From cantaloupe to tomatoes, honey bees to cicadas, Roots in Research Yield of 2021 has it all. In this years istallment you will get an indepth look at the work being done by our distinguished faculty and talented students. These established and young minds , alike, are working diligently to solve some of our greatest challenges. Issues such as hunger, alternative pest control, and water quality are met head on within these pages.

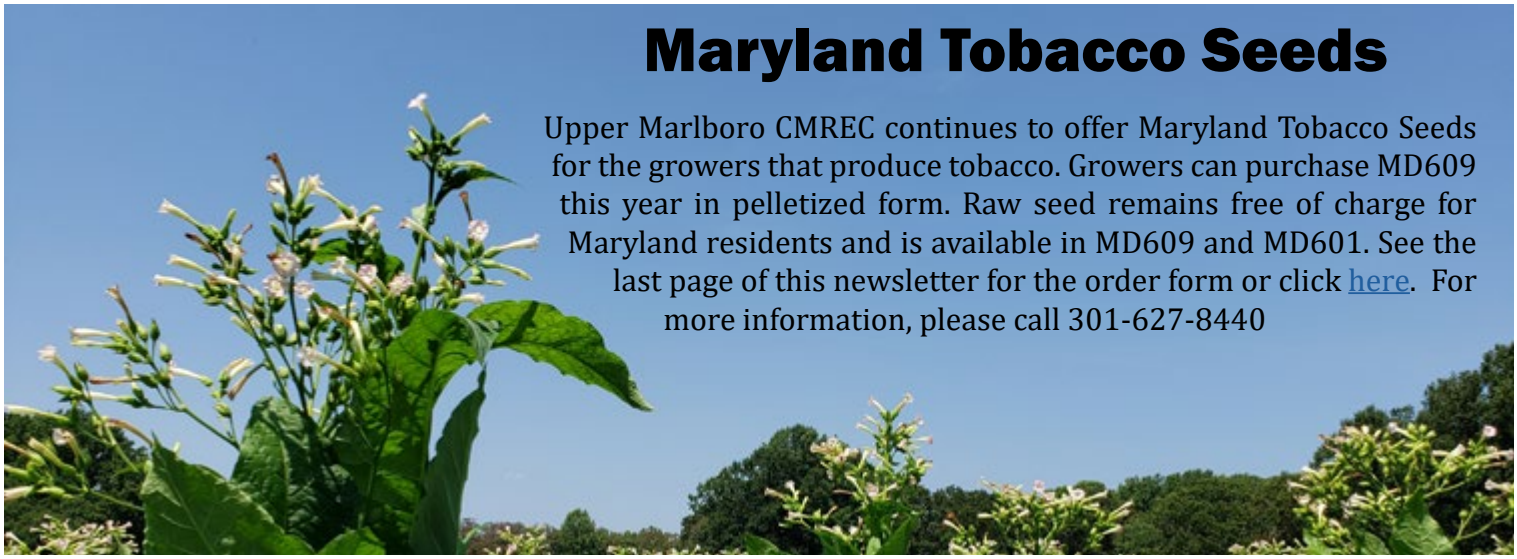
2021 witnessed the triumphant return of the Brood X cicada. Not only is this pest an audible nuisance, but we also learned it can be quite a destructive nuisance to small fruit species as well. Thankfully this is an easily predicted pest that we only have to deal with every 17 years.

The most important return afforded us in 2021 was the return to hosting in-person events. It was a pleasure to once again host an in-person Twilight Tour in the beginning of August and later that month to host the ETE scholars. We hope you enjoy reading about these events and all of the great work taking place at CMREC - Upper Marlboro.

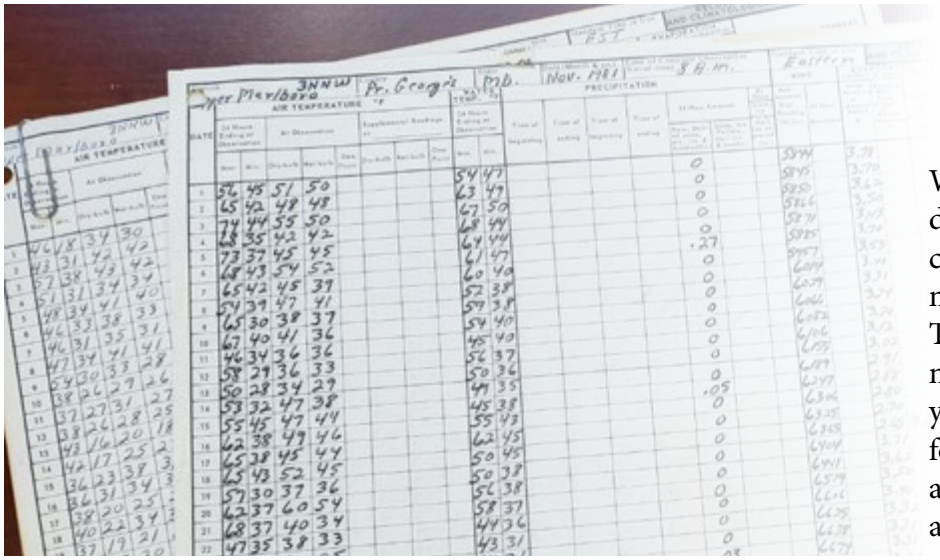
Donald Murphy, Facility Manager
dmurphy@umd.edu

In This Issue:

Maryland Tobacco Seeds



Upper Marlboro CMREC continues to offer Maryland Tobacco Seeds for the growers that produce tobacco. Growers can purchase MD609 this year in pelletized form. Raw seed remains free of charge for Maryland residents and is available in MD609 and MD601. See the last page of this newsletter for the order form or click here. For more information, please call 301-627-8440



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.

Garlic Seed Production

Guy Kilpatric - Terp Farm Manager

In November of 2019 as the growing season was drawing to a close, students from the Terps4Change volunteering club assisted the Terp Farm Manager Guy Kilpatric in planting the farm's first ever garlic crop. A few days beforehand, the 'seed' [variety: Music] had been delivered to the farm as whole heads which necessitates being 'popped' into individual cloves in preparation for planting. As those students sat in a circle separating cloves and inspecting for damage or disease, they imagined the many ways they could enjoy cooking with the garlic and marveled at the prospect that each individual clove would become another whole head by harvest time the next year. On planting day the sun was still warm in contrast to the cool soil as each clove was carefully tucked in. It would

Individual garlic cloves being planted. [Photo by: Guy Kilpatric]

be another eight or more months before they'd see light again, and by then it would be the roasting hot sun of July. But only following a brief curing period in the barn it would be off to the real oven for the garlic to be cooked and prepared for meals in the dining halls on campus.

2021 Garlic crop hanging to cure in the barn.
[Photo by: Guy Kilpatric]

Of course a lot changed about our world in the intervening months and by the summertime in 2020 it wasn't clear that the dining halls would even be open for business as it appeared that campus would be going virtual for the fall semester. By mid-summer crop production had been put on pause and plans for scuttling fall production were being considered. Yet here this garlic crop was still in the ground, having been planted more than half a year prior, so it was harvested nonetheless. An initial one hundred pounds of seed (which cost nearly $2000) came to yield roughly two hundred pounds of harvested garlic and the bulk of the harvest was distributed at the UMD Campus Pantry. However, an interesting idea was then put forward that due to the budget tightening that had been a result of the pandemic, the following year's garlic crop should be planted using saved seed instead of buying new seed.

So when November came back around in 2020 the biggest and cleanest cloves were chosen to plant - though it was a significantly smaller population at only about one-quarter the number of plants as the previous year. Then an interesting thing happened, in early 2021 as the plants began to awaken from winter dormancy, it was evident that this crop was going to be different. The plants showed improved vigor right from the beginning. When harvest time came in mid-July the heads were larger and more uniformly sized than the previous crop, with less instances of disease to blemish the paper or shorten storage life. It was really remarkable to see the difference in quality, but also to consider the increased profit potential just simply from the cost-savings of not buying the seed. For the students who had a chance to be involved in the process it was also a great teaching and learning experience.

Garlic growing in an uncovered high tunnel, showing good uniformity and plant vigor.
[Photo by: Guy Kilpatric]

Plans are again in place to save seed from the crop of 2021 to plant for 2022, as well as increasing the plot size two-fold with further intentions of doubling that again the following year in a return to the originally intended planting scale. As a bonus measure, extra garlic seed for planting was shared with the UMD Community Learning Garden on the College Park campus, and with the Kate Chandler Campus Community Farm at St. Mary's College of Maryland.

Website: *terpfarm.umd.edu* ***Email:*** *terpfarm@umd.edu*
Instagram: @terp.farm

Environment, Technology and Economy's (ETE) Scholars' Annual Service Day

On Friday, Aug. 27, 2021, as part of College Park Scholars' annual Service Day, 885 first-year Scholars deployed to 20 sites on the University of Maryland campus, Prince George's and Montgomery Counties, Baltimore City, and Washington, DC, to perform service on their first day as college students. Service Day is an annual College Park Scholars tradition where new students build community within their programs while bettering the community around the University of Maryland. It's an ideal way for students to begin living out Scholars' values of community (and service) and hands-on learning from the start of their University of Maryland career. College Park Scholars, a two-year living–learning program for academically talented college students, started with four programs in 1994 and consists of twelve programs today. Nine of the twelve academic colleges at the university sponsor at least one program. The program has been so successful that it has been widely emulated on campus and across the nation.

When Scholars expanded to seven programs in 1995, the college of Agriculture and Natural Resources began sponsoring the Environment, Technology and Economy (ETE) Scholars program (then called Environmental Studies). ETE teaches students about sustainability, in the process squarely centering the University of Maryland's origins as an agricultural college. The curriculum complements AGNR's mission, and opportunities such as Service Day allow ETE to emphasize the many aspects of AGNR.

Naturally, ETE continued its long-standing tradition of service at CMREC-UM this year. After being welcomed by Dean Beyrouty and Sherry Corbin, students helped harvest 2,000 pounds of tomatoes, peppers, eggplant, and okra in temperatures that reached 107 degrees Fahrenheit on the "real feel" index. (The produce was subsequently donated to a church in Upper Marlboro.) Students also washed and sanitized the harvest tubs and helped sharpen, sand, and oil the hand tools for the Terp Farm and labeled more than 400 jars for education activities at the State Fair. Thanks to the generosity of Ben Beale and Dave Myers, everyone was able to enjoy freshly churned ice cream.

Cerruti Hooks, a researcher in the Department of Entomology whose plots ETE Scholars students helped harvest, delivered the vegetables to the food pantries himself. "I felt like Santa Claus; the Reverend and volunteers for the church pantry really lit up when they saw the truck full of produce," he says. "I certainly would not have been able to pull it off without the Scholars students who had helped harvest."

College Park Scholars gives students the support and relationships more easily found at a small college and the opportunities, resources and academic challenge of a cutting-edge research university, and Service Day each year sets the tone for the experience ETE and other Scholars students will have during their first two years of college. As much as possible, they will learn through hands-on experiences, engaging with their community on and off campus. They will learn the value of civic engagement and service and they will apply those lessons to their lives as they complete their degrees and move into our nation's workforce. This year's Service Day offered a good start for the new cohort: Scholars students, including those in ETE, ultimately provided 3,668 combined hours' worth of volunteer work on Service

Authors:
Tim Knight, ETE Director
Mayu Mishina, Assistant director, Scholars Central
Kyle Russo, Communications Intern

2021 Crops Twilight Tour

Our annual tour, held on August 4th, was a success! Before we boarded the wagons, we all enjoyed a delicious meal provided by AGR Fraternity and homemade ice cream, compliments of our Ag Agents, Dave Myers, Ben Beale and Alan Leslie. There was also time built in for a self-guided Terp Farm walking tour with Guy Kilpatric and his team available to answer any questions.

The tour included learning about some of the research projects going on at the facility. A full list of the highlighted projects is on the right.

· Using living and dead cover crops to suppress weeds in sweet corn
· Mixed vegetables interplanted with perennial clover
· Effects of intercropping broccoli with edamame on pests and their natural enemies
· Using biosolarization, cover cropping, andstrip-tillage to suppress soil-borne pests and improve weed control
· Using spring-seeded grass covecrops to reduce herbicide inputs in plasticulture peppers
· Forage crabgrass variety trial
· Developing a perennial living mulch system for pest control in cantaloupe
· Using marigold as an insectary plant to enhance natural enemies of stink bugs and other insect pests
· Basil downy mildew trial
· Blackberry, raspberry and blueberry trial updates
· Heirloom tomato hybrids

Evaluation of New Artisan Type Tomato Cultivars in Southern Maryland

Ben Beale, Extension Educator, St. Mary's County
Alan Leslie, Extension Educator, Charles County
Mariah Dean, Agent Associate, Home Horticulture, St. Mary's County

There is growing consumer demand for heirloom or specialty tomato cultivars that exhibit unique test, texture or appearance attributes. These "boutique" or "artisan" cultivars demand premium prices at farm markets and direct to consumer outlets. Some cultivars currently being grown include Cherokee Purple, Mr. Stripey, and Mortgage Lifter. While these varieties have great taste and visual appeal, they often lack some of the key attributes of newer hybrid varieties including disease resistance, yield, and vigor. In response to the buy local movement, seed companies have been developing hybrid cultivars with soft flesh, thin skins, and heirloom appearance, but with better disease and yield potential. In 2021, we undertook two cultivar trials evaluating some of these new varieties. The trials include five new hybrids plus Big Beef hybrid as a standard comparison. One trial was in a high tunnel at the St. Mary's Extension office and the other was an outside field trial at the Central Maryland Research and Education Center-Upper Marlboro Facility. Below is a description of the cultivars.

Cultivar	**Source Seed**	**Description from seed company**	**Disease resistance ratings from seed company description**
Medusa	Harris Seed	A hybrid indeterminate purple tomato with heirloom flavor and appearance. Vigorous plants with a strong disease package set large uniform fruit with reduced cracking. Performs in open field and protected culture.	Intermediate resistance to Late Blight, Verticillium Wilt, and Nematodes.
Marnero	Johnny's	Marnero keeps the best attributes of the black tomatoes and improves upon the disease resistance and yield. Flesh is very soft and has excellent flavor and texture. Fruits avg. 7-10 oz. A dead ringer for Cherokee Purple. Indeterminate. Marnero requires a minimum of 13 hours of daylight per day, starting at emergence.	High resistance to Fusarium (race 1), Fusarium crown and root rot, tomato mosaic virus, and Verticillium wilt.
Marbonne	Johnny's	Marbonne is a hybrid version of the long popular French heirloom Marmande, but with improved disease resistance and vigor. Beautiful, deep red, ribbed tomatoes are borne on healthy plants. Flavor is among the best with smooth, soft texture. High yields of 7-9 oz. fruit. Makes a nice mix with Marnero and Margold. Marbonne requires a minimum of 13 hours of daylight, starting at emergence.	High resistance to Fusarium wilt (race 1) and tomato mosaic virus. Indeterminate.
Marnouar	Johnny's	High-performance purple beefsteak. Firm, uniform, crack-resistant 10–16 oz. fruit combine a beautiful heirloom look with good flavor and improved shelf life. Marnouar offers longevity, vigor, and broad disease resistance. Strongly vegetative early on. A significant improvement over Marnero in marketable yield, though less rich in flavor. Performs well in shorter daylength conditions.	High resistance to Fusarium wilt (race 1), Fusarium crown and root rot, leaf mold, tomato mosaic virus, Verticillium wilt; and intermediate resistance to nematodes and tomato yellow leaf curl virus.

Big Beef	Johnny's	Still unsurpassed as the top choice for fresh market beefsteak tomatoes. Large, avg. 10-12 oz., mostly blemish-free, globe-shaped red fruit. They have full flavor - among the best - and ripen early for their size. Broad disease resistance package. High resistance to Alternaria stem canker, Fusarium wilt races 1, 2, gray leaf spot, nematodes, tobacco mosaic virus, and Verticillium wilt. AAS winner.	High resistance to Alternaria stem canker, Fusarium wilt races 1, 2, gray leaf spot, nematodes, tobacco mosaic virus, and Verticillium wilt.
Bejo 3345 (Carole)	Gowan	Consistent through multiple harvests. Firm with great eating quality. Dual purpose that will hold for the shipper market and roadside stands. Crimson genes. Performs well in the open field with high stakes and in high tunnels/ greenhouses for extended harvest.	HR: Fusarium Wilt, Root Knot, Late Blight, Tomato Mosaic Virus, Verticillium Wilt.

At the both sites, transplants were set in the ground on June 3. Varieties were planted in four rows, each with three plants of each variety planted as replicates, and varieties randomly assigned within each block. Plants were grown on flat beds covered in white plastic mulch film, and trellised using the stake and weave system at Upper Marlboro. At the Saint Mary's high tunnel, plants were grown on raised beds covered in landscape fabric, and trellised using a single-leader system. Yield data were collected from five harvest periods from July 23 to August 20 at Upper Marlboro, and six harvest periods from August 18 to October 22. During each harvest, fruit were separated into three size classes (small/ medium, large/extra large, and jumbo), counted, and weighed. Numbers and mass of unmarketable fruit, or culls, were also recorded.

Overall, the new hybrid varieties did not perform as well as expected, either under protected culture or in the field setting. The two varieties that produced the highest yields were Big Beef and the Bejo 3345 (Carole). Big Beef is an older hybrid variety and Bejo 3345 is a new indeterminate variety meant for the conventional beefsteak tomato market; neither of which exactly fit the typical artisanal tomato market. In field production, the harvest period was concentrated and truncated by plants rapidly senescing due to bacterial leaf spot. None of the varieties on trial have any known resistance to this pathogen. Neither of the field sites had any history or evidence of having any pathogen pressure for which the newer artisanal hybrids have good resistance. Future trials will focus on protected culture, and will have an earlier planting date. These changes would provide better representation of the standard production practices that farmers would use in Maryland.

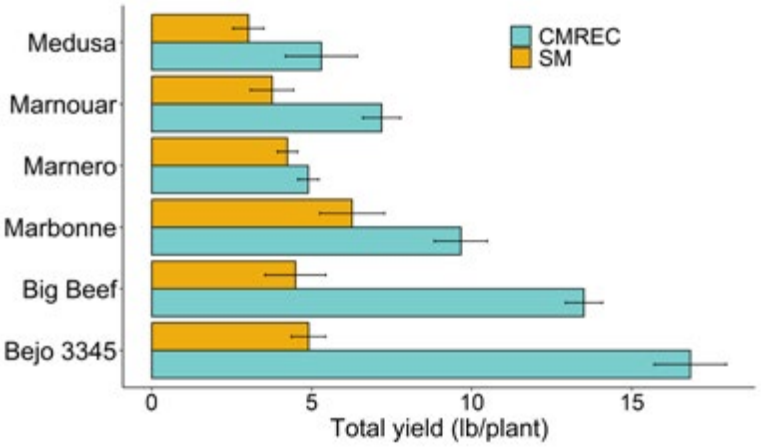


Figure 1. Total yield of different tomato varieties at the two research sites.

Figure 2. Tomato plant senescing from bacterial leaf spot in outdoor production.

Basil Downy Mildew Cultivar Study

Jerry Brust , IPM Vegetable Specialist
Karen Rane, Director, Plant Diagnostic Laboratory

Summary: This study examined five cultivars (Passion, Obsession, Devotion, Thunderstruck and Prospera) of basil that are reported to have resistance to basil downy mildew with a susceptible cultivar (Aroma). A field trial was planted in July and harvested throughout the summer and fall. Four of the five cultivars (Passion, Obsession, Devotion and Thunderstruck) became infected with downy mildew at the same time as did the susceptible cultivar (Aroma). In this study only Prospera did not develop downy mildew symptoms. The infected cultivars had significantly reduced marketable yields at first and then no marketable yields 4 weeks after infection. Prospera continued to have good marketable yields throughout the entire study period.

Introduction: Downy mildew of basil is a devastating disease that has plagued growers of the herb for years. It was first reported in the United States in 2007 and has since spread widely to wherever basil is grown. Basil downy mildew is caused by Peronospora belbahrii, a fungus-like microorganism in the group called water molds. This disease affects the leaves, branches, and stems of sweet basil with green-leafed varieties being particularly susceptible. Basil that has become infected with downy mildew has a yellowish appearance that is similar to a nutritional problem. Yellowing of leaves normally first appears on lower areas of the plant (fig. 1).

Fig. 1 *Basil plant infected with downy mildew.*

Gray sporulation develops on the underside of the yellow areas of leaves (fig. 2). As the disease advances, the leaves turn completely yellow and fall off, the stems wither, and the plant eventually dies. Trial: Seedlings of Obsession, Passion, Devotion, Thunderstruck (Rutgers breeding program), Aroma and Prospera were obtained from a commercial herb producer and transplanted at CMREC-UMF near Upper Marlboro, MD on 21 July.

The transplants were planted into two rows of white plastic with drip irrigation. There were 4 reps of each cultivar with 6 plants per rep. Plants were set 2 ft apart in a row and rows were on 6-ft centers. First harvest occurred on 4 August for all cultivars except Obsession. Harvest consisted of taking the top part of plant and cutting it 4-8 inches from the soil line. This cutting was inspected for leaf and stem quality and any blemished leaves or stems were removed and the rest of the harvested material was placed in a plastic bag marked and placed in a cooler. Bags were then taken to the lab where the harvested basil was

Fig. 2 *Dark 'fuzzy areas' (spores) on underside of basil leaf infected with downy mildew.*

examined again for quality and recorded as marketable weight per plant. Harvests occurred approximately every two weeks (4, 17, 31 August; 15, 28 September and 15 October). Marketable weights of the basil cultivars were subjected to an ANOVA and significant results ($p < 0.05$) were then analyzed using Tukey's HSD means separation test with significant differences of $p < 0.05$ being reported.

Results: Basil plants grew well and after two weeks after transplanting were ready for the first harvest except for Obsession, which grew more slowly. The first harvest (4 August) was small and will not be shown here. No symptoms of downy mildew were observed on any basil cultivar during the first harvest. Second harvest (17 August) was good with the cultivars Passion, Devotion and Aroma yielding well with Passion having significantly greater ($p<0.05$) marketable yields than Prospera and Obsession (fig. 3). Fusarium wilt of basil was found on a few plants of Thunderstruck at this time. No downy mildew was found on any cultivar on this harvest date. The third harvest (31 August) showed that all basil cultivars yielded very similarly with an average of ~100g/ plant (fig. 4). The Fusarium wilt on Thunderstruck did not spread and apparently was confined to the 3 plants that had been removed. No downy mildew was observed on this harvest date.

On the 4th harvest (15 September) downy mildew symptoms and signs were found on Passion, Obsession, Devotion, Thunderstruck and Aroma, but not on Prospera. Marketable yields were reduced significantly ($p<0.05$) by 55% for Passion, Obsession, Devotion and Thunderstruck compared with Prospera (fig. 5). The susceptible cultivar Aroma had its marketable yield reduced by 95% compared with Prospera and by 85% when compared with Passion, Obsession, Devotion and Thunderstruck. Prospera did not show any symptoms of basil downy mildew on this harvest date. By the 5th harvest (28 September) only Prospera had any marketable yields (fig. 6). Prospera showed no symptoms of basil downy mildew. The cultivar Aroma was defoliated on this harvest date (fig. 7) and while the other cultivars still retained much of their foliage, that foliage showed symptoms of basil downy mildew infection making them unmarketable (fig. 8).

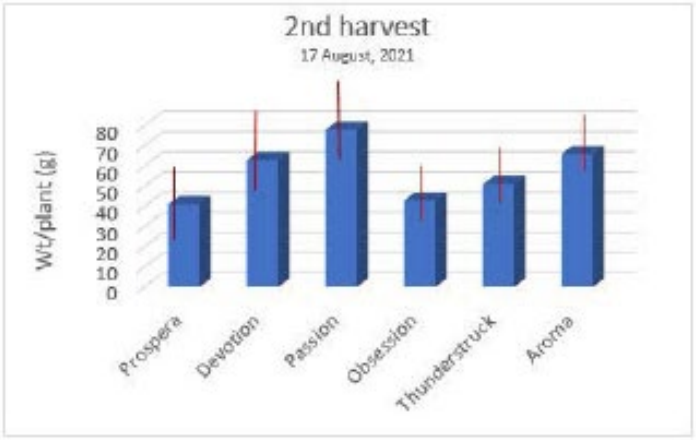


Fig. 3 *Second harvest of basil.*

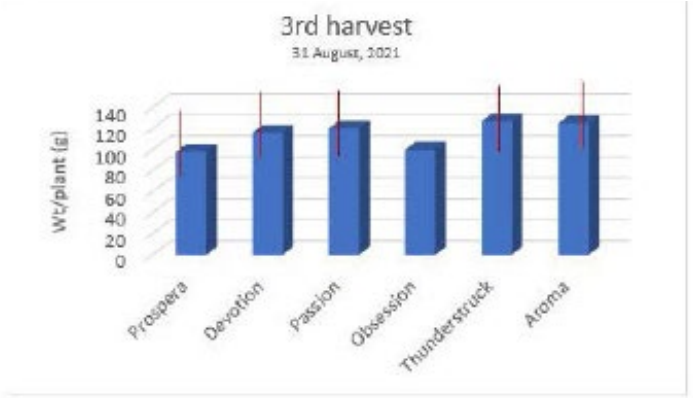
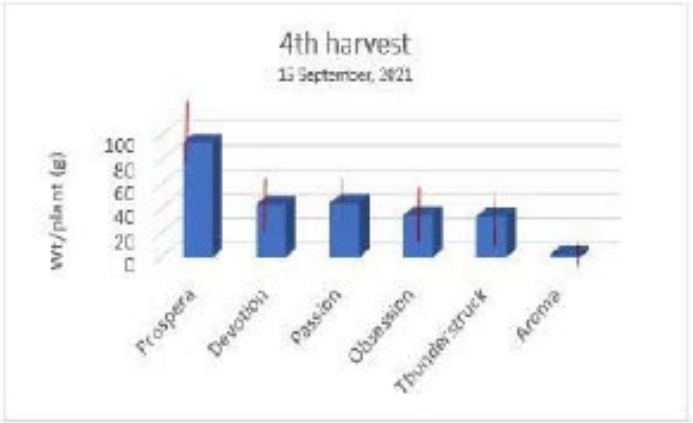


Fig. 4 *Third harvest of basil.*



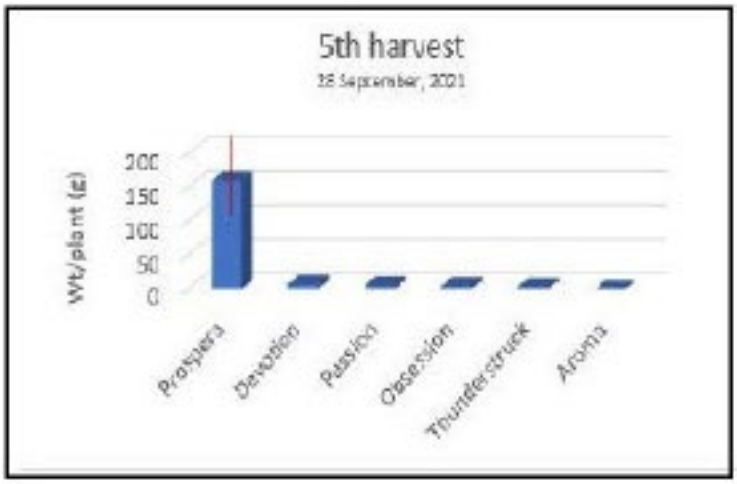


Fig.

