UNIVERSITY OF MARYLAND EXTENSION
AgFS Agriculture & Food Systems

Fruit & Vegetable News

A research-based publication from the University of Maryland Extension Team

June 2022 Volume 13, Issue 3

Be on the Lookout for Green Stink Bug.

Emily Zobel, Senior Agent Associate, UME Dorchester County, ezobel@umd.edu

Fig. 1.) Adult Green stink bug. Photo by David Cappaert, Bugwood.org

University of Delaware extension and Rutgers both as recently reported seen a large increase in green stinkbugs (*Acrosternum hilare* or *Chinavia hilaris*) in their black light traps. Scout peaches and apples for adults stink bugs (Fig 1.). They can difficult to see so it might be useful to shake a few branches over a sheet to determine if they are present. Adult feeding during bloom and shuck split can cause the fruit to abort. As fruit grows feeding damage causes a characteristic dimpling and subsequent catfacing injury (Fig. 2). Mature fruits will have depressed lines and multiple corky areas resulting in a gnarled and mottled appearance. Several types of insets with piercing-sucking mouthparts cause catfacing injury on peaches and apples, including tarnished plant bugs and many types of stink bugs.

Fig. 2) Early-season catfacing injury on the surface of a developing peach with sunken tissue devoid of fuzz. Photo by Bruce Barrett

Scout grapes and small fruits since adult stink bugs will often lay their eggs early in the season and many small nymphs will begin to suck the juices out of the maturing fruit. Stink bug nymphs (Fig 3.) will readily hide when disturbed, therefore, careful inspection is necessary.

With only one generation per year adult green stink bugs are prevalent in June and tends to tapers off in fruit trees in July and August. Because these bugs are strong fliers, their presence may be widespread, and depending upon availability of other host plants, injury can vary considerably. There are no action thresholds based on SB monitoring. Eliminating alternate weed hosts in the orchard should reduce damage caused by this pest complex. Preventing serious catfacing injury depends largely on well-timed, early season insecticide applications. On pome fruit critical timings for the control of tarnished plant bug and most native stink bugs are pink and petal fall. On stone fruits applications at petal fall, shuck fall, and 10 days after shuck fall typically provide good control. Applications during pink are often unnecessary because most fruit injured at this time aborts. For more information about control see the [Penn State Tree Fruit Production Guide (page 155).]

Fig. 2.) Green Stinkbug nymph. Photo by Daren Mueller, Iowa State University, Bugwood.org

Inking in Peaches and Nectarines: Symptoms, Causes and Control

Macarena Farcuh, Ph.D., Assistant Professor and Extension Specialist
University of Maryland, College Park, mfarcuh@umd.edu

Symptoms of Peach and Nectarine Inking: Field inking or skin discoloration is characterized by the appearance of dark colored, brown-black spots or longitudinal stripes on the fruit surface, restricted to the skin (Fig. 1). Inking affects the skin cells and causes the death of these cells, but it will not affect the tissue below or the flesh of the fruit. Although the symptoms are superficial and cosmetic, they render the fruit unmarketable or cause them to be second grade. Inking symptoms can be triggered in the field, during harvest as well as during transportation to the packinghouse. The symptoms do not become visible immediately (inking can become evident after 48 hours after harvest). Peaches are more susceptible than nectarines, but the susceptibility to inking can also vary depending on the cultivar, as well as environmental conditions and the management strategies used in the orchard.

Fig 1. Inking in peach fruit evidenced by brown and black spots on the fruit's skin. Source: Carlos Crisosto, UC Davis.

Causes of Peach and Nectarine Inking: Abrasion damage in combination of heavy metals such as aluminum, copper or iron can cause the development of peach and nectarine fruit inking. These metals may come from water or applied products such as fungicides, insecticides, or foliar fertilizers, which can have the ability to induce field inking on peach and nectarine when followed by abrasion damage. The inking results from the collapse of the skin cells, which contain the anthocyanin and phenolic pigments important for color development, and thus their contents react with the heavy metals turning their color black/brown. Research in California has shown that only 10 ppm of iron (Fe) is enough to induce peach and nectarine inking. Wash water high in iron or low in pH can also increase the inking problems. Additionally, excess rain at harvest, very common in the mid-Atlantic, can cause fruit swelling and cell damage together with storm damage and abrasion. This situation, in combination with the presence of heavy metals, can increase the incidence of inking.

Steps to avoid Peach and Nectarine Inking: There are several measures that can be taken in order to control the development of field inking. Some of these include: handling fruit gently in order to avoid abrasion damage (prefer using air-ride suspension on trailers and avoid long hauling); avoiding and reducing fruit contamination by keeping containers dirt, dust free and clean; picking fruit in the morning instead of later during the day; near harvest choose chemical applications carefully and avoid spraying foliar nutrients or preharvest fungicides containing aluminum, copper or iron within 3 weeks of anticipