, NC). However, not all of these damaged ears were tested for Vip3A expression, so there is the possibility that some ears resulted from contaminated non-Bt or Cry-expressing seed. Nevertheless, assuming all ears with live larvae expressed Vip3A, the overall PFR estimated from trials conducted during 2020-2022 was 0.0044.

In 2023, additional sentinel plots were planted with the Vip3A expressing Milky Way sweet corn, and most collaborators sampled higher number of Remedy and Milky Way ears to increase the chances of detecting early signs of resistance to the Vip3A toxin. Twelve of the 49 sentinel plantings that satisfied the selection criteria were infested with a few surviving CEW, with PFRs for Vip3A resistance ranging from 0.003 to 0.070. In contrast with previous sentinel results, sentinel locations in IL, NE, IA, VA and NC had the highest PFRs (≥0.020) showing evidence of Vip3A resistant alleles, compared to southern locations in TX, AL and LA reporting PFRs ≤0.007. The higher PFRs in the more northern sentinel locations may be the result of migrate CEW moths that were previously subjected to a generation of Vip3A selection pressure in the south. In any case, these results continue to indicate early signs of CEW resistance to Vip3A, yet there was no evidence of any increase in 2023 compared to the 2020-2022 results. Furthermore, the Vip3A expressing sweet corn still provided excellent ear protection against CEW in all sentinel plantings.

UMD Bee Lab and the New UMD Bee Squad

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!

Update from IR-4 Field Research Center (LESREC)

2023 Trial Summary

In 2023, there were 17 Magnitude of Residue (MOR) trials placed at the University of Maryland's LESREC in Salisbury, MD. There were 6 greenhouse trials and 9 field trials.

PR #	Crop	Chemical	Trial Status
13035.23 MD154	Hemp	Cyclaniliprole	Complete
13541.23 MD165	Pea	Fluazifop-P-Butyl	Complete
13541.23 MD383	Pea	Fluazifop-P-Butyl	Complete
13511.23 MD164	Tomato	Inpyrfluxam	Complete
13405.23 MD159	Pepper (GH)	Isocycloseram	Complete
13194.23 MD157	Lettuce	Mefenoxam	Cancelled
13194.23 MD387	Lettuce	Mefenoxam	Complete
07883.23 MD152	Sweet Corn	Pyridate	Complete
11473.23 MD153	Lettuce (GH)	Pyriofenone	Complete
13498.23 MD162	Cucumber	Tiafenacil	Complete
13087.23 MD155	Tomato (GH)	BCS-CW64991	Cancelled
13088.23 MD156	Cucumber (GH)	BCS-CW64991	Complete/Cancelled
13485.23 MD161	Green Onion	Bifenthrin	Cancelled
13485.23 MD385	Green Onion	Bifenthrin	Complete
AAFC23-021R-090	Tomato (GH)	Isocycloseram	Complete
13407.23 MD160	Strawberry (GH)	Isocycloseram	Complete
13501.23 MD163	Pepper	Tiafenacil	Complete

We had another successful field season at LESREC. It was the third year working with industrial hemp and the first year that we established a healthy, successful crop. It is truly a challenging crop. Work on hemp is in high demand because of the limited number of registered pesticides. The LESREC farm manager, David Armentrout, assisted with the planting and establishment of the crop. Spraying and harvesting it proved to be difficult, but we were able to provide fiber samples to the lab.

Marylee Ross trying on the extendable offset backpack boom that would be used for applications over the 12 to 14 foot tall crop. Photo by Megan Hickman.

During the season we experienced 5 cancellations of trials (one of which was a postponed 2022 trial) that we were conducting at our site. All work that IR-4 was conducting on a compound named BCS-CW64991 was cancelled by request of the registrant. This impacted three trials at LESREC (one complete, one ongoing and one not yet started). We are grateful this is a rare occurrence and also grateful that this decision was made before more resourceswere spent on research and analysis of samples nationwide.

Samples that were discarded at LESREC due to the BCS-64991 cancelled trials. Photo by Megan Hickman.

Due to challenges during the growing season, two trials in the field (leaf lettuce & green onions) were lost but also reestablished and completed during the growing season. All of the other trials were completed on time and without any delays. This included a uniquely challenging trial on sweet corn that required multiple sampling dates and three different crop fractions.

One of our greenhouse trials was in cooperation with Agriculture and Agrifoods Canada. This magnitude of residue trial assessing an insecticide was completed and will hopefully provide data that will result in a new registration for growers in Canada and the US.

Megan Hickman modifying cucumber samples. Photo by Marylee Ross.

Cucumbers and peppers in GH2 during summer 2023. Plastic barriers are in place for an application. Photo by Marylee Ross.

This was our second season in the newly glazed Greenhouse 2. It is amazing what a difference the new glass has made. There is a noticeable improvement in the quality of plants and pest control. We appreciate the support from UMD that helped to make that happen. This enables us to better serve our growers!

Poplar Hill - Effect of Saltwater Intrusion on Nutrient Release

Kate Tully, Associate Professor, Department of Plant Science and Landscape Architecture, UMD
Alison Schulenburg, Agroecology Research Scientist, University of Maryland

As sea levels continue to rise and high tide flooding events increase in frequency, researchers and farmers alike are looking for solutions to adapt to and mitigate the effects of saltwater intrusion (SWI). This phenomenon alters nutrient cycling and damages crop yields. Some landowners on the Lower Eastern Shore of Maryland respond to SWI by taking land out of agriculture. For example, they may 1) attempt to remediate salt-damaged soils (e.g., planting switchgrass, *Panicum virgatum*), 2) restore native marsh grasses (e.g., planting saltmarsh hay, *Spartina patens*), or 3) abandon fields altogether (e.g., allow for natural recruitment of weeds). This study focused on the survival of target species under saltwater-intruded conditions and the potential for these plants to survive and alter cation concentrations (e.g. calcium [Ca], magnesium [Mg], potassium [K], and sodium [Na]) in soil. This work also examined the ability of each of these land management practices to reduce phosphorus (P) levels in soils and porewater, with the overall goal to benefit both the farming community and water quality in the Chesapeake Bay. As SWI encroaches and soil Na concentrations increase in coastal landscapes, *P. virgatum* exceeded all other species in biomass production and remediated soil cations over time. *S. patens* removal of cations from soil was significant, but did not increase over time, suggesting the species is able to co-regulate cations. Furthermore, we found that both remediation and restoration practices are efficient at taking up soil P and reducing porewater P concentrations through biomass P uptake. Therefore, if harvested, implementing these strategies may ultimately decrease the amount of P available to runoff into the Chesapeake Bay. Remediating or restoring farm fields affected by SWI by planting *S. patens* or *P. virgatum* has benefits for the soil by decreasing Na and P levels and communities by protecting coastlines. Results from this work will help inform state-level coastal management policies and determine optimal strategies for climate resilience.

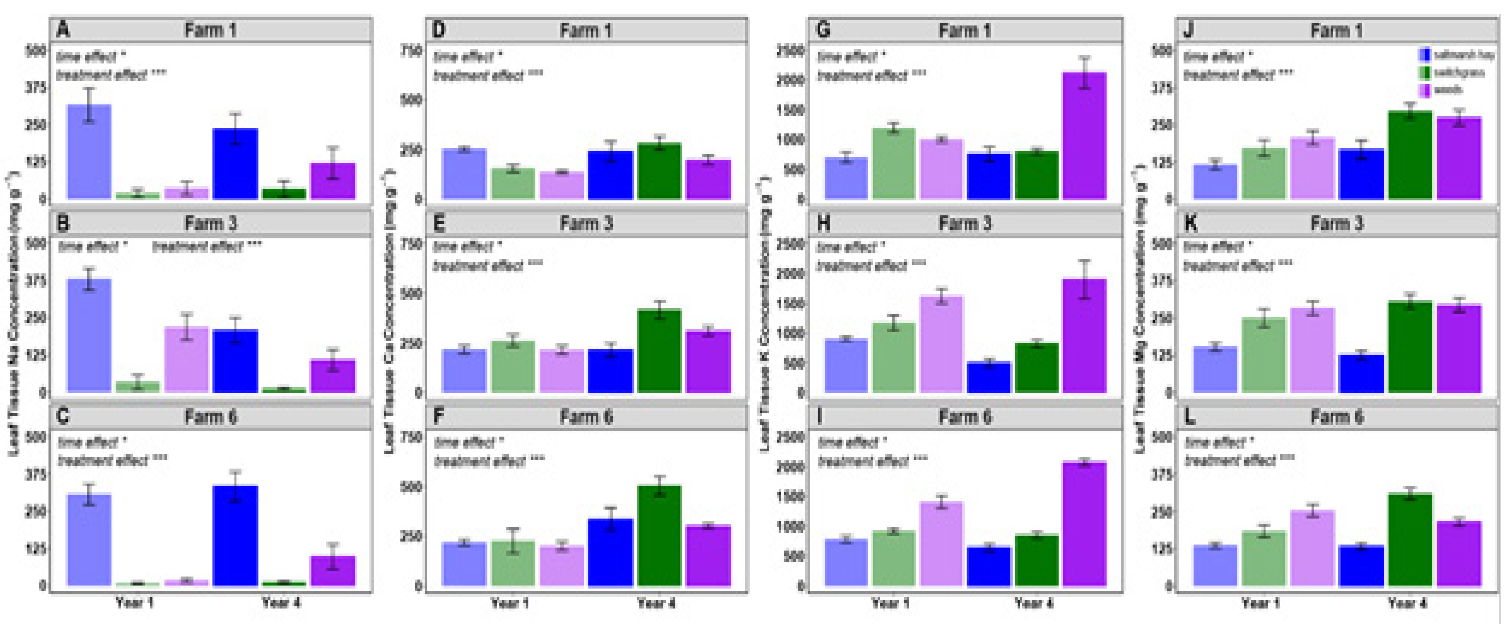


Figure 1. Plant leaf tissue cation concentrations at three saltwater-intruded field sites on the Lower Eastern Shore of Maryland from year 1 (baseline) to year 4. The x-axis is year and the y-axis is plant leaf tissue Na (A,B,C), Ca (D,E,F), K (G,H,I), and Mg (J,K,L) in milligrams per gram. Section was not significant, so 0-5 m and 15-20 m from the ditch were averaged together and separated by treatment which is represented by colors. *S. patens* is blue, *P. virgatum* is green, and weeds are purple. Statistical significance (*p-value*) is indicated by symbols *^ = p<0.05, * = p<0.01, ** = p<0.005, *** = p<0.001.*

