COLLEGE OF AGRICULTURE & NATURAL RESOURCES

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CMREC UPPER MARLBORO FACILITY

ROOTS IN RESEARCH

Yield of 2023

This past year was one of tremendous yield. We were blessed with another excellent growing season that brought about the highest crop yields we have ever achieved in a variety of crops. Everything from corn and soybeans, to tomatoes, pumpkins, and squash set Facility yield records. Even more important than our crop yields, our greatest growth was the addition of a new Staff member, a new Faculty member, and an expansion of our collaboration with Dining Services in the Terp Farm.

We were fortunate enough to hire Nathan Hepp to fill our last vacant Staff position. Nathan comes to us via transfer from the University's Beltsville Facility. Nathan brings a broad background of equipment operation and repair experience that will further our ability to serve our research mission.

Another significant addition to the personnel stationed at CMREC – Upper Marlboro is Dr. Hemendra Kumar. Hemendra was hired to fill a newly created Precision Ag. Specialist position that was of great need to our State. We look forward to supporting Dr. Kumar's research in the years to come. This past year the Terp Farm began its transition from a standalone project to a fully integrated component of CMREC – Upper Marlboro. We completed our first year of a two year agreement, between AGNR and Dining Services, which aims to strengthen our collaboration and incentivizes growth of the Terp Farm footprint. Under the terms of this agreement, all Facility grown produce are a part of Terp Farm and the revenue from the sale of the crops is invested in labor, infrastructure, and equipment to support the expansion of Terp Farm and its mission.

Donald Murphy, Facility Manager

To view this newsletter electronically, scan the QR code!

Upper Marlboro Weather Station

Weather data for Upper Marlboro is displayed on our website from 1956 to current. 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 Elizabeth McGarry and she will help to get the information you are requesting.

In This Issue:

Cover photo: Students harvesting and stacking butternut squash (Photo: Lindsay Barranco) **See article on page 4.**

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 Upper Marlboro Welcomes Nathan Hepp

Nathan Hepp transferred from the Beltsville Research Facility to Upper Marlboro. He performed harvesting, planting, excavating, and equipment maintenance tasks and brings those skills to the duties he performs here. He is eager to learn more about vegetable production and further his mechanical skills. Nathan lives in Calvert County and enjoys spending his free time hunting, working on tractors and trucks, and gardening.

Crops Twilight Tour & Ice Cream Social

Wednesday, August 2, 2023

It was another great turnout for our annual Crops Twilight Tour and Ice Cream Social. We enjoyed a catered dinner before the local Ag Agents served up some of their homemade ice cream. We boarded the wagons for the tour at 6 pm and took a drive around the facility with 6 stops and 11 research updates. See below for the list of topics and research covered at this years event. Don't miss next year's event, scheduled for Wednesday, August 7, 2024. You must pre-register through the Anne Arundel County Extension office.

- Utilizing Living Mulches in CBD Hemp Production – Dwayne Joseph
- Managing Weeds with Leftover Fruit Waste and the Sun – Dwayne Joseph
- High and Low Input Pest Management Tactics in Cantaloupe – Leo Kerner
- UMD Weed Research Update – Kurt Vollmer
- CEW, FAW, and WBC Trap Data – Heather Knauss
- AAUFRC Urban Farming – Dave Myers and Brian Hufker
- Terp Farm Collaborative – Guy Kilpatric
- Weird Happenings in Vegetables and Fruit – Jerry Brust
- Grafted Watermelon and the Tomato Cultivars – Ben Beale
- Using Apple Pumace as an Organic Amendment for Biosolarization in Tomatoes – Leo Kerner
- Exploring Perennial Clovers for their Adaptability to Vegetable Systems – Alan Leslie

Red Clover Living Mulch- A Look into Reduced Tillage Strategies for Insect Pest and Weed Management

Leo M Kerner, Graduate Student, Dept of Entomology
Cerruti Hooks - Professor Department of Entomology, University of Maryland

Modern agricultural systems typically consist of monoculture plantings that rely heavily upon chemical and mechanical inputs. These conditions create farming environments that are costlier, susceptible to pest outbreaks, and less hospitable to beneficial organisms above and below the soil. Interplanting a living mulch into a cropping system is a tactic that can be used to increase vegetation diversity within crop fields and subsequently reduce pest abundance. A living mulch is a cover crop interplanted with a cash crop that lives the entire duration of the cash crop cycle. Research has shown that living mulches can enhance arthropod predators and parasitoids and effectively suppress weeds. However, the impact of living mulches on insects and weeds are often investigated separately, and not evaluated in combination with chemical inputs.

Fig. 1, A big eyed bug (*Geocoris*) and its prey, likely a minute pirate bug (*Orius*). Predators like these are common in vegetable fields and their populations may be enhanced by living mulch.

Fig. 2, A spotted cucumber beetle (*Diabrotica undecimpunctata*) resting on a clover leaf. These insects are significant pests of Cucurbits.