Fig.8 Resistant cultivar of basil with downy mildew infected leaves making them unmarketable.

Discussion: All cultivars yielded well after the 1st harvest. It wasn't until downy mildew disease was found in most of the basil cultivars by the fourth harvest that -significant differences in yields between those cultivars were observed - The four basil cultivars that were bred for resistance to downy mildew (Passion, Obsession, Devotion and Thunderstruck) showed downy mildew symptoms and signs by mid-September as did Aroma, which does not have resistance. Prospera showed no signs or symptoms of downy mildew throughout the trial. Aroma became completely defoliated by the fourth harvest, while the four infected resistant cultivars were still producing marketable yields albeit significantly less than Prospera. By the 5th and 6th harvests four of the resistant cultivars produced almost no marketable yield. Prospera continued to produce marketable yields through the entire study. At the 4th harvest many infected leaves had to be discarded from the infected resistant cultivars before a marketable product could be produced. Cleaning plants of infected leaves would increase production time and costs and be impractical for growers.

Evaluating Marigold as an Insectary Plant in Sweet Corn

Veronica Yurchak, PhD Candidate
Scott McCluen, Insect Diagnostician
Cerruti R.R. Hooks, Professor
Department of Entomology UMD

Fig. 1. (A) Marigold flower (B) Lady beetle (C) Minute pirate bug

Introduction

Conservation biological control methods aim to lure beneficial insects (predators and parasitoids) into cropping systems to provide natural pest control. This can be done through the addition of flowering strips along the edge of crop fields. These strips can provide important resources to beneficial insects including pollen, nectar, and increased habitat diversity. Previous studies have found that marigold, *Tagetes spp*., (**Fig.1A**) used as a companion or border plant can increase parasitoid abundance and longevity, as well as decrease herbivorous pest abundance in snap beans and onion plantings. Some species of predators, including the minute pirate bug (**Fig 1B**) and lady beetles (**Fig. 1C**) were found in greater abundance in crops bordered by marigold plants. Both insects are important predators of the corn earworm, an economically damaging sweet corn pest. As such, the aim of this study was to investigate the use of marigold border strips for enhancing populations of natural enemies and pest suppression in sweet corn plantings.

Study objectives included: 1) assessing the attractiveness of insect natural enemies to French marigold and naturally occurring vegetation in field margins, 2) determining how marigold buffers influence beneficial arthropods in adjacent sweet corn plantings within the crop border and interior rows, and 3) quantifying the impact of marigold buffers on the amount of pest damage within the crop border and interior rows.

Experimental Procedure

Experimental Layout. The experiment consisted of two treatments: 1) sweet corn bordered by French marigold strips on two sides (MG) (**Fig. 2**) and 2) a monoculture sweet corn control (**Fig. 3.**). Treatments were replicated four times and each block was located in a separate field. Each plot contained 16 rows of sweet corn. Mowed grassways bordered the bare-ground areas in both treatments.

Fig. 2. *Sweet corn bordered by French marigold followed by bare-ground area.*

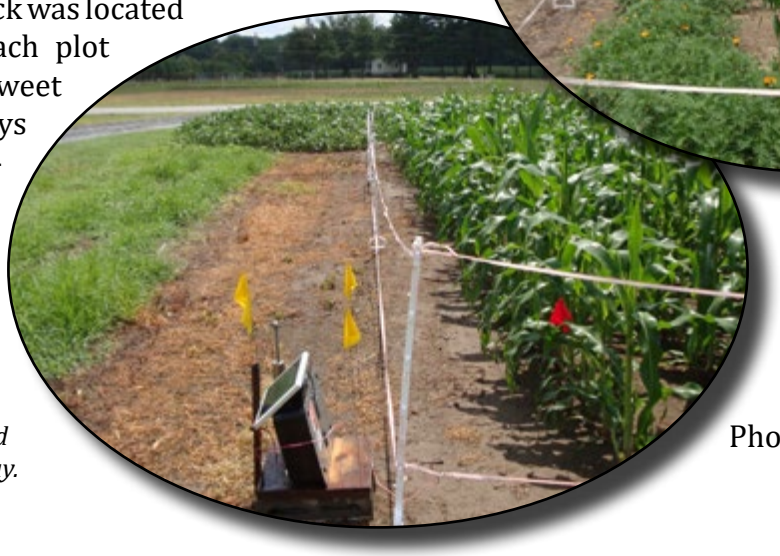


***Fig. 3**. Sweet corn bordered by bare-ground area and weedy grassway.*

Photo credit: C.R.R. Hooks

Arthropod Sampling. Insect numbers were estimated in three ways: visual counts, yellow sticky card traps and vacuum sampling. Sampling activities which spanned the period of corn earworm oviposition and early development, began at corn tasseling and continued through early dough stage. During visual counts, 16 plants per plot were searched and all arthropods found on each plant were identified. Aerial arthropods were assessed via three yellow sticky cards per treatment (**Fig. 4.**). Cards were placed between the two center rows in each sweet corn plot, between two border corn rows near the plot edge, and within either the marigold strip (MG treatment) or field margin bare-ground area (control treatment). Finally, vacuum sampling was performed in the marigold strip (MG treatment) and field margin grassway area (control treatment) to compare the arthropod community attracted to the marigold and weedy grassway.

Sweet Corn Damage. Four sweet corn ears per row, 64 per plot, were picked, husked, and inspected for corn earworm, sap beetle and stink bug insect damage. Ears were randomly sampled from the center of each row and grouped according to distance from the field edge.

Fig. 4. *Yellow sticky card trap located in interior corn rows.*
Photo credit: V. Yurchak

Results

Sticky card trap and vacuum samples revealed several families of parasitoids and predators, including lady beetles, were attracted to French marigold plants. Further, significantly more parasitoids were captured on traps located at the field margin of marigold-bordered sweet corn plots (MG) compared to those treatment plots without marigold borders (control). Still, there were similar numbers of predators and parasitoids found on sweet corn plants and/or card traps within all sweet corn plots (**Fig. 5**), suggesting that the marigold border strips had a limited influence on the beneficial insect community within the sweet corn.

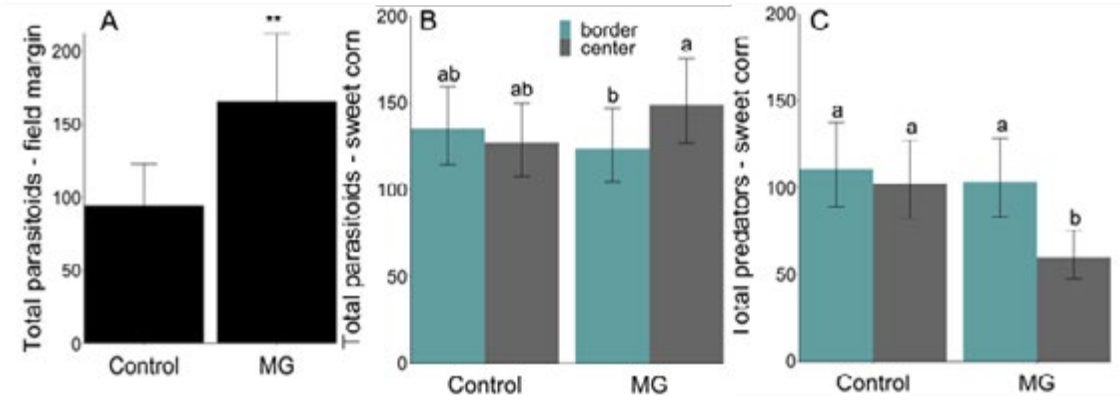


Fig. 5. *Total number of parasitoids collected from yellow sticky cards along the field margin (A) and within the border and center sweet corn rows (B), and total number of predators collected within the border and center sweet corn rows (C).*

Although French marigold demonstrated some ability to attract and influence the location of beneficial arthropods within sweet corn plots, its presence as a border plant did not result in an increase in essential earworm predators on corn plants. Further, feeding damage caused by some common sweet corn pests was similar in MG and control treatments. As such, when used as a border insectary plant, marigold may not improve biological control in sweet corn plantings. Moreover, in this study, it may have functioned as a natural enemy sink by luring parasitoids away from sweet corn border rows.

UMD Bee Lab and the New UMD Bee Squad

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

The University of Maryland Bee Lab has taken an epidemiological approach to studying honey bee health and management here in Maryland and throughout the United States with our partners at the Bee Informed Partnership (BIP). The UMD lab processes thousands of samples from our ongoing USDA APHIS National Survey and those taken by BIP throughout the United States. This high-throughput diagnostic service allows beekeepers to receive pest and pathogen data to allow them to make management decisions to help reduce colony loss, an issue still plaguing beekeepers. Closer to home, here in Maryland, the lab informally surveyed beekeepers to find what resources were needed to help reduce colony loss. It was found that, while Maryland does have several commercial beekeeping operations, a majority of beekeepers are classified as small scale or backyard beekeepers. This segment of the beekeeping population tends to have significantly fewer colonies but higher colony mortality ates. Beekeepers indicated that although local bee clubs were a good source of basic information, there as a lack of access to more advanced beekeeping information.

The Bee Lab formed The Bee Squad to consolidate and develop extension and outreach programs to fill this gap in educational resources. The Bee Squad, led by Mark Dykes a former chief apiary inspector and researcher, has developed a suite of programs to help beekeepers in Maryland and raise awareness about both managed and native pollinators. Due to COVID restrictions a majority of these resources have been virtual, delivered through the Zoom platform. The Bee Squad has also partnered with the Maryland State Beekeepers Association and the Maryland Department of Agricultural to develop programing to provide the more advanced educational opportunities that the Maryland beekeepers have indicated they need. In addition to standard lecture and lab courses, The Bee Squad will hold in person field classes as restrictions are lifted.

Wednesday Water Webinars

Drinking Wells, Water Quality and Septic Systems

University of Maryland Extension now 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 register, or if the date has past, the link will take you to the recording of that webinar, or check out our website for past recordings and more!

1/20/21 - Landscaping a Septic System? Whether it be a sand mound drainfield or the maintenance access ports to a septic tank or BAT unit, homeowners often wish they could camouflage these to make their yards more aesthetically pleasing. This covers considerations, options and specific plants & practices to use.

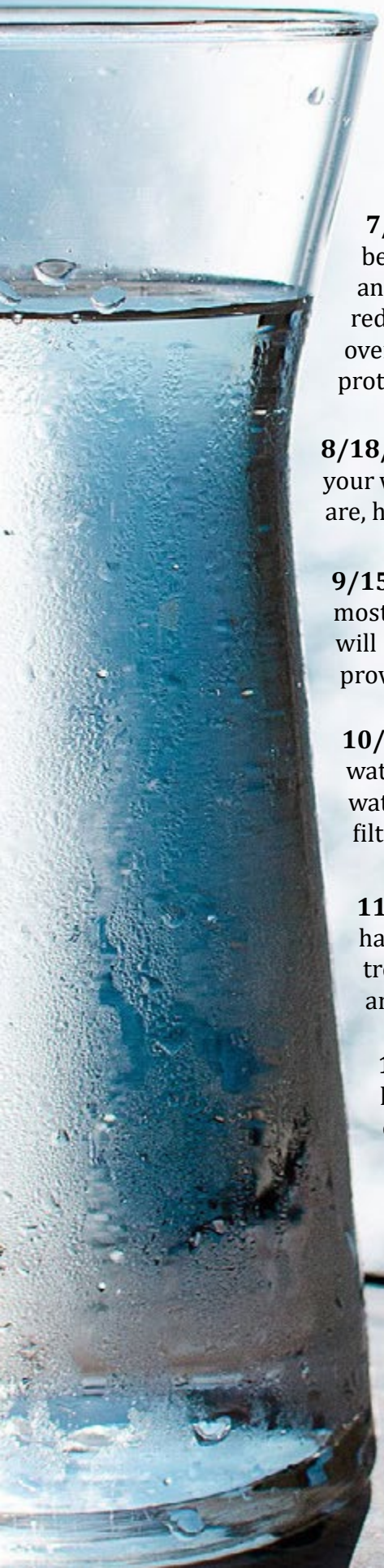
2/17/21 - All This Rain / Does It Harm My Septic System? This webinar willpresent basic hydraulic capacity and design flow of a septic system and how excessive surface water may negatively affect the efficiency of the system and potential harm to the system and environment.