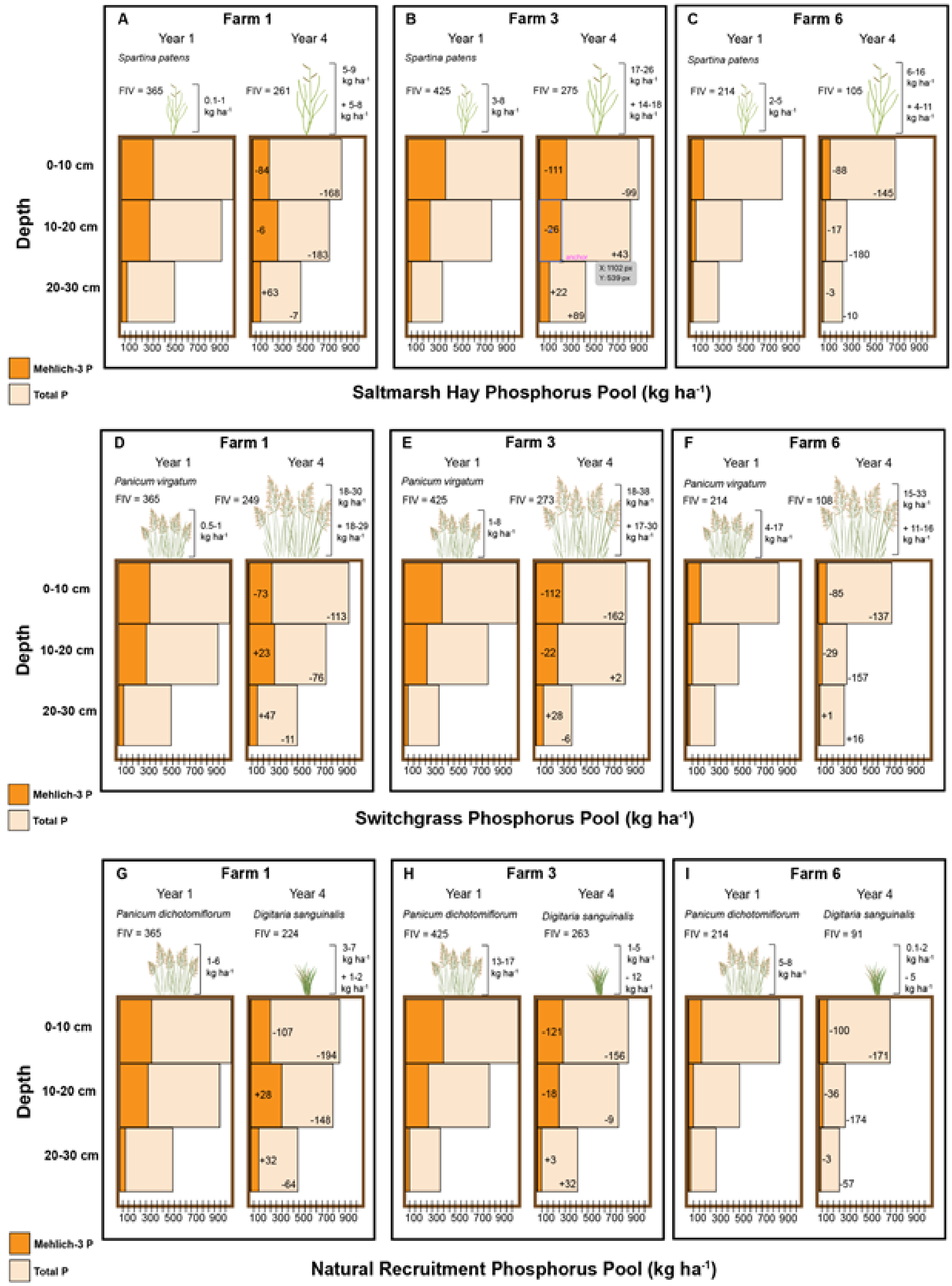


Figure 2. Conceptual diagram of saltmarsh hay (*Spartina patens*; A-C), switchgrass (*Panicum virgatum*; D-F), and weeds (*Panicum dichotomiflorum* and *Digitaria sanguinalis*; G-I) aboveground biomass P and respective belowground total and available P pools from three depths (0-10, 10-20, and 20-30 cm) in year 1 (baseline) compared to year 4 at three saltwater-intruded field sites on the Lower Eastern Shore of Maryland. The x-axis is phosphorus pools in kilograms per hectare and the y-axis is depth in centimeters. Mehlich-3 available P is the darker bars and total P is the lighter bars. Change in Mehlich-3 P from year 1 to year 4 is in the middle of the bars, and the change in total P from year 1 to year 4 is in the bottom right corner of the bars; positive numbers (+) indicate an increase in P pools and negative numbers (-) indicate a decrease in P pools.