This project compares the efficacy of using red clover (*Trifolium pratense*) as a living mulch in combination with standard and reduced chemical inputs with a traditional practice of using polyethylene mulch with standard and reduced chemical input to control insect and weed pests. Cantaloupe (*Cucumis melo*) is used as the test crop; however, methods being investigated are compatible with additional vegetable crops. Data is collected on the abundance of weeds, arthropod predators and parasitoids, insect herbivores and pollinators, and detritivores. Natural enemy efficacy in reducing insect pest numbers as well as crop productivity and marketable yield has also been studied and recorded. Knowledge gained from this work has and will continue to be disseminated to growers, their advisors, and other stakeholders through multiple outreach venues (e.g., walking tours, presentations at commodity events, newsletters). This study is a part of the Hooks lab applied ecology laboratory and is conducted as a master's project by student Leo M Kerner.

Developing and Implementing Insect Pest, Diseases and Weed Monitoring and Managing tactics on Hemp Production in the Delmarva Region

Dwayne Joseph – University of Maryland Extension Educator, Kent County
Simon Zebelo – Professor, Department of Natural Sciences, University of Maryland Eastern Shore
Kurt Vollmer – University of Maryland Extension Specialist, Weed Management
Alan Leslie – Center Director WMREC, CMREC, LESREC, University of Maryland
Cerruti Hooks – Professor, Department of Entomology, University of Maryland

Integrated Weed Management (IWM) is crucial in hemp production due to limited herbicide options, with only one conventional herbicide approved for use in the US. Additionally, research on weed management in hemp is limited following its recent removal from the controlled substance list. Weeds pose a significant challenge to hemp growers, especially in controlling broadleaf varieties. This challenge was evident in a University of Maryland Eastern Shore pilot program where growers struggled with Palmer amaranth and common ragweed. Weeds also negatively impacted profit margins due to the high labor costs associated with hand weeding. Hence, there is a pressing need to develop new weed management strategies to reduce production costs. Cover cropping emerges as a promising aspect of IWM programs for both standard and plasticulture-grown hemp. Therefore, this study aims to evaluate the effectiveness of conservation tillage, cover cropping, and other integrated tactics on weed control and floral hemp yield.

Methods

Plot preparation

The study was laid out in a randomized complete block design with four replications. Treatments included bareground (BG), premium clover mix (PCM), and Teff red clover (Teff-RC).

Fall – In early fall, a cover crop mixture consisting of four different clover cultivars was planted in BG and PCM plots at 12 lbs/acre with 6-inch row spacing. Cereal rye was seeded in Teff-RC plots.

Spring – In early spring, cover crops in BG plots were mowed and disked under, followed by laying 3 ft-wide black plastic mulch with a plastic mulch bed layer. In Teff-RC plots, the entire plot was mowed to terminate the rye before laying black plastic mulch. Teff and red clover were then planted between the plastic-mulched rows at 6-inch row spacing and rates of 12 and 15 lbs/a, respectively. In PCM plots, 40-inch-wide strip rotovation was done in intra-row areas, with black plastic and drip lines laid in these zones, while clover remained in the inter-row areas as a living ground cover.

Data sampling

Weeds – Weed density and visual percent cover measurements were collected at 1, 2, 3, and 5 weeks after planting (WAP). During each assessment, 100 sq-inch quadrats were randomly placed in each plot within two inter-row areas. Weeds were identified, counted, and visually rated for the percentage of ground covered by cover crop, weeds, and bare soil. Visual percent ground cover assessments ranged from 0% (no soil cover) to 100% (total soil cover).

Crop growth & yield – Hemp height and width were measured on six selected plants per plot every 14 days after transplanting until flowering. Once flowering began, crop maturity was assessed by measuring the total THC content of random plants in each treatment to ensure compliance with the 0.3% THC limit at harvest. Subsequently, four plants were randomly harvested from the center rows of each plot and weighed for fresh mass before being air-dried to approximately 10% moisture content. After drying, each plant was weighed again for dry mass, and colas were clipped from branch terminals and weighed separately.

Results & Discussion

Data relating to weed density, weed counts, and hemp growth and yield from the 2023 trial-year of this study are yet to be analyzed. Therefore, no official numbers will be reported at this time. However, from visual observations, it can be noted that the living mulch system offered a superior weed management technique compared to bareground (no cover crop). Preliminary observations suggest that the PCM plots had the least number of weeds present at all sampling times. Teff-RC plots also showed a low number of weeds, although slightly more than PCM plots. The hemp plants were initially small at transplant and remained so throughout the growth sampling times. They fell short of the expected size requirements, with only a few colas present at the final harvest, which is significantly less than what is typical for the Cherry Wine cultivar. In fact, the plants in the study only reached approximately a quarter of the size they typically achieve (Figure 2). We attribute this to the small size of the transplants received from the nursery and the late planting date. These issues will be addressed in the next trial year by growing larger transplants 2-3 weeks earlier. These adjustments should help the plants meet maturity milestones on schedule, as they had to contend with early-season shading by the living mulch, which may have contributed to their stunted growth. There appears to be promise in this IWM approach for floral hemp growers. However, a more comprehensive assessment will be possible after data analysis and implementing the aforementioned changes for the next growing season. This will provide a clearer

Figure 1. Left, Teff-RC plot 1 week after transplant, and Right, PCM plot 1 week after transplant.

Figure 2. Left, Cherry Wine plant 10 weeks after transplant in PCM plot, illustrating its notably small size, and Right, Cherry Wine plants 12 weeks after transplant, displaying the typical size they can achieve.