3/17/21 - Pond Management Basics - The basics of pond ecology and water quality will be presented while providing pond owners an understanding of the pond ecosystem and practices to help maintain water quality. Also covered are strategies for managing ponds for varied uses, e.g. fishing, swimming, and irrigation.

4/21/21 - Water Gardens and Management - Water gardens can be an enjoyable feature of homes, providing a relaxing area with water sounds, fish and varied colored plants and flowers. Caring for these requires new gardening skills and the understanding of water quality to maintain the pond and minimize both required input and issues. This webinar will present the basics of managing a water garden.

5/19/21 - Upgrading to Best Available Technology (BAT) Septic System - Advanced nitrogen reduction technologies provide significant improvements in onsite wastewater treatment compared to a traditional septic tank. This webinar will present how the systems work, operation and their care, and will describe Maryland's Bay Restoration Fund grant program supporting upgrading to the technology.

UNIVERSITY OF MARYLAND EXTENSION



6/16/21 - Water Contaminants of Emerging Concern (CEC's) - The growth in production and use of industrial chemicals and personal care products has resulted in these contaminants reaching surface and ground waters. Many of these compounds either have been shown to cause environmental damage or are detrimental to human health. This webinar will present an overview of many classifications of CEC's including organic waste compounds, endocrine disruptors, personal care products and PFAS.

7/21/21 - Prolonging the Life of Your Septic System - A septic system may be the most expensive technology or appliance of a home. Providing proper care and maintenance can help protect your investment, prolong the system life, while reducing risks to public and environmental health. This webinar will present an overview of recommended maintenance practices to empower homeowner to protect their system and help save money.

8/18/21 - Is Lead in My Drinking Water – Concerned about lead possibly being in your water? This webinar will present how lead gets into water, what the health risks are, how to test your water, and treat it to ensure your water is safe to drink.

9/15/21 - Top Things to Know about Septic Systems -Your septic system is the most expensive appliance in your home and provides significant value. This webinar will discuss various keys aspects of a septic system to a home including service provided, costs and value, and protection of environmental and public health.

10/20/21 - Drinking Water Treatment 101 – Want to know how to treat your water to ensure it is safe and good quality? This webinar will cover the basics of water treatment including public water supply and private wells and options of filtration and application in your home.

11/17/21 - Types of Septic Systems – Not sure what type of septic system you have or if you do, how it works? The various systems used for home wastewater treatment including conventional systems, advanced technology or BAT units, and drainfield technologies will be discussed.

12/15/2021 - Top Contaminants in Well Water – You may have heard of lead toxicity issues in drinking water, but there are numerous other potential contaminants that can cause health issues. This webinar will present the major contaminants found in drinking water, both public and private well sources. Among these are arsenic, bacteria, chloride, copper, lead, iron, manganese, radium, total dissolved solids, and various contaminants of emerging concern.

Andrew Lazur, Ph.D.
State Extension Specialist - Water Quality
University of Maryland Extension
lazur@umd.edu.

Utilizing a Living Mulch System for Managing Pests in Mid-Atlantic Cantaloupe Operations

Demian Nunez, MS Student
Cerruti R.R. Hooks, Associate Professor
College of Computer, Mathematical and Natural Sciences
Department of Entomology - University of Maryland

Introduction

Managing pests can be one of the biggest challenges of cantaloupe agriculture. Cucumber beetles are most serious pests of cantaloupe in the mid-Atlantic and have the capacity to spread serious plant diseases including the highly contagious bacterial wilt, which has the capacity to wipe out entire crops and jeopardize the livelihood of growers. Striped cucumber beetles (Fig 1) are generally considered the most serious cantaloupe pest due to how easily they transmit bacterial wilt even at low densities. Many extension offices recommend a threshold of as little as one beetle per-plant to for a knockdown spray to avoid catastrophic economic losses. Because of this many growers rely on frequent systemic applications of neonicotinoids and foliar applications of pyrethroids to keep populations below injurious levels.

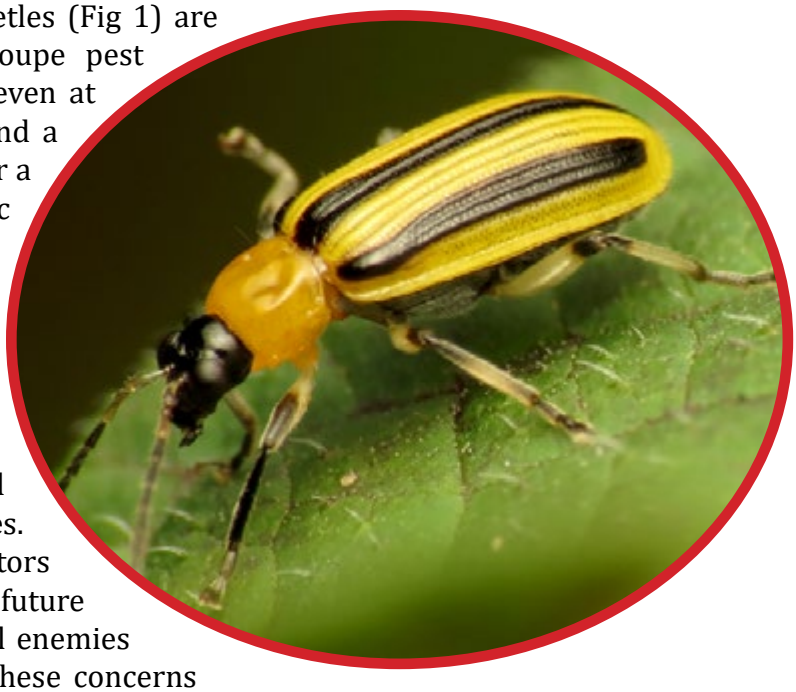


Fig. 1. Striped Cucumber beetle. Photo credit: Katja Schulz, Creative Commons.

Such frequent and aggressive chemical control comes with drawbacks however. Frequent use of pesticides comes with a great economic cost and has very disruptive impacts on non-target species. This can further contribute to loss of pollinators and other beneficial insects, as well as promote future outbreaks of other pests with the loss of natural enemies such as parasitoids and predators. Because of these concerns there is interest in developing alternative practices for managing pests in cantaloupe and other similarly vulnerable cucurbit crops

Research Objectives

The goal of this project at the University of Maryland's Central Maryland Research and Education Center (CMREC) was to investigate the viability of interplanting cantaloupe with different living mulch species for controlling cantaloupe pests. The term "living mulch" simply refers to a cover crop that is left alive throughout the cash crop's lifecycle. Past work in the lab showed similar companion planting strategies could reduce pest pressure in related crops such as cucumber and zucchini. These crops share a similar pest complex with cantaloupe and are similarly vulnerable to bacterial wilt. This past work included research conducted by former Hooks' lab member Hanna Khal, who also did much of her work at CMREC. Her work showed that the presence of red clover increased the presence of beneficial arthropods while reducing cucumber beetle and aphid populations, all without imposing a penalty on cucumber yield.

This study sought to see if similar results could be replicated in cantaloupe due to the similarities of its lifecycle and pest complex with cucumber, as well as to compare two structurally distinct living mulches for their different effects.

Experimental Protocols

Two structurally distinct living mulches were selected for this study. Alsike clover and Virginia wildrye were chosen as the living mulch species because they are both perennial, cool-season cover crops that are lightly competitive and could be established in the field during the fall prior to planting the cantaloupe. Their cold tolerance allowed them to become established before more competitive spring weeds. It was also believed that during the cantaloupe's growth phase in the summer these species would be less likely to harm yield through competition for resources as they go into a low growth or dormant phase in the summer during the cantaloupe's critical growth phase. Choosing a clover species made sense, given the past success of clover for similar purposes in other studies. A perennial bunch grass was also chosen because of past research that suggested that ground beetles and wolf spiders (a particularly important cucumber beetle predator) thrive in bunch grasses. They are also known to provide excellent overwintering habitat for such species

Multiple sampling methods were used to monitor arthropods in the plots. Yellow sticky cards were used to monitor arial pests and natural enemies while pitfall traps were used to monitor epigeal (ground dwelling) species such as ground beetles and wolf spiders, which are both generalist predators. Direct visual counts allowed us to directly observe arthropods on the surface of the plants and gave us the opportunity to make more frequent observations. Visual counts also allowed us to observe certain arthropods whose behavior could have prevented them from being detected using other methods, such as web-spinning spiders (Fig. 3). Data was collected during the 2020-2021 field seasons. All visual counts and trap deployments began about two weeks after cantaloupe transplanting. Traps remained in the field for a week at a time, with three sampling periods spread across the summer spaced two weeks apart to represent different stages in the cantaloupe's development. Foliar counts were repeated every subsequent week until the cantaloupe was harvested.

Fig 3. A yellow garden spider residing in a Virginia wildrye plot. Photo Credit: Demian Nunez

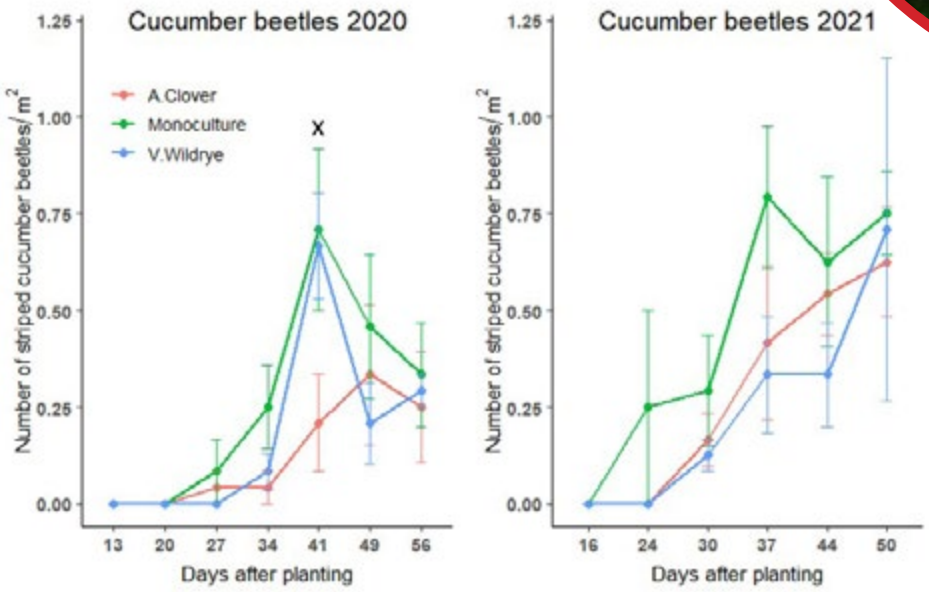


Fig 4. Mean densities (+ SE) of striped cucumber beetles (Acalymma vittatum) found within the cantaloupe foliage in monoculture and Virginia wildrye (wildrye) and alsike clover (clover) interplanted treatments during the 2020 and 2021 field seasons. Letter x indicates densities in monoculture and wildrye are greater than clover ($P < 0.05$).

Results

During the study arthropod abundances were fairly low, however there were still some measurable differences between treatments. It was hypothesized that living mulches would reduce cucumber beetle beetles and other cantaloupe specialist herbivores, as well as promote natural enemy abundance, however, not all arthropods conformed to these expectations, and some responded differently to different living mulches. Most notably, striped cucumber beetles appeared to be largely unaffected by either living mulches with populations being similar across treatments for nearly the entire study period (Fig 4). Also, during several periods in both study years more leaf piercing herbivores such as aphids were found on yellow sticky cards in cantaloupe interplanted with clover than wildrye and/or the monoculture control. However, no differences were detected among herbivores by visual counts in the cantaloupe foliage. It is worth noting that most of the herbivorous species found were economically benign, and they may be able to act as an alternate food source to support natural enemy populations at higher levels so they might better respond faster to a spike in pest species. Spiders were one of the few natural enemy groups that was affected by the living mulch. They were found in greater abundance during visual counts in cantaloupe interplanted with clover than wildrye or monoculture plantings during several sampling periods, including most of 2021 (Fig 5). Though differences in cucumber beetle numbers weren't found during this study, such increases in spider numbers could potentially prove beneficial in years with greater pest pressure as there is a more substantial population of predators able to respond to such pests. Other natural enemy guilds such as parasitic wasps and piercing predators had inconsistent responses to the living mulch types.

Unfortunately, differences in yield between the treatments were apparent, with the monoculture plots having the highest yield during both years of the study (Fig 5). Yield reductions when using living mulches could prove to be a major obstacle for grower adoption unless changes to the protocol can be made to ameliorate this.

Widening the cantaloupe rows and mowing the living mulch lower could potentially reduce competition between the mulch and the cash crops and preserve yield but may also come at the cost of natural enemy populations and their associated ecosystem services. Living mulches can confer benefits beyond pest control however, such as weed control and soil quality improvement. As such, growers, especially those that operate at small scales or grow organic, may still find value in using such a living mulch system in cantaloupe if yield can be preserved.