Preplant Burndown Options for Glyphosate Resistant Italian Ryegrass

Kurt M. Vollmer, Ph.D.
Extension Specialist, Weed Management

Italian ryegrass is a winter annual weed found throughout the United States. This species is most problematic in small grain production, but can be a problem if not managed prior to planting corn and soybean. Uncontrolled, Italian ryegrass can reduce corn yields as much as 65% and soybean yields as much as 37% (Steckel and Bond 2018). Italian ryegrass resistant to Group 1 (ACCase-inhibiting) herbicides was first reported in Maryland in 1998 (Heap 2024). In 2017, a population of Italian ryegrass from southern Maryland exhibited resistance to both Group 1 and Group 2 (ALS-inhibiting) herbicides. In 2021, a population of Italian ryegrass from Maryland's Eastern Shore exhibited resistance to glyphosate, clethodim, and pyroxsulam. It is recommended that Italian ryegrass be controlled in the fall with residual herbicides or tillage. However, Italian ryegrass can emergence in the spring, and residual herbicide control from fall applications may decline prior to soybean planting. Therefore, options are needed for pre-plant control of Italian ryegrass prior to planting cash crops.

A study was conducted in the spring of 2023 at the Lower Eastern Shore REC Poplar Hill facility to investigate preplant herbicides for controlling Italian ryegrass. Treatments included glyphosate, glyphosate + clethodim, glyphosate + saflufenacil, paraquat, and paraquat followed by paraquat. Herbicide applications were made on March 30 and April 13, 2023. A non-treated check was included for comparison. Weed control was rated on a visual scale from 0% (no control) to 100/% (complete control).

No treatment differences were observed 7 days after the initial treatment (DAT, Table 1). However, greater control was observed with glyphosate + clethodim 14 and 22 DAT, and by sequential applications of paraquat 22 DAT compared to other treatments (Figure 1). This study supports previous work conducted in Pennsylvania that showed glyphosate + clethodim controlled ryegrass 98% two months after treatment (Wallace and Lingenfelter 2022).

While this particular population does not appear to be glyphosate-resistant, it is important to note that several factors dictate the efficacy of ryegrass control with glyphosate. Low temperatures will affect glyphosate movement in plants. For best results, glyphosate should be applied at 1.25 to 1.5 lb. ae/A when temperatures are greater than 55°F (and remain above 45°F for 3 to 5 days). Damage to foliage using urea ammonium nitrate (UAN) and high rates (>0.25 lb. ai/A) of triazine herbicides such as atrazine, simazine, and metribuzin can also reduce glyphosate absorption and translocation. Ryegrass plants should be less than 6 in. (but no more than 8 in.) tall at the time of application. A spray grade ammonium sulfate (8.5 to 17 lb. /100 gal) should also be included in the tank to minimize any water compatibility issues.

Always consult the label before applying any pesticide.

Table 1. Italian ryegrass control at the Lower Eastern Shore Poplar Hill facility in 2023.[a]

Treatment[b]	Application rate	7 DAT[c]		14 DAT		22 DAT	
	lb. ae or ai a^{-1}			%			
glyphosate	1.25	81	--	86	b	87	b
glyphosate + clethodim	1.25 + 0.121	86	--	94	a	98	a
glyphosate + saflufenacil	1.25 + 0.022	78	--	78	c	90	b
paraquat	1	89	--	87	b	86	b
paraquat fb paraquat[d]	1 fb 1	86	--	86	b	97	a
LSD (p = 0.05)		7.87		6.40		5.20	

a. Means followed by the same letter are not significantly different (α = 0.05).
b. All treatments contained ammonium sulfate (8.5 lb. /100 gal), a nonionic surfactant (0.25% v/v) was included with the glyphosate + clethodim treatment, and crop oil (1% v/v) was included with the glyphosate + saflufenacil and paraquat treatments.
c. Abbreviation: DAT, days after (initial) treatment; fb, followed by.
d. Paraquat was applied as a sequential application on March 30, 2023 and April 13, 2023.