Utilizing Biosolarization, Cover Cropping and Strip Tillage as an Integrated Weed Management Technique in Vegetables

Dwayne Joseph - University of Maryland Extension Educator, Kent County
Alan Leslie – Center Director WMREC, CMREC, LESREC, University of Maryland
Kurt Vollmer - University of Maryland Extension Specialist, Weed Management
Cerruti Hooks - Professor Department of Entomology, University of Maryland

Vegetable farmers face challenges due to the limited availability of herbicides registered for vegetables compared to row crops. Additionally, existing herbicides often fail to provide full-season weed control and may pose risks of crop injury if not applied correctly. Organic farmers, in particular, encounter significant obstacles as they rely heavily on manual and mechanical weed control methods, consuming substantial time and labor resources. To address these challenges, we developed a novel approach that integrates biosolarization, strip tillage, and living mulch systems. Biosolarization is a method similar to solarization but includes the incorporation of organic amendments into the soil before the passive solar heating process. As the moist soil undergoes heating, the organic material decomposes, releasing allelochemicals and

other biotoxic compounds into the soil. Following the 14-day biosolarization process, the transparent plastic mulch is removed, and the soil is aerated for seven days before crop transplant. Biosolarization presents a promising option for integrated weed management (IWM). Research has shown that it can enhance weed seed mortality, reduce soil pathogens and is compatible with organic farming. While biosolarization has received limited attention compared to soil solarization, its potential synergies with conservation tillage (strip-tillage) and cover cropping (living mulch) remain largely unexplored.
Fruit processing by-products (pomace) are promising soil amendments for biosolarization because they are rich in organic compounds, don't pose any biohazard safety risks, and can be relatively abundant and inexpensive (Figure 1). In this study, the biosolarization potential of grape pomace combined with a living mulch was investigated as an IWM technique. We hypothesized that biosolarization would reduce the growth and establishment of weeds. Furthermore, the study objectives were to demonstrate the use of biosolarization, conservation-tillage and cover cropping to: 1) reduce nematode, weed and insect pests, 2) enhance crop growth and marketable yield, and 3) improve soil quality and health.

Methods

Treatments were organized in a randomized complete block split-plot design and were replicated four times. The whole plot treatments included summer squash and okra grown under the following conditions: 1) in living mulch with no-till (LM-NT), 2) interplanted with cover crops (LM), 3) grown in solarized soil (Sol), or 4) interplanted with a cover crop and grown in biosolarized soil (Biosol). To assess the direct impact of whole plot treatments on cash crop growth and yield in the absence of weeds, half of all plots were kept weed free by manual weeding throughout the growing season.
Fall plot preparation – In early fall, red clover + cereal rye mixture was planted in Biosol, Sol and LM treatment plots at 6-inch row spacing. In LM-NT plots, the red clover and cereal rye was seeded in separate, alternating rows. One row of red clover was planted at each border and internal rows were alternated between six rows of cereal rye and four rows of red clover.
Spring plot preparation – In Biosol plots, the entire plot was mowed, the within-row areas (where the cash crops were transplanted) was strip rotovated 40-inches wide. Grape pomace was spread onto the soil surface and incorporated (rotovated), then transparent plastic tarp and drip lines were laid in rotovated zones (Figure 2). The biosolarization process proceeded for 24 days then the plastic tarp was removed and the soil was remediated for seven days before cash crop transplant. In LM-NT plots, the cereal rye was terminated with a roller crimper. In Sol plots, the entire plot was mowed and rotovated. The transparent plastic tarp and drip lines were laid in intra-row areas. In LM plots, the entire plot was roller crimped to terminate cereal rye. The within-row areas were strip-rotovated (40-inches wide) prior to transplanting the cash crops. Four rows of summer squash and four rows of okra seedlings were transplanted into all plots on the same day with a within and between-row spacing of 4 ft and 5 ft, respectively. Organic fertilizer was applied (side-dressed) according to crop nutrient requirement throughout the season.
Data Collection – Individual weed counts (species & number) were taken at 2, 4, 6 and 9 weeks after planting (WAP) from eight randomly (two within- and between-row for both cash crops) placed 100 sq-inch quadrats within each plot. Yield data was recorded from plants within the two internal rows of each cash crop.

Results & Discussion

The data from the 2023 growing season is still undergoing statistical analysis, so it won't be presented in this report. However, preliminary results indicate that Biosol plots had a low within-row weed density, particularly during early-season sampling times, compared to other treatments. This aligns with 2022 trial results, where biosolarization effectively inactivated broadleaf weed seeds but had minimal control over nutsedge due to its vegetative reproduction and high field pressure. Transitioning to a field

with lower nutsedge pressure in 2023 resulted in reduced nutsedge infestations. However, biosolarization's ineffectiveness against vegetatively propagated weeds was evident in 2022 data. Grass weeds like foxtails, crabgrass, and goosegrass were initially controlled by biosolarization but showed decreased efficacy by the final rating, a trend consistent with preliminary findings from 2023. LM-NT plots demonstrated good within-row weed suppression due to cereal rye mulch, suggesting it as a superior weed management tactic compared to strip tillage used in LM plots. Additionally, the presence of a red clover living mulch between cash crop rows in Biosol, LM, and LM-NT plots showed promising weed suppression abilities resulting in low weed numbers. Preliminary findings, along with 2022 data, suggest biosolarization as a viable weed management option within crop rows and an effective IWM technique in organic vegetable production. Future work will include performing an additional trial year. Subsequently, we will explore different pomace sources, soil amendment rates, and optimize the timing and duration of the biosolarization process.