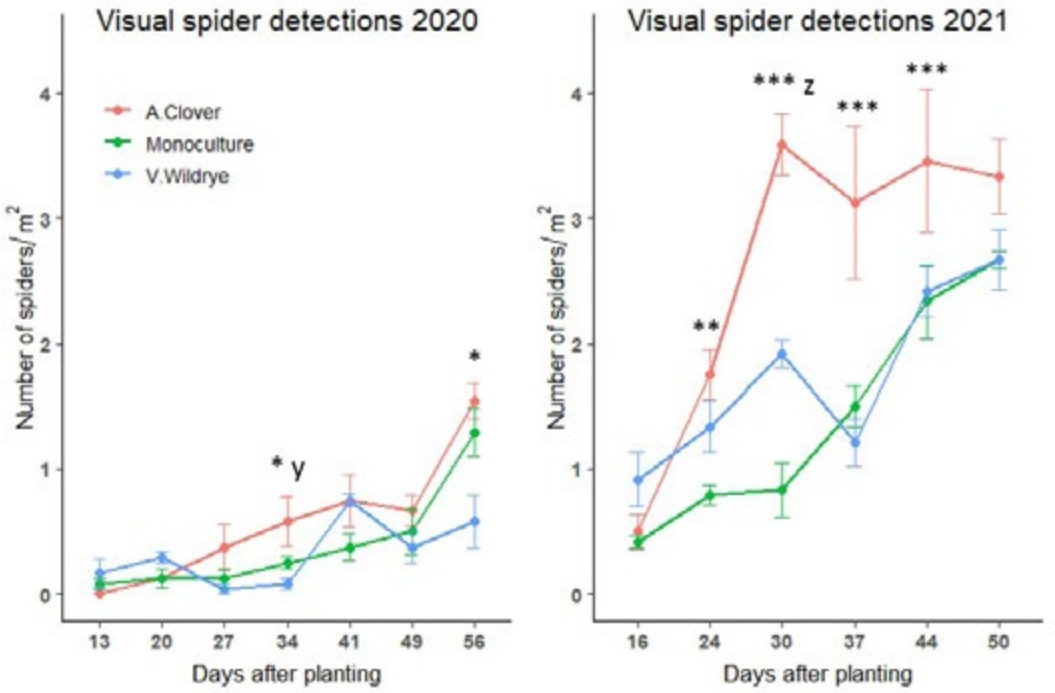


Fig 5. Mean densities (+ SE) of spiders (order: Araneae) found within the cantaloupe foliage in monoculture and Virginia wildrye (wildrye) and alsike clover (clover) interplanted treatments during the 2020 and 2021 field seasons. The letter y indicates densities are greater in monoculture than wildrye; * indicates densities are greater in clover

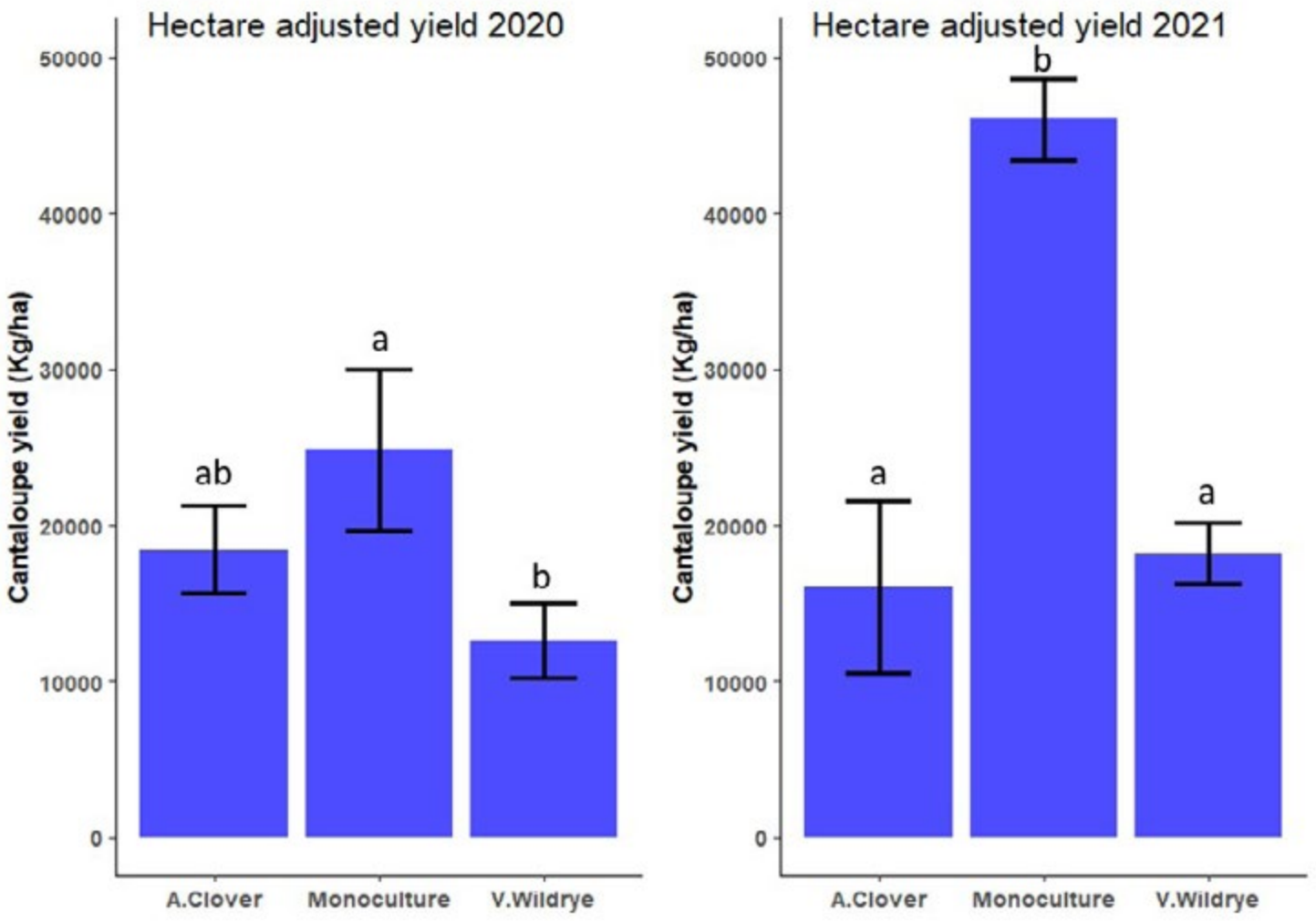


Fig 6. Mean cantaloupe marketable yield (+ 95% CI) by treatment during the 2020 (A) and 2021 (B) field seasons. Different letters indicate significant differences among treatments ($P < 0.05$).

Using Spring-seeded Cover Crops to Reduce Herbicide Inputs in Plasticulture Peppers

Dwayne Joseph - University of Maryland Extension Educator, Kent County
Kurt Vollmer - University of Maryland Extension Specialist-Weed Management
Alan Leslie - University of Maryland Extension Educator, Charles County
Cerruti Hooks - Professor Department of Entomology, University of Maryland

Weeds account for significant yield losses in plasticulture vegetable systems. Plasticulture systems offer substantial weed control within the crop row however, the bare soil areas between rows are often exploited by weeds. These weeds reduce crop yield, interfere with harvest, serve as hosts for plant pests and pathogens, and produce weed seeds that affect subsequent crops. Currently, the weeds between plastic-mulched beds are managed with herbicides, cultivation, mowing or manually. However, these tactics are labor intensive and their use can lead to rips in the plastic, increased soil erosion and degradation of soil organic matter. Moreover, applying herbicides after planting is challenging because of the limited number of products registered for vegetable use along with the risk of crop injury.

A viable solution to these challenges may include growing a cover crop between plastic-mulched beds. Cover crops such as spring oats and cereal rye are known to effectively suppress weeds. For example, research has shown that spring-seeded cereal rye planted between plastic-mulched beds reduced early-season weed density and biomass. However, it didn't suppress weeds the full cropping cycle. Therefore, the objectives of this study were to: 1) evaluate the use of cover crop management tactics on weed suppression, 2) evaluate the utility of cover crops for reducing herbicide applications in plasticulture systems, and 3) demonstrate the utility of cover crops for weed management in plasticulture production.

Methods

The study design consisted of a two-factor factorial arranged in a split-plot design consisting of cover crop termination and factorial subplots of cover crop species and residual herbicide treatment (Table 1). Cover crops were seeded in between plastic-mulched rows at least four weeks prior to transplanting the cash crop, and terminated with paraquat (Gramoxone), clethodim (Select Max), or no herbicide (roller crimped) using a tractor-mounted shielded sprayer (Figure 1), 3 to 4 weeks after transplant (WATr). Residual herbicide treatments consisted of fomesafen (Reflex) + S-metolachlor (Dual Magnum) applied within 24 hours of cover crop termination or no residual herbicide which were roller crimped. Data collected from plots included visual weed control assessments (100% = total weed control/no weeds present, and 0% = no weed control), weed species and abundance, cover crop biomass, and crop growth and yield.

Table 1. Cover crop and herbicide treatments.

Cover Crop Termination	Cover Crop Species	Residual Herbicide
Gramoxone (1.2 pt ac^{-1})	Cereal rye (240 lbs ac^{-1})	Reflex (1.5 pt ac^{-1}) + Dual Magnum (1.67 pt ac^{-1})
Select Max (1 pt ac^{-1})	Spring oats (277 lbs ac^{-1})	
No herbicide (roller crimped)	Cereal rye (120 lbs ac^{-1}) + Spring oats (138 lbs ac^{-1})	No residual herbicide

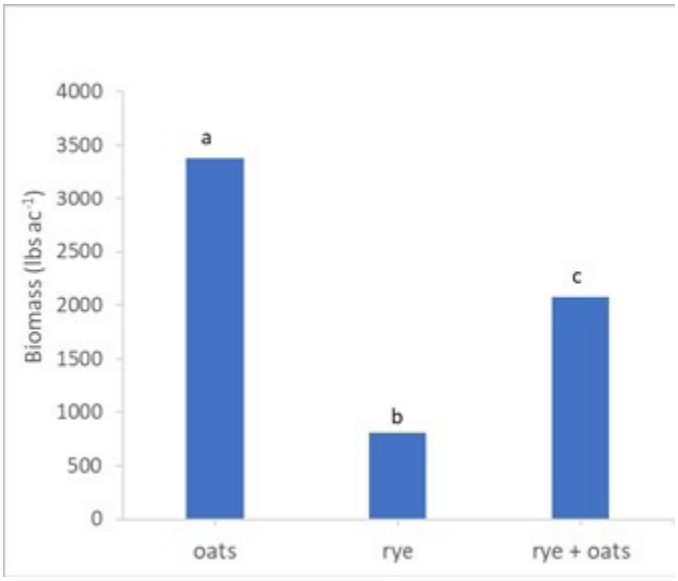


Figure 1. Cover crop biomass at termination. Values with the same letter are not significantly different according to Fisher's LSD (α = 0.05)

Oats produced the most biomass (3384 lbs ac-1), followed by the combination of cereal rye + oats (2077 lbs ac-1), then cereal rye (802 lbs ac-1), with all differences being statistically significant (Figure 1). Termination method, residual herbicide application as well as cover crop type influenced percent weed control and pepper yield. Termination with paraquat provided the best weed control (Figure 2). Plots terminated with paraquat offered 100% better weed control than roller crimped plots at 7, 9 and 11 WATr. Paraquat terminated plots provided significantly better weed control than clethodim terminated plots at all rating times. A residual herbicide application significantly increased weed control at all rating times (Figure 3). The presence of a cover crop, regardless of species, significantly increased weed control compared to when no cover crop was present (Figure 4). The presence and type of cover crop had a significant effect on yield (Figure 5). Mean pepper yield was 100%, 83% and 67% greater in cereal rye + oats (12 lbs plot-1), oats (11 lbs plot-1) and cereal rye (10 lbs plot-1) respectively, compared to plots containing no cover crop (6 lbs plot-1). A similar trend was observed with mean fruit production, where plots containing cereal rye + oats (65 fruits plot-1), oats (59 fruits plot-1) and rye (51 fruits plot-1) producing significantly more fruit than no cover crop (33 fruits plot-1) plots on average (Figure 6).