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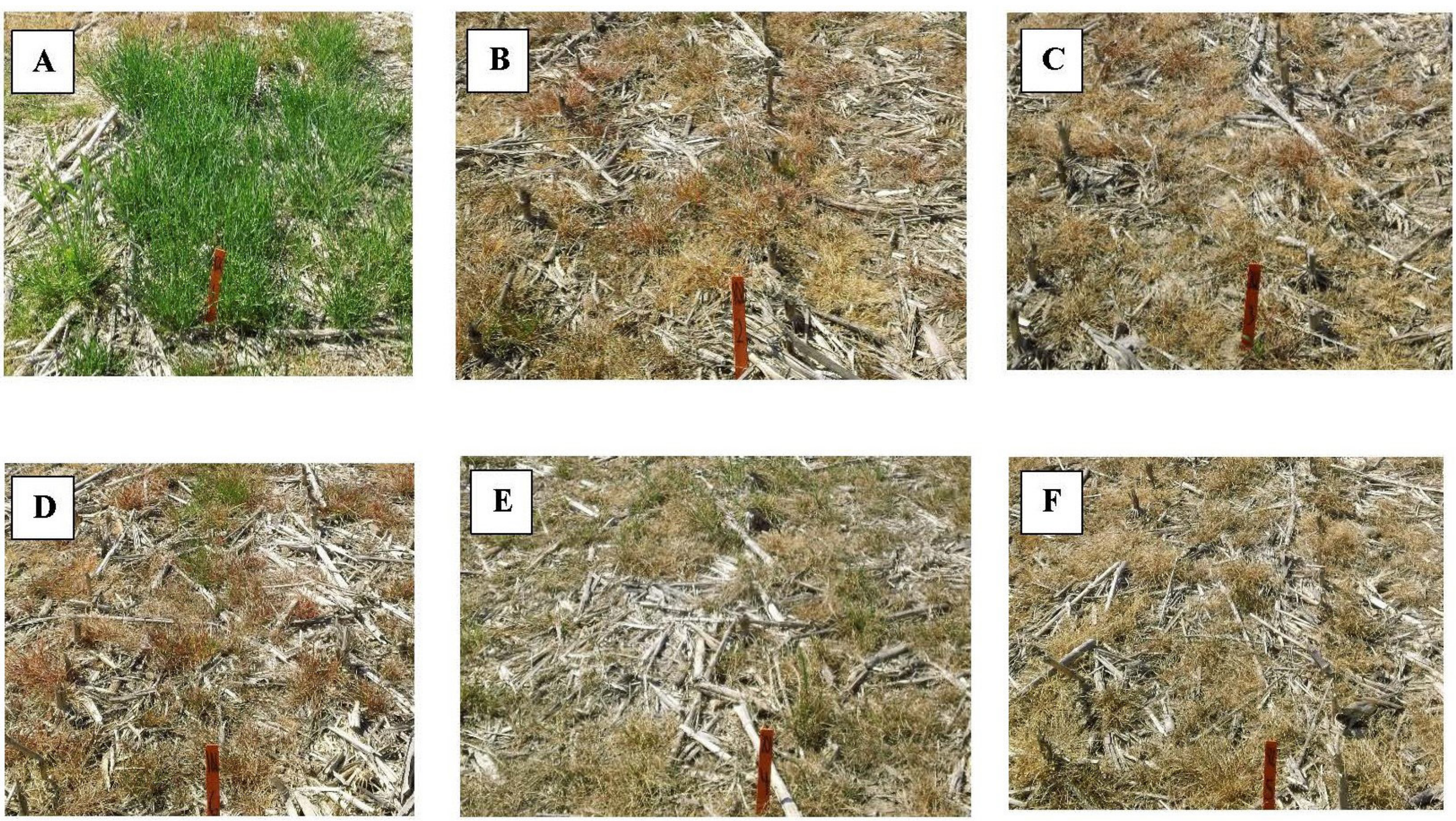
Figure 1. Italian ryegrass response 22 days after initial application to a) non-treated, b) glyphosate, c) glyphosate + clethodim, d) glyphosate + saflufenacil, e) paraquat, and f) paraquat fb paraquat plots.