Figure 1. Left, Wet grape pomace undergoing drying, and Right, grape pomace after drying prior to application.

Figure 2. A) Grape pomace before incorporation in Biosol treatment, and B) Biosol treatment with transparent tarp and drip line as it undergoes passive solar heating.

Precision Agriculture ~ Dr. Hemendra Kumar

Dr. Hemendra Kumar is Precision Agriculture Specialist at the University of Maryland Extension in the College of Agriculture and Natural Resources of University of Maryland College Park. Hemendra is establishing a Precision Agricultural Lab (PAL) at CMREC-Upper Marlboro Facility of at the University of Maryland. Before joining the University of Maryland, Hemendra was a postdoctoral scholar with The Ohio State University and USDA ARS Application Technology Research Unit (ATRU). Hemendra holds an undergraduate degree in Agricultural Engineering. After undergraduate degree, Hemendra competed his first MS degree in Hydrology from Indian Institute of Technology Roorkee (IIT Roorkee) focusing water management using data and data-driven statistical approaches. Hemendra worked as a researcher in Germany on various projects and continue working on projects with collaboration. Hemendra holds a PhD majoring in Biosystems Engineering and minoring in Statistics. During his PhD, Hemendra developed advanced irrigation management methods for optimizing irrigation timing and thresholds using the data collected from farmers' fields and helped them with determining the right time and right rate of irrigation. Hemendra developed the method on optimizing variable rate irrigation scheduling based on management zones in the fields delineated using crop yield, soil, and field elevations. Hemendra also worked on developing the criterion for water withdrawal for irrigation in the agricultural watershed in Alabama. Hemendra has been working with different agricultural technologies, including control drainage structures, drones, irrigation, soil moisture sensors, remote-sensing, modeling, and drone image processing. Hemendra is an FAA certified drone pilot.

Research and Extension interests of Precision Agriculture Lab (PAL)
Precision Water Management and Smart Agricultural Technologies
Precision Agriculture, Climate-Smart Irrigation Management, Soil Physics, Soil Moisture, Optimization, Agricultural Water Management, Digital Agriculture, Hydrology, Water Quality, Surface and Subsurface Hydrologic Modeling, Statistics, Groundwater.

Tools and instruments
Soil moisture sensors
LAI Ceptometer LP-80

Current projects
Develop the database of soil hydraulic properties for precision irrigation management in Maryland.
Quantifying actual nutrient load reduction in drainage structures. Harry R. Hughes Center for Agro-Ecology. (2024-2026)
Precision Horticulture using Unpiloted Aerial Vehicles as part of an Integrated Plant Management Approach for Ornamental Nurseries. NIFA. (2024-2025)
Drought risk reduction through automated drainage water management. Nationwide AgTech. (2023-2024)

Students

Undergraduate
Ananth Sriram
Shreeya Venkatesh Babu

Graduate
Shivam Sehgal
Abubakar Siddiq Palli

Farmer/Industry partnerships
PAL is motivated to support and help farmers throughout the State of Maryland with diverse agricultural problems. If you are a farmer or industry representative and want to participate in the on-farm research or want to test equipment, please feel free to contact Dr. Hemendra Kumar.

Opportunities for students
PAL is always looking for motivated students to work on innovative research projects related to precision agriculture aspects. Please contact Dr. Hemendra Kumar for more information.

Contact
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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

Wednesday Water Webinars

Drinking Wells, Water Quality and Septic Systems

University of Maryland Extension hosts monthly ***Wednesday Water Webinars*** on various water quality related topics. Join Andy as he dives into water topics that affect us all. These webinars take place via Zoom from 12 - 12:40 PM, allowing time for Q & A at the end. Click on a title below to see the recording of that webinar, or check out our website for past recordings and more!

1/18/23 - Smart Use of Deicing Salts - Salt is an effective deicing tool to keep our roads, driveways and sidewalks safer during winter. However, salt is negatively affecting our streams, rivers and groundwater quality. How can homeowners responsibly use salt to deice steps and sidewalks? Several easy stewardship practices will be discussed.