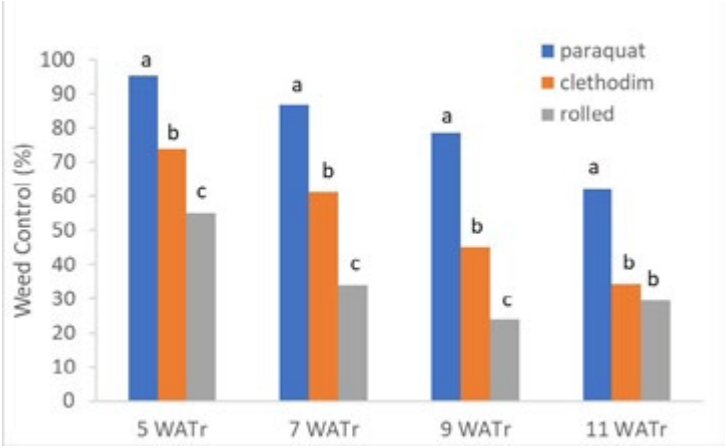


Figure 2. Weed control at different rating times in response to cover crop termination method. Values with the same letter at the same rating time are not significantly different according to Fisher's LSD (α = 0.05)

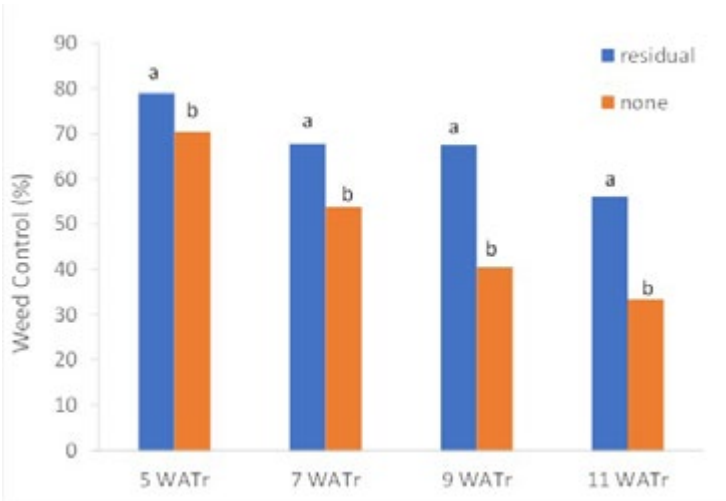


Figure 3. Weed control at different rating times in response to residual herbicide application. Values with the same letter at the same rating time are not significantly different according to Fisher's LSD (α = 0.05)

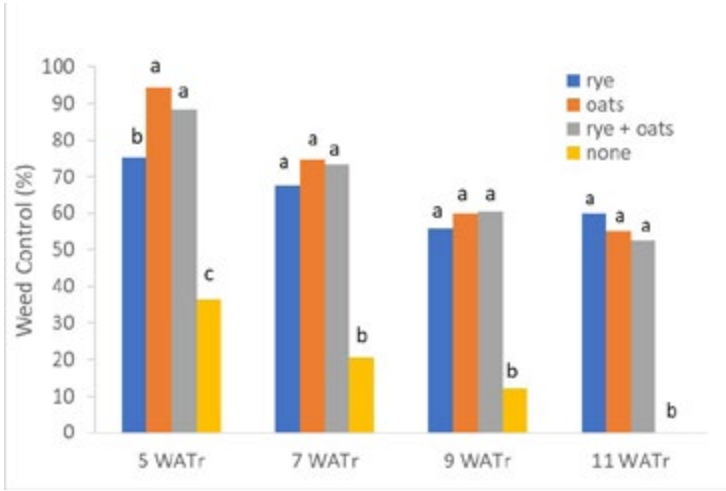


Figure 4. Weed control at different rating times in response to cover crop type. Values with the same letter at the same rating time are not significantly different according to Fisher's LSD (α = 0.05)

Discussion & Conclusion

This study demonstrated that spring-planting a grass cover crop between plastic-mulched beds can be an effective integrated weed management (IWM) tool. Furthermore, this study also showed that an application of a residual herbicide after cover crop termination is a viable option to increase full-season weed control in plasticulture vegetable systems. Our results show that the presence of a cover crop increased weed control and crop yield compared to when no cover crop was present. Additionally, cover crop selection is important for maximizing yield potential. Cereal rye + oats significantly increased pepper yield compared to rye alone. There was a steeper decline in weed control in oats compared to cereal rye plots as the rating times increased. This may be attributed to the different mechanisms by which each cover crop suppresses weeds. The initial biomass of oats offered excellent weed suppression. However, as the residue broke down further in the season, its ability to suppress weeds lessened, and at final rating was similar to cereal rye. Furthermore, there was a slower decline in weed control with cereal rye because it uses allelopathy to suppress weeds. Therefore, a delay in weed control is seen as allelochemicals are slowly released from residue to soil. Termination with paraquat offered the best weed control because it's a non-selective burndown herbicide. Although clethodim and roller crimping are effective at terminating a grass cover crop, broadleaf weeds present at termination will escape control, thereby contributing to yield loss at harvest. To provide crop producers with effective IWM options in plasticulture systems, this study was duplicated in three other crops (watermelon, cucumber, and tomato) and two other Mid-Atlantic locations (New Jersey and Eastern Shore of Maryland).

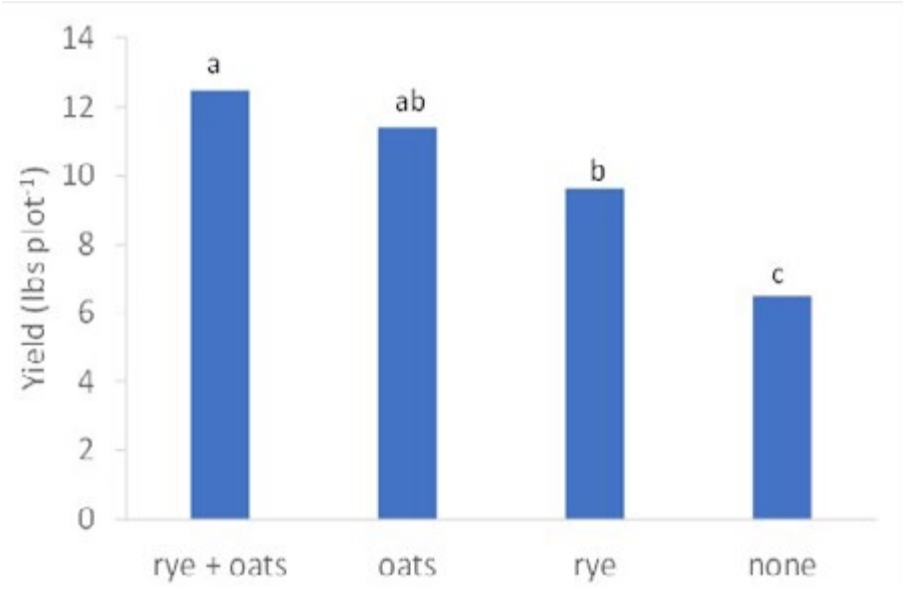


Figure 5. Mean pepper yield in response to cover crop type. Values with the same letter are not significantly different according to Fisher's LSD (α = 0.05)

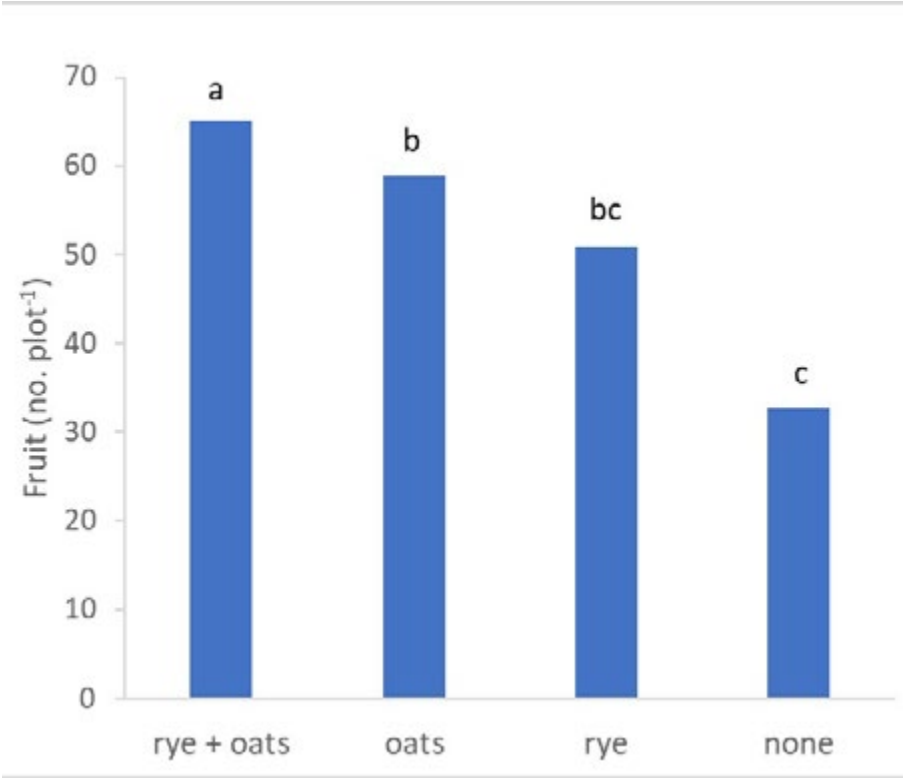


Figure 6. Mean pepper fruit production in response to cover crop type. Values with the same letter are not significantly different according to Fisher's LSD (α = 0.05)

Evaluation of Hot-Set Tomato Cultivars to Fill the Summer Slump in Southern Maryland

Ben Beale, Extension Educator, St. Mary's County
Alan Leslie, Extension Educator, Charles County

During the 2021 growing season, we trialed 13 cultivars of tomatoes (Table 1) that show promise to set fruit in high temperatures during hotter summer conditions present in Southern MD (Fig. 1). The trial also included standard varieties, and some older varieties that have not been widely adopted for comparison purposes. This year, tomato trials were also located on 10 cooperating farms in St. Mary's and Charles Counties as well as a formal replicated field trial at the Central Maryland Research and Education Center-Upper Marlboro Facility (CMREC; Fig. 2). Transplants were set in the field between the first and third week of June depending on trial location, with the CMREC site planted on June 3. Most plants were up to the fourth string by mid-July with harvest of first fruit just beginning by early August. Temperatures in the three weeks prior to first harvest reached well into the upper 90's, providing a good test of the heat tolerance of these varieties. The goal of this trial is to find new cultivars that will perform well during the traditional summer slump, where pollination and fruit set suffer from high heat in other varieties.

Figure 1. Example of Tomatoes under trial (variety: Roadster).

Figure 2 Field trial of hot-set tomatoes at the CMREC farm. Varieties were randomized within each of the four plastic rows, which servced as replicates.

Table 1. Cultivars evaluated in the 2021 trial. Asterisk (*) denotes that these varieties are currently recommended for commercial production in MD. Varieties Red Mountain and Red Deuce are currently widely grown in Southern MD.

	Seed Company Description
Red Deuce*	Extra-large fruit for early vine ripe harvest. High-yielding producer of smooth fruit. A good fit for fresh market with its solid, meaty interior, and good color.
Red Mountain*	Produces smooth fruit on a compact plant with good cover. A clean fit for the second early slot, shows excellent quality from one pick to the next.
Red Morning*	Red Morning tomato plants produce early maturing, large red round fruit on improved determinate plants that offer good cover. Great yields of high quality large fruit. The deep red fruit have smooth shoulders and exceptional quality. Resistant to V, F 1, 2 and tomato Mosaic Virus. Intermediate resistance to Tomato Spotted Wilt Virus.
Scarlet Red*	Scarlet Red is a fresh market shipper tomato with great flavor. Here we offer a fresh market shipper with the firmness and fruit quality of Florida 47R, but with a much improved flavor. Scarlet Red is a high yielding tomato produced on a vigorous determinate plant. Its extra-large fruit have a deep red color, a scarlet red interior, and excellent firmness and shelf life. Scarlet Red works well for either mature green or vine ripe harvest, and your customers are delighted with its improved eating quality over others in this class.

Roadster	Roadster (STM2261) is a high quality determinate salad variety featuring a combination of early maturity and extra-large size. Fruit are an attractive red, very firm and smooth shouldered with good flavor. Suited for both mature green and vine ripe markets. The plants are medium tall and benefit from light pruning. Roadster has a concentrated set and very high yield potential.
Red Snapper	Red Snapper is a versatile and adaptable determinate salad variety. Fruit are an attractive red color, firm and have a good shelf-life. It is suited for both mature green and vine ripe markets. The plants are medium tall, have mid cover and benefit from pruning. Red Snapper has a more manageable plant than most hot set commercial varieties with good fruit set potential.
STM 2255	STM2255 is a very versatile and adaptable determinate salad variety with high yield potential and good vine-ripe flavor. Fruit are an attractive red color, firm and have a good shelf-life. It can be used for both mature green and vine ripe markets. The plants are medium tall, have mid cover and benefit from pruning. STM2255 has potential to be used in multiple slots and regions across the eastern USA.
Bejo 3437 - Carrie	Bejo-3437 is a high eating quality/high yield variety that works great as a gas green in Florida fall/winter but has great roadside vine ripe potential in the Mid-Atlantic region. Size on 3437 is a bit smaller (Lg-Xl on first set then Md-Lg up the plant) than some of the other varieties, but is comparable to Roadster. Highest yielding cultivar in 2020 Cornell trials.
Camaro*	Camaro produces early maturing, extra-large and firm red globe shaped fruit, on mid-compact determinate plants. Setting and size is good through the plant with final yield potential being high. Due to the plant habit, pruning is either unnecessary or should be low. The deep red fruit have smooth shoulders and perform well for both vine-ripe or for mature green gassing.
Grand Marshall*	Grand Marshall is a vigorous hot set variety with extra-large and large fruit that are firm, deep oblate shaped, on medium strong to strong vigorous determinate plants. Yield potential is high. Pruning is beneficial and at a low to medium level. The deep red fruit have smooth shoulders and perform well for both vine-ripe or for mature green gassing. Grand Marshall has good performance under hot conditions and often when bacterial pressure is present.
Rambler	Rambler is an adaptable, high-quality determinate salad variety featuring high yield potential of jumbo and extra-large fruit. Fruit size, color, quality and firmness is excellent. Suited for both mature green and vine ripe markets. The plants are medium-tall and benefit from light to no pruning.
Bejo 3345 - Carole	Consistent through multiple harvests. Firm with great eating quality. Dual purpose that will hold for the shipper market and roadside stands. Crimson genes. Performs well in the open field with high stakes and in high tunnels/greenhouses for extended harvest.
XTM 5187- Thunderbird	Thunderbird is an improved quality, high yielding hot set determinate round variety with a strong plant and good general disease resistance. The plants have a good balance of cover and ease of harvest. Fruit are extra-large in size, very firm, with good shelf-life. The color is deep red and part of the Sakata high color range. Thunderbird is a dual-purpose variety with both vine-ripe and mature green potential.