Salisbury - Cover Crops and Switchgrass for Anaerobic Digestion

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The Delmarva Peninsula (Delaware, Maryland, and Virginia) makes up the Eastern Shore of the Chesapeake Bay. It is predominantly rural and, especially from mid-Delaware south, heavily dependent on agriculture, which dominates the region's economy. The area is also economically distressed and home to a large, historically underserved minority population. It is an area in need of support and implementation of new approaches to sustain and diversify agroeconomic production. The project objectives are to explore the potential environmental and socioeconomic benefits of incorporating cover crops – both winter covers and perennials – into the Delmarva Region's agricultural cash crop rotation in order to serve as an additional cellulosic feedstock for anaerobic digesters. The work will assess the potential for an agro-economy in which perennial and/or winter crops are grown by underserved farmers to sequester carbon, reduce nutrient leaching/runoff, and produce a salable harvest and valuable co-digestion feedstock for poultry litter anaerobic digestion (AD). The AD systems will generate renewable energy from the feedstock and return the digested solids back to the fields. We will use life cycle analysis to track greenhouse gasses, carbon, nutrients, and energy flows from the field to the final digestion products. The work will also explore the difference in greenhouse gas emissions between traditional poultry litter management practices and the new system incorporating AD. The purpose is to create a cyclic and sustainable system harnessing waste to improve crop production and create new commodities to support small, underserved farmers. We will also engage in dialogue with these producers to ensure economic and environmental justice in the implementation of the new production strategies. The project consists of field trials at the Lower Eastern Shore Research and Education Center (LESREC) in Salisbury, MD as well as on Millennium Farms in Pocomoke City, MD. We are also actively seeking new farmer partners who are interested in planting ryegrass and/or switchgrass to be harvested and used as co- feedstock for anaerobic digestion of poultry litter. Farmer partners will be financially compensated (by the acre) for participation in the project. We will be ramping up research activities in the spring of 2024 and the project will run through August 2028.

Watermelon Variety Fusarium Trial

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Utilizing the LESREC watermelon Fusarium wilt screening field, trials were conducted to investigate management options for Mid-Atlantic watermelon producers. Watermelon seed companies are interested in breeding for resistance to Fusarium wilt. A trial was conducted to assess genetic material in company breeding pipelines for resistance to Fusarium Wilt. Data from this trial will aid genetic selections and breeding efforts for this disease. Companies have interest in developing fungicides for application at planting via drip line. A trial was conducted to assess efficacy of fungicide products applied through the drip line at planting and/or 14 days after planting. This work will support future labeling of promising products for the Mid-Atlantic region.

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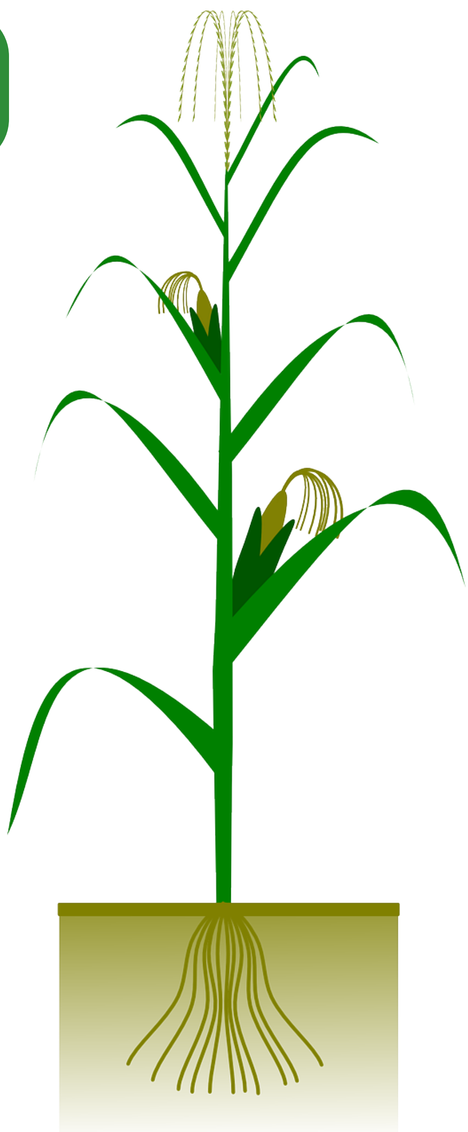

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