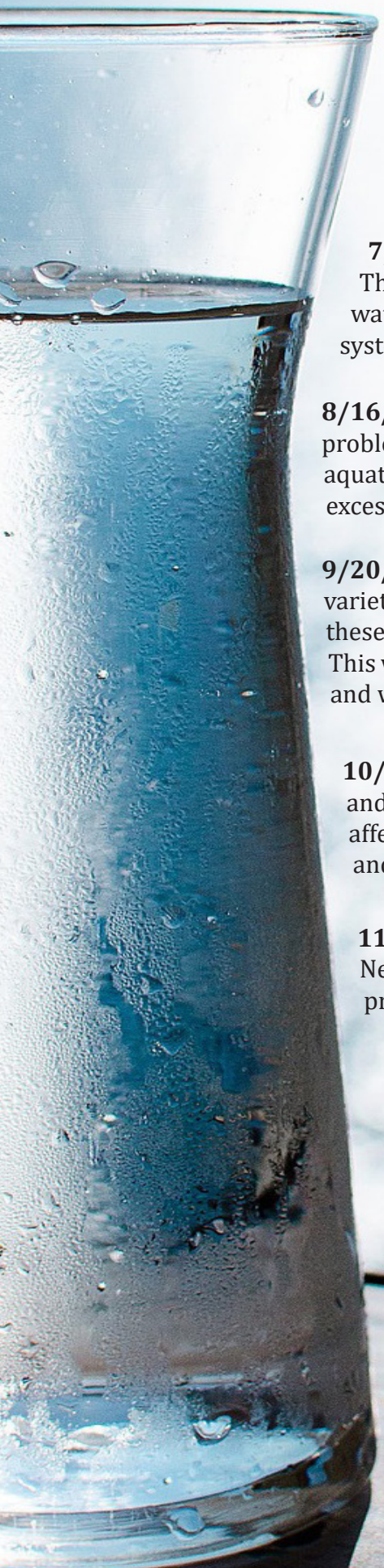
2/15/23 - Upgrading Your Septic System to Best Available Technology - Have an older septic tank, or one that is leaking and needs replacement? Learn more about the Maryland Bay Restoration Fund grant program to help replace septic tanks with advanced treatment units or best available technology (BAT). The increased treatment and nitrogen reduction and operation of these systems, as well as the grant program and application process, will be discussed in this webinar.

3/15/23 - Basic Tips for Managing Ponds - Ponds are a dynamic ecosystem involving numerous biological and chemical processes working together to maintain the variety of living organisms in a healthy condition. Sometimes things can get out of balance however, requiring some management interventions. Fish kills or excessive aquatic plant growth are examples. This webinar will discuss common problems that can occur in ponds and what practices there are to resolve and reduce the risk of these issues.

4/19/23 - Ensuring Safe Water by Well Testing - We are what we drink – so ensuring that our well water is safe and of good quality makes good health sense. Since private wells are not regulated as public water sources are, it is up to the well owner to test the water, and treat if necessary. This webinar covers the basics of the how, what, and when to have well water quality tested.

5/17/23 - Financial Assistance Programs for Private Wells and Septic Systems - There are a variety of financial assistance programs including grant and low interest loans available to qualifying homeowners for repairs to their private well or septic system. This webinar will discuss those programs.

UNIVERSITY OF MARYLAND EXTENSION



6/21/23 - What We Need to Know About PFAS – the Forever Chemicals - PFAS compounds are found in many of the products we use daily and are getting into our water and drinking water. These compounds are increasingly being shown to cause various health impacts. They have been called the 'forever chemicals' due to their persistence in the environment. We will discuss what these contaminants are, the health risks, and what we can do as consumers to reduce exposure.

7/19/23 - Drinking Water Treatment - Do we need to filter our drinking water? This webinar will discuss the potential for contaminants in public and private water supplies. Whether treatment is warranted, and if so, what type of treatments systems there are to reduce exposure to contaminants.

8/16/23 - Pond Management Basics – The most common complaint about ponds is problem aquatic plants. This webinar will discuss the reasons for too many unwanted aquatic plants, how to solve these and what management steps can be used to control excessive plant populations in ponds.

9/20/23 - Upgrading to an Advanced Treatment Septic System - With the wide variety of personal care and other home products we use on a daily basis, many of these can enter our water supplies and potentially contaminate our drinking water. This webinar will review the different types of contaminants, associated health risks, and what we can do to reduce those risks including treatment options.

10/18/23 - Winter Care for your Well and Septic System – Cold temperatures and high rainfall can cause freezing issues with well water supplies and also may affect septic system performance. Learn about some basic tips to keep your well and septic system protected from winter impacts.

11/15/23 -What New Homeowners Need to Know About a Septic System – New homeowner and never been on a septic system? We will discuss some basic principles of a system and how to care for it to help keep it working effectively.

12/20/2023 - Answering Your Questions on Drinking Water Quality – Got any questions on drinking water quality? This webinar will provide answers to your questions that you submit during registration, and will also address other common questions that people ask.

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On the Move While Harvesting Butternut Squash at the Upper Marlboro Terp Farm

Lindsay Barranco, Experiential Learning Coordinator, University of Maryland Institute of Applied Agriculture

On a sunny, beautiful day in late September 2023, students from INAG123 People, Planet & Profit: Digging into Sustainable Agriculture, took a field trip to the Terp Farm and Central Maryland Research and Education Center's Upper Marlboro Facility. This course is popular with many students from numerous undergraduate programs, but also includes Institute of Applied Agriculture (IAA) students who are enrolled in the 2-year certificate program in Applied Agriculture. Students began the tour by hearing from facility manager, Donny Murphy, about some of the agricultural implements they use at the Upper Marlboro Facility for cultivating the fields and harvesting crops.

After Donny's talk, Guy Kilpatric, manager of the Terp Farm project at the Upper Marlboro Facility, took the group on a tour of the hoop house storage area for harvested vegetables, which contained multiple bins of acorn, butternut and spaghetti squash, all of which goes to the UMD College Park Dining Facilities (and we learned that butternut squash can be stored for a full year!). Students then walked out to the radish fields, where they could pull up a watermelon radish – which when cut in two, revealed a brilliant interior of pink and green. The last part of the visit involved harvesting butternut squash using a conveyor belt that led to the wagon. As Guy drove the tractor slowly forward, he pulled the attached wagon and conveyor belt along as students picked butternut squash, and then placed it on the conveyor belt for other students to retrieve and stack onto the wagon (see video). A group of 24 students harvested hundreds of butternut squash in 15-20 minutes, which would have taken one person hours to accomplish.