At CMREC, harvest was carried out from the first week of August through the second week of September, with a total of seven harvests. Plants were grown following the Mid-Atlantic Commercial Production Recommendations Guide, and received weekly fertilization injected through drip irrigation under plastic mulch and weekly preventive fungicide sprays. Figure 3 shows the total marketable yield across all varieties tested, with the current standard varieties grown in Southern Maryland highlighted in orange. Several varieties on test outperformed both standard varieties, and among them only Grand Marshall is currently recommended for commercial production in MD. Figure 4 shows the average fruit size of all varieties on test, and shows that the two varieties commonly used for mid-season field production in Southern MD account for the largest (Red Deuce) and smallest (Red Mountain) varieties tested. All other varieties have average fruit sizes that fall between these two.

When considering multiple criteria used for evaluating the different tomato cultivars, there were a few varieties that stood out during the trial. STM 2255, Bejo 3437 (Carrie), Grand Marshall, and XTM 5187 (Thunderbird) were four varieties that had the highest average yield during the trial. Bejo 3437 (Carrie) also stood out by producing the highest percentage of marketable fruit, or the lowest number of cull fruit. The tradeoff with this variety is the relatively small size, with most fruit in the LG/XL size category, and relatively few in the jumbo category. There were similar tradeoffs with STM 2255 and Grand Marshall as well. XTM 5187 (Thunderbird) stood out in that it produced relatively large fruit, while having relatively low percentage of unmarketable fruit. From the first year of study, XTM 5187 (Thunderbird) showed good promise as a future standard variety of mid-season field tomato production. This project is planned to be repeated again during the 2022 season, and we will again be recruiting local farmers to grow these different varieties on-farm for evaluation. As a part of evaluating these varieties, we are interested in learning the opinions of local farmers on how these varieties perform compare to some of the typical varieties planted for mid-season production.

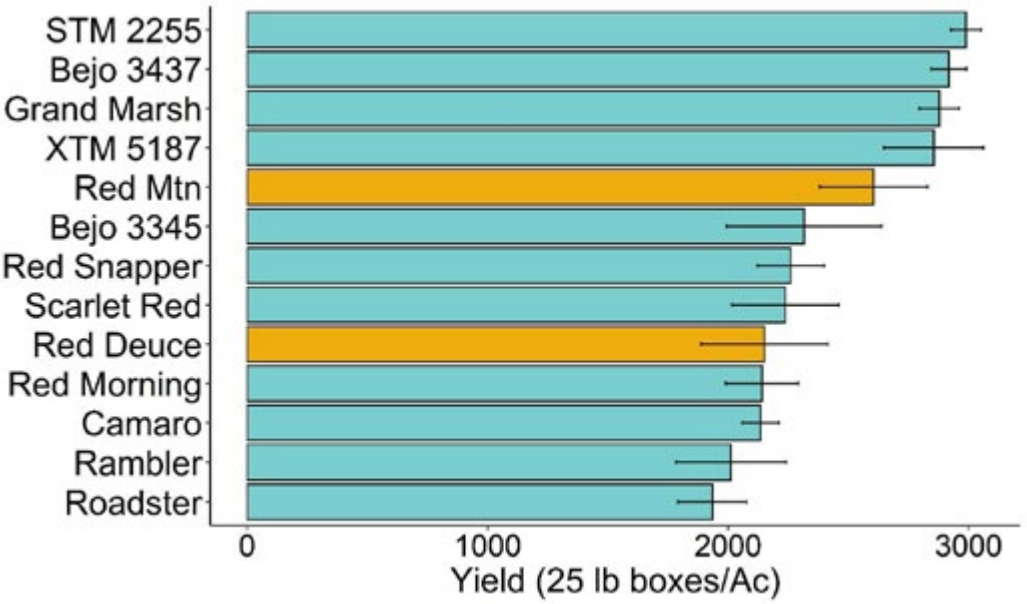


Figure 3. Average total yield of the 13 tomato varieties tested at the CMREC site in 2021. Varieties highlighted in orange are current standards for mid-summer field production in Southern Maryland.

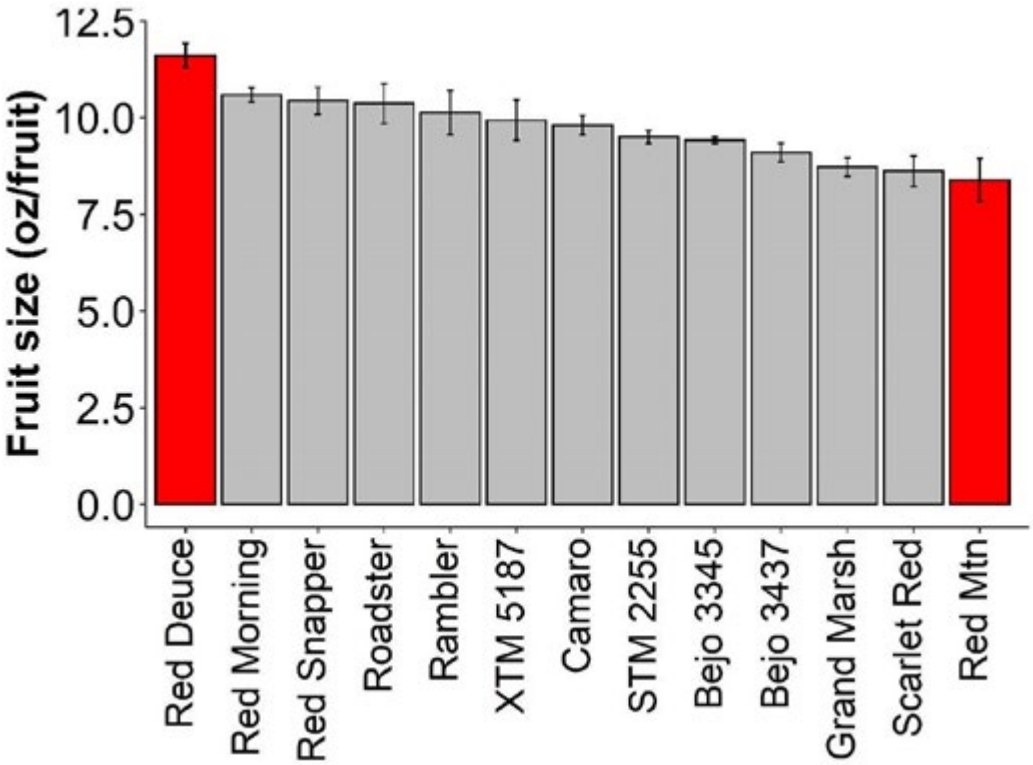
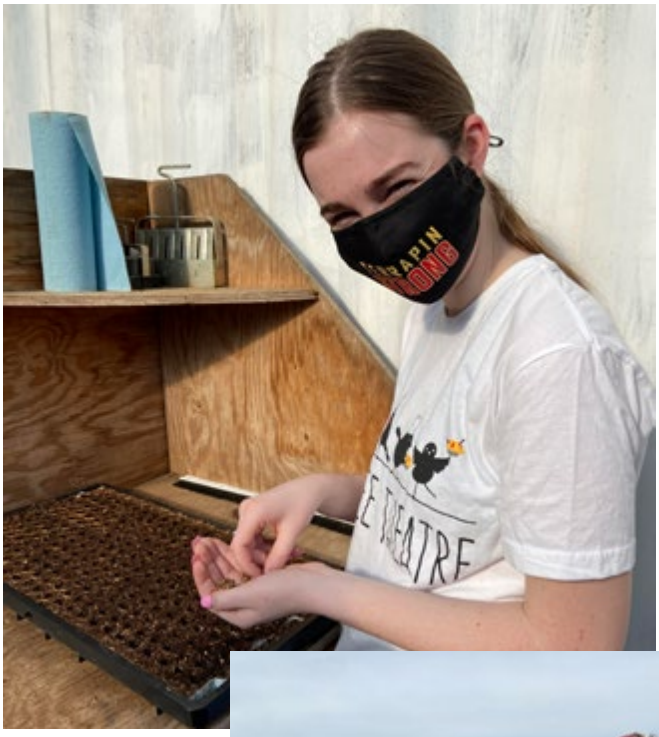


Figure 4. Average fruit size of different tomato cultivars in 2021 trial. Bars highlighted in red are current standards for mid-season field tomato production in Southern Maryland.

IAA Students Learn Hands-on Throughout Pandemic



While most University of Maryland courses were conducted remotely in the spring of 2021, some were able to meet in person due to the nature of the coursework being outdoors – especially courses taught by the Institute of Applied Agriculture (IAA), which has always emphasized hands-on learning on farms, golf courses, gardens, and more. Agriculture courses lent themselves especially well to hybrid teaching when many other disciplines left students stuck inside on laptops early on in the COVID-19 pandemic. The difference in student engagement was palpable.

The IAA course INAG213 Crop Production Practices covers the applied methods of producing various vegetable and agronomic crops in Maryland. The course focuses on commercial scale production where economics impact production decisions, and a key part of the course is experiential learning sessions at UMD's Terp Farm. Located at the Upper Marlboro Research and Education Center, Terp Farm is the vegetable production operation of UMD Dining Services. It has a strong focus on education and hands-on student experiences. Terp Farm is a natural partner for courses like INAG213 and others throughout AGNR.

During March, April, and May 2021, the 18 students enrolled in INAG213 made their way to Terp Farm for five 3-hour sessions. Each started with a "field walk," where Farm Manager Guy Kilpatric and Senior Lecturer Meredith Epstein guided students in observations of soil and crop conditions, as well as discussing farm management systems. Then, students got to operate a walk-behind tractor, construct a caterpillar tunnel, fill and seed trays in the greenhouse, harvest salad greens, and lay out drip irrigation.

Southern Maryland Small Fruit Variety Trials

Alan Leslie, Extension Educator, Charles County

Blackberries are an attractive alternative crop for many fruit and vegetable farmers in Maryland, and present an opportunity to add diversity to u-pick, direct sale, or wholesale operations. In general, blackberries are well adapted to growing conditions in Maryland, but newer cultivar releases from University breeding programs in Arkansas and North Carolina have yet to be thoroughly tested in this state. In collaboration with the Southern Maryland Agricultural Development Commission, we established a cultivar trial, testing five newer cultivars and one older release at the Central Maryland Research and Education Center in Upper Marlboro, MD. The blackberry cultivars included in the trial are Arapaho, Freedom, Natchez, Osage, Ouachita, and Von. All cultivars are thornless, floricane-fruiting types, with the exception of Freedom, which is a thornless, primocane-fruiting cultivar. Floricane cultivars produce fruit on the second-year growth of the plant, which results in earlier fruit production and typically a short fruiting period with high yields. These cultivars require overwintering of the first-year growth, and can be sensitive to extreme winter temperatures. Primocane cultivars develop fruit on the first-year growth, and therefore typically do not mature until late summer or early fall, which can extend the harvest season. Primocane cultivars do not rely on winter hardiness of first-year canes, and therefore may be more resilient to abnormally cold winters. For this trial, we retained the first-year growth of Freedom plants to measure both floricane production for early season blackberry production.

The cultivar trial was initially established in the spring of 2018, with four replicates of each cultivar planted in a randomized complete block design. Each replicate contained three plants of that specific cultivar, each spaced 3 feet apart. For the initial two years, data were collected on plant vigor and survival, with 2020 being the first year that yield data were collected. Fertilizers and protective fungicides were applied according to production guide recommendations. Weeds were controlled with herbicide application in early summer and mowing between trellised rows. Regular insecticide applications were not made through the season. Yield data mainly highlight differences in yield between cultivars, and not necessarily fruit quality for any individual cultivar.

Figure 1. Female periodical cicada using her ovipositor to lay eggs inside of blackberry stems, causing injury to the floricane branches.

The 2021 growing season saw significant yield losses from damage caused by the emergence of the Brood X periodical cicadas (Magicicada spp.). These cicada species emerge in late May and early June, which was the period that these blackberry cultivars were producing green and red fruit. Female cicadas typically use thin tree branches to lay their eggs, using their sharp ovipositor to deposit eggs inside of the pith. Brambles are apparently also a preferred egg-laying site for these insects, and any blackberry plantings in the vicinity of mass cicada emergences should be protected with insecticides or netting. The oviposition scars left by females effectively girdled the floricane branches, causing developing fruit to shrivel and die.

Figure 2. Dieback of fruiting floricanes as a result of cicada damage.

Ripe berries were picked weekly between June 17 and July 27 and weighed to determine yield per replicate. Because replicates had uneven plant survival, we then divided the yield values by the number of surviving plants to present yield on a per-plant basis as well as a per-plot basis. A subsample of harvested berries were counted and weighed separately to determine average berry size. Yield totals for the entire season are summarized in the table, with Osage and Von having significantly higher yields than Arapaho or Freedom. Ouachita and Natchez were intermediate in yield, and not significantly different from Osage and Von. Figure 3 shows differences in timing of fruit production, with Osage peaking slightly earlier in the season (Jul 1), followed by Arapaho, Von, Natchez, and Ouachita over the following two weeks (Jul 8 - 14). Figure 4 shows the mean berry size by cultivar. Freedom produced the largest berries despite the low yields, while Osage had the smallest berries on average despite having the highest yield. These data represent the second year of observations on yield for these cultivars in Maryland, and yield values are expected increase through the third year of harvest. However, early observations indicate that cultivars Osage and Von are good candidates for commercial production in Maryland. Ouachita and Natchez also performed relatively well during this second year of the trial. Future work will repeat measurements of yield and berry size, and will include measures of berry quality and flavor parameters for each cultivar. The overall goal is to provide objective assessment of the quality of these different blackberry cultivars for the Maryland farmer.