Thank you to Upper Marlboro Facility Manager Donny Murphy and Terp Farm Manager Guy Kilpatric for the time they spent teaching students about harvesting, equipment and crop production.

Students learn about tractors and other farm implements from Donny Murphy
(Photo by Meredith Epstein)

The brilliant pink interior of a watermelon radish
(Photo by Lindsay Barranco)

Harvesting watermelon radish (Photo by Lindsay Barranco)

Service Day for Environment, Technology, and Economy (ETE) Program of College Park Scholars

Tim Knight , Director - Environment, Technology, and Economy, College Park Scholars

On August 25, 2023, the students of the Environment, Technology, and Economy (ETE) program of College Park Scholars returned to CMREC as we do each year. Sponsored by the College of Agriculture and Natural Resources, ETE teaches incoming students about sustainability and food systems as they transition to the University of Maryland. We believe in the value of bonding in adversity, so our students spend their first full day on campus working together. For some, it is their first exposure to agriculture. Many friendships formed on Service Day last throughout their college careers and beyond.

As usual, ETE students visited two sites, the Central Maryland Research and Education Center (CMREC) in Upper Marlboro, which is the site of the Terp Farm, and Clagett Farm, owned and operated by the Chesapeake Bay Foundation. At Clagett, we weeded the strawberry fields, allowing Clagett Farm to grow strawberries without herbicides. At CMREC, we cleared out a greenhouse, so it can be used for a new project, refurbished another greenhouse and cleaned up a high tunnel, allowing the Terp Farm to use them to grow more food for Dining Services or to be donated. We harvested lots of winter squash and tomatoes, mostly to be served in dining halls or donations. We also labeled 1008 jars for an educational activity at the Maryland State Fair and washed 300 produce crates for the Terp Farm to use in future harvests. In our colloquium this year, students are also writing a grant proposal to fund the installation of a pollinator garden, in collaboration with the Terp Farm. We hope to have an update for you next year!

Early Establishment of Industrial Hemp (*Cannabis sativa L.*) Increases Yields in the Mid-Atlantic

Erin Myers, Master's Student, and Nicole Fiorellino, Assistant Professor & Extension Specialist
Department of Plant Science and Landscape Architecture, University of Maryland, College Park

Introduction

Planting dates are well established for crops such as corn and soybean to maximize yield and quality, but production guidance is lacking for industrial fiber hemp (Cannabis sativa L.), especially in the Mid-Atlantic region. With fiber hemp production increasing since the passing of the 2014 and 2018 US Farm Bills, we need to understand how it can fit into current crop rotations, by determining appropriate planting and harvest dates to support yields. We performed the present study to develop production recommendations for hemp produced for fiber in Maryland.

Methods

The two-year study was performed at two University of Maryland Research and Education Center, Wye Research and Education Center (WREC) in 2022 and 2023 and at Upper Marlboro (CMREC) in 2023. We utilized a split plot, randomized complete block design with planting date as main plots and either variety or harvest date as split plots (Figure 1).

Figure 1. Drone image of the study location at WREC in 2023. Image taken the first week of July, PD 6 had not been planted yet. Photo courtesy of Dr. Kurt Vollmer.

In 2022 at WREC, we established plots at five planting dates, using two hemp varieties (Bialobrezkie and Yuma), and one harvest timing, at the onset of flowering (Table 1). Seed was planted via grain drill into prepared seed beds, every three weeks, starting in April and ending in July, with a target seeding rate of 35 lbs of live seed per acre. Modifications were made to the study design in 2023 based on lessons learned in 2022, namely, the poor performance of Bialobrzskie led to its removal the following year. In 2023 at both WREC and CMREC, we established plots at six planting dates, using only the Yuma variety, and two harvest timings: Harvest 1 occurred 90 days after each respective planting date, with Harvest 2 representing a full season harvest, as all planting dates were harvested at the same time, at the onset of flowering (Table 1).

At the time of each harvest in both years, average plant height and stalk diameter were measured from 10 plants from each plot, followed by fresh weight of the entire harvested plot. Due to establishment errors in 2023, namely poor germination of carryover seed and excessive seeding rate with new seed, some planting dates were removed from statistical analysis (Table 1).

Planting Date (PD)	Wye 2022		Wye 2023		UM 2023	
	Planting	Harvest	Planting	Harvest 1	Planting	Harvest 1
1	–	–	–	–	03 April ‡	02 July ‡
2	26 April	20 Sept	24 April ‡	23 July ‡	24 April ‡	23 July ‡
3	17 May		15 May	13 August	15 May ‡	13 August ‡
4	07 June		01 June	30 August	01 June	30 August
5	28 June		22 June	20 Sept	22 June	20 Sept
6	20 July		10 July	_	_	_

Table 1. Planting dates for Wye 2022 and 2023 and UM 2023. In 2023, Harvest 2 was 25 September for all plots at both locations. †90 d growing season for PD 6 at Wye in 2023 coincided with harvest during Harvest 2, therefore no Harvest 1 data was collected; ‡ Data collected from these treatments were removed from statistical analysis due to use of carryover seed with poor germination or incorrect seeding rate.

Results

Harvest 1 results represent a "short season" fiber hemp crop, while Harvest 2 represents a "full season" fiber hemp crop, with results presented separately herein for the two harvests.

Fresh Yield

For Harvest 1, where all plots were harvested after a 90 d growing season, fresh yield was significantly impacted by the interaction between plant date and site-year ($p = 0.0293$). Short season hemp performed best at CMREC, with earlier plantings there yielding the best, with early plantings at WREC following with good yields. These data suggest that photoperiod plays an important role in fiber hemp yields (Table 2). Given the removed data from the earlier plantings, more research is needed to support the recommendations of a shortened growing season.

	WREC 2023	CMREC 2023
Planting Date	**Yield (lb/ac)**	
3	23,768 ± 1,469 b	_
4	6,830 ± 514 c	33,257 ± 3,115 a
5	11,188 ± 1,434 c	28,806 ± 1,289 ab

Table 2. Mean fresh hemp yield and standard error for each planting date by location for Harvest 1

For Harvest 2, where all plots were harvested near the onset of flowering regardless of planting date, planting date ($p < 0.0001$) and site year had significant impacts ($p < 0.0001$) on fresh yield. CMREC in 2023 and WREC 2022 yielded similarly, with significantly decreased yields at WREC in 2023. Data supported that earlier planting dates had increased yields for the Harvest 2 data (Figure 2). Significant decreases were seen after the early June planting date, supporting a viable full season planting range of late April to early June, allowing for flexibility when planting this crop.

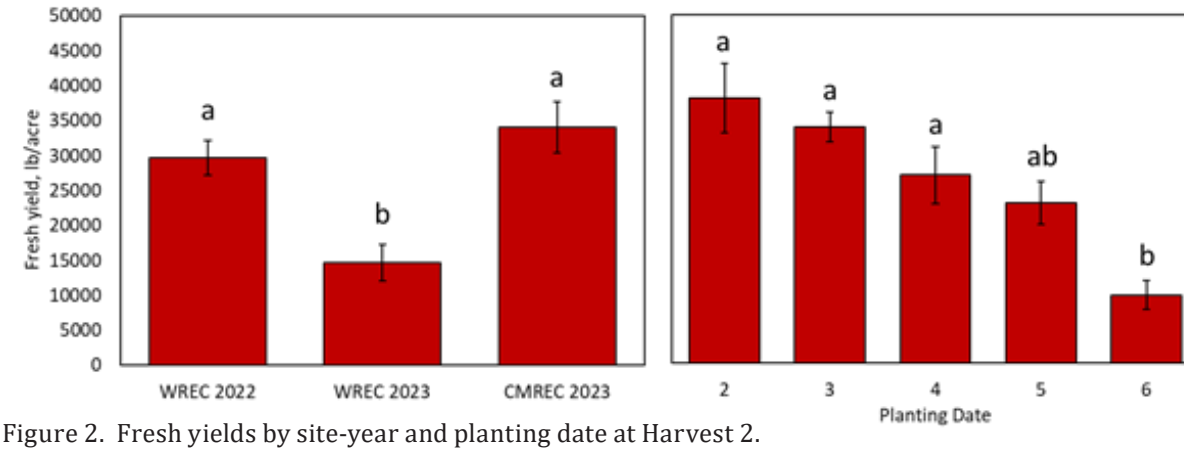

Figure 2. Fresh yields by site-year and planting date at Harvest 2.

Height and Diameter

Neither planting date or site-year significantly impacted plant height or stalk diameter at Harvest 1 (90 d growing season), indicating the shorter growing season is not long enough to maximize height or diameter. At Harvest 2, site-year and planting date significantly impacted plant height ($p < 0.0001$ and $p = 0.0005$, respectively). Similar to yield, the shortest plant height was observed at WREC in 2023 and plant height decreased across planting dates but remained relatively constant after the mid-season planting (Figure 3).

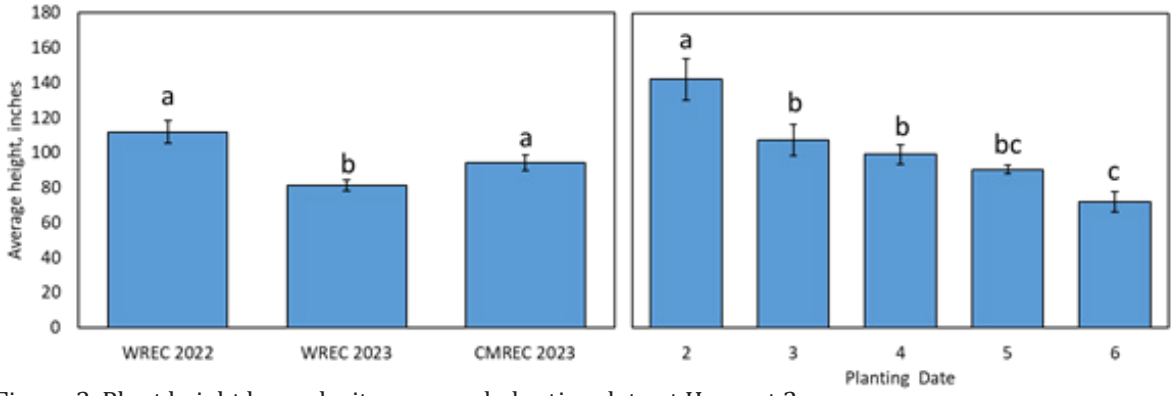

Figure 3. Plant height by each site-year and planting date at Harvest 2.