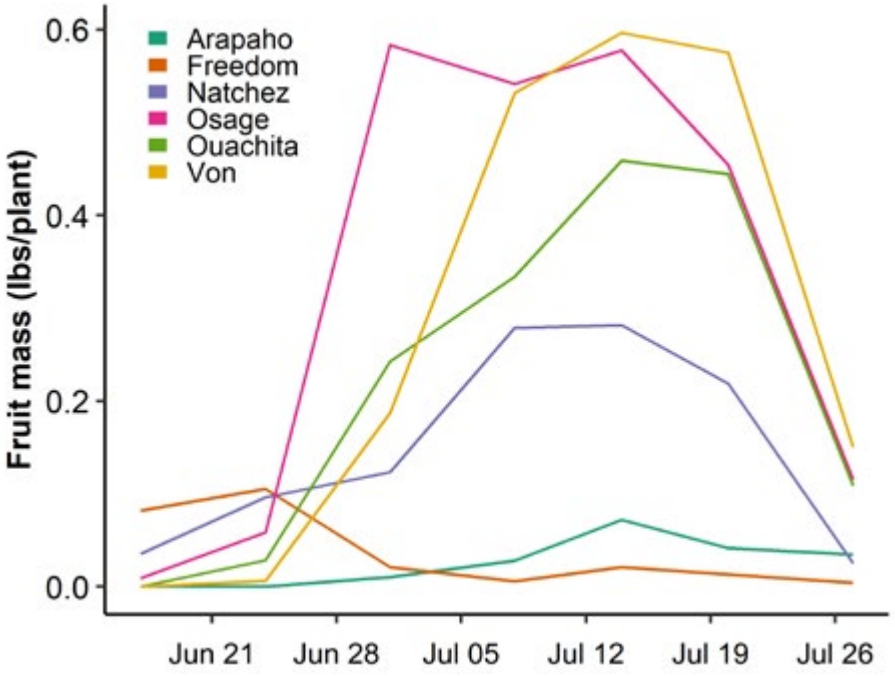


Figure 3. Yield of blackberry varieties through multiple summer harvests.

Variety	Yield (lbs/ plant)	SEM	
Arapaho	0.19	0.11	B
Freedom	0.25	0.10	B
Natchez	1.06	0.50	AB
Osage	2.34	0.30	A
Ouachita	1.62	0.42	AB
Von	2.05	0.44	A

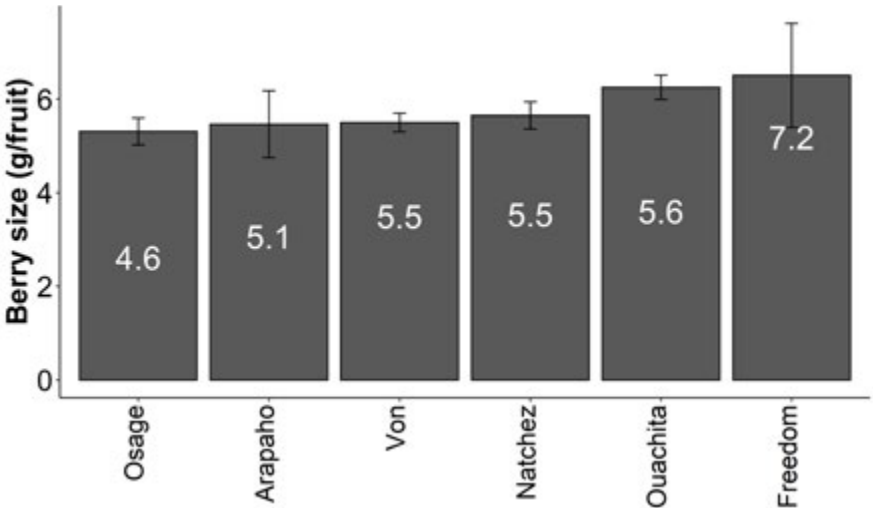


Figure 4. Mean berry size among blackberry cultivars.

Making Every Practice Count

Jacqueline Takacs - Watershed Restoration Specialist

Stormwater remains one of the most difficult and expensive sources of Chesapeake Bay pollution to control. While a great deal of attention and resources have been committed to the wide scale adoption of agricultural best management practices (BMPs) to manage stormwater, many counties and towns are increasingly faced with stormwater issues coming from smaller scale residential and private properties. According to the Chesapeake Bay Program, pollution from urban/suburban stormwater is actually increasing compared to all other sources. While individual actions taken on these smaller properties, such as the installation of rain barrels and rain gardens, may only have a small effect on nitrogen, phosphorus and sediment pollution, total pollution reductions can become substantial when these actions are multiplied over hundreds of properties within a watershed.

Small-scale residential stormwater BMPs are most often voluntarily installed by environmentally conscientious property owners but are rarely effectively tracked by county and municipal agencies. Under the current Chesapeake Bay TMDL situation, where any water quality practice must be counted and tracked to receive a nutrient and sediment reduction credit, there is no incentive for the investment in these small-scale, non-regulated stormwater BMP's. The ability to count, track, certify and aggregate these BMP's will document additional quantifiable water quality benefits across the Watershed.

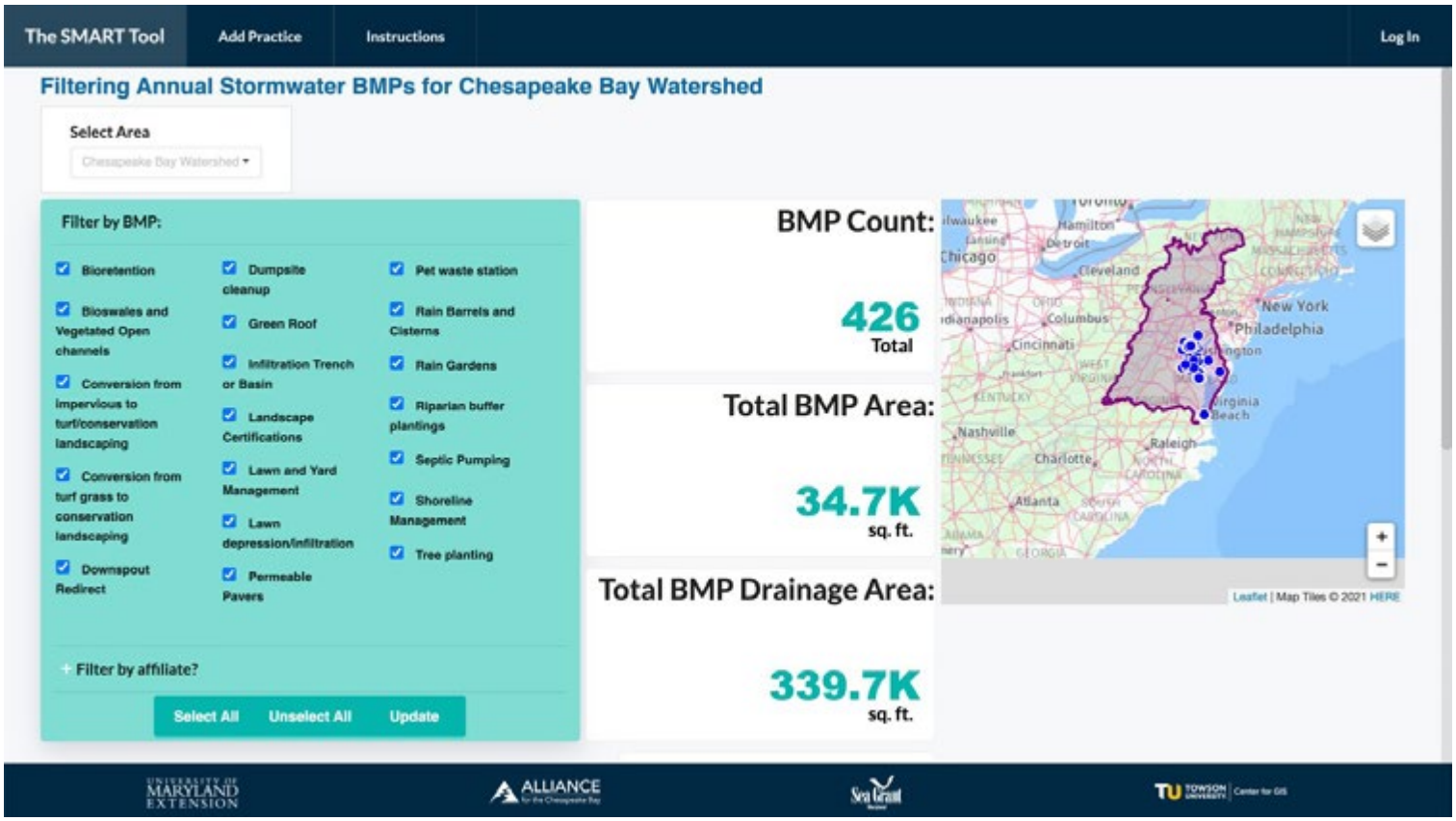
In an effort to promote greater engagement by property owners in Bay restoration, the Chesapeake Bay Program's Urban Stormwater Work Group approved a streamlined verification procedure for these non-regulated BMPs. The basic premise is to simplify the property owner BMP reporting process while still retaining a high degree of quality assurance with the actual installation of each BMP being certified by a designated third party or a local government at time of construction/installation. The Stormwater Management and Restoration Tracking (SMART) Tool, developed by the University of Maryland Extension Sea Grant Watershed Protection and Restoration Program, in partnership with the Alliance for the Chesapeake and the Center for GIS at Towson University, provides the needed mechanisms to track, certify and report progress on these small-scale, non-regulated BMPs.

The SMART tool is an interactive, web-based mapping, tracking and reporting tool that provides a credible and certifiable way to account for 10 small-scale practices and 9 larger-scale that can implemented on small-scale residential properties in both rural and urban areas. SMART's open-access dashboard allows the user to sort and display information about stormwater practices and associated nutrient and sediment removals

rates across the entire Chesapeake Bay watershed. Additional filtering capabilities allow for state, county, municipality, along with smaller HUC-8 and HUC-12 watershed, information to be viewed. A public data entry portal allows property owners, or their representatives, to enter their practices directly into SMART and receive immediate feedback on their impact on local water quality.

SMART incorporates all approved nutrient and sediment reduction information approved by the Chesapeake Bay Program's Water Quality Goal Implementation Team to calculate and report out individual and aggregate reductions for each BMP tracked. This reporting ability allows for the adoption of small-scale BMP's into the formal accounting of nutrient and sediment reductions of local TMDL/Phase II WIP, NPDES and MS4 permit requirements and could potentially result in considerable quantifiable cost-savings for local governments.

Direct access to SMART - smart.extension.umd.edu
Overall SMART website - https://go.umd.edu/SMART



Front dashboard of the SMART tool shows all practices reported in the tool and calculates the total BMP area, Total BMP Drainage Area, Total Nitrogen removed, Total Phosphorus removed, and Total Sediments removed.

COLLEGE OF AGRICULTURE & NATURAL RESOURCES

Central Maryland Research and Education Center
Upper Marlboro Facility

2005 Largo Road · Upper Marlboro, MD 20774-8508
301-627-8440

https://go.umd.edu/CMREC-UM

Facility Personnel & Support

Donald Murphy
Facility Manager
dmurphy@umd.edu

Alfred Hawkins
Agricultural Technician Supervisor
ahawkins@umd.edu

Ronald Wood
Agricultural Technician Lead
rwood123@umd.edu

Bill Eversfield
Agricultural Worker I
weversfi@umd.edu

Elizabeth McGarry
Administrative Assistant I
emcgarry@umd.edu

Resident University Faculty

Dr. Gerald Brust
Regional Extension Specialist
Maryland Vegetables
jbrust@umd.edu

Andrew Lazur
Extension Specialist, Water Quality
Well Water and Septic Systems
lazur@umd.edu
301 789-5256

Jackie Takacs
Watershed Restoration Specialist
Watershed Protection and Restoration
takacs@mdsg.umd.edu
240 393-6508

Terp Farm

Guy Kilpatric
Terp Farm Manager
Department of Dining Services
terpfarm@umd.edu

Maryland Tobacco Seed Order Form

MD 609 is available this year in pelletized form

Growers can purchase seed by completing the form below and mailing it with payment to:

University of Maryland CMREC
Upper Marlboro Facility
2005 Largo Road
Upper Marlboro, MD 20774

Please pay by check made payable to:
University of Maryland

Seed will be mailed to you by the postal service or UPS, so please provide a valid address that can accept packages.

For more information, please call 301-627-8440.

Raw Seed Only:
Raw seed remains free of charge for Maryland residents and is available in the following varieties:
MD609 and MD601

Primed pelletized MD609 seed - $18.00 per bottle of 10,000 seeds

Number of bottles needed _____(10,000 seeds per bottle)

__X $18.00__(Price per bottle)

Total amount enclosed $_____

Shipping Information:

Name:_____

Street or PO Box:_____

Town, State, Zip:_____

Phone Number:_____