At Harvest 2, planting date only significantly impacted stalk diameter ($p = 0.0020$), with stalk diameter decreasing across planting dates, but leveled off in the later dates (Figure 4). Different end-product industries using fiber hemp will have material specifications that are optimal, which means the impact of planting date on both height and stalk diameter in the present study is not positive or negative. But the effect of planting date on these two plant characteristics indicates management, such as planting date, can be manipulated by farmers to generate hemp that meets industry specifications once they are defined for a specific industry.

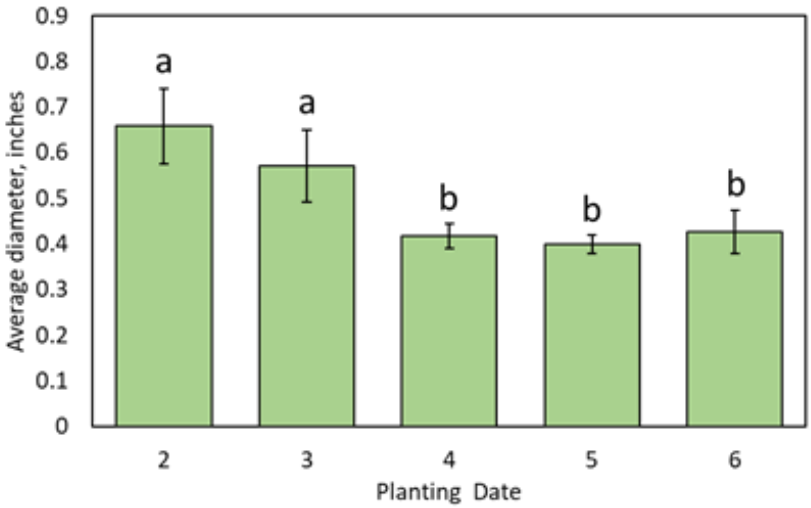

Figure 4. Stalk diameter by planting date at Harvest 2.

Conclusions

Results from this study support that early planting dates increase fresh yield, plant height, and stalk diameter of industrial hemp produced for fiber in Maryland. Fiber hemp should be planted between mid-April and mid-June, recognizing that the photoperiod sensitivity of the crop induces flowering around mid-September. Additionally, it is important to recognize that hemp is not an irrigated crop and drought conditions may negatively impact germination and, ultimately, yield. To incorporate fiber hemp into our current corn, soybean, and small grains rotations in Maryland, it is recommended that fiber hemp be managed as a full season crop to maximize yield and plant characteristics. Future research should focus on an intermediate harvest timing, that results in a growing season longer than 90 days with a harvest prior to hemp transition to reproductive growth; this would likely result in hemp harvest prior to corn or soybean harvest. This study and future research investigating an intermediate harvest timing will provide better guidance to farmers interested in growing fiber hemp as part of their current crop rotation.

Cultivating Sustainability: Terp Farm and the MAES Strategic Vision

Guy Kilpatric, Terp Farm Manager

As the manager of Terp Farm, I've witnessed the powerful alignment between our mission and the vision of the Maryland Agricultural Experiment Station (MAES). At Terp Farm, we're not just growing food; we're also focused on cultivating sustainable communities and ecosystems, in line with MAES's vision of a healthier, more resilient world.

Our commitment to growing food locally with sustainable methods directly supports MAES's mission to advance sustainable and profitable agriculture. By meeting a significant portion of campus vegetable needs and donating a portion of our produce to food-insecure members of our community, we're enhancing food security and promoting sustainable practices both locally and beyond.

At Terp Farm, we're not only growing vegetables; we're also cultivating environmental benefits. By increasing the availability of campus-grown produce in the dining halls, we're reducing our carbon footprint and promoting soil health. The sustainable farming methods we utilize also lead to enhanced species diversity, increased nutrient levels, and reduced erosion rates, contributing to healthier ecosystems in line with MAES's vision.

One of the most rewarding aspects of my role at Terp Farm is seeing the impact on student experiences. Through this program, students have the opportunity to work on the farm for classes, internships, or independent studies, gaining invaluable learning and work experiences. Additionally, our engagement with students through volunteerism, campus partnerships, and educational initiatives enhances their understanding of our campus food system and environment, empowering them to be agents of change in their communities. As we reflect on our accomplishments—173,000 pounds of vegetables produced, hundreds of engaged visitors each season, and over 35 student worker alums—we're also looking ahead to the future. We're committed to continuous growth, innovation, and impact. Moving forward, we aim to expand our reach, deepen our impact, and explore new ways to promote sustainability and community resilience.

As we continue on this journey toward a more sustainable future, we invite you to join us. Whether you're a student looking for hands-on learning opportunities, a faculty member interested in research collaboration, or a community member passionate about sustainability, there's a place for you here at Terp Farm. Together, we can cultivate change and create a healthier, more resilient world for generations to come.

To reach out - email terpfarm@umd.edu or visit https://dining.umd.edu/terp-farm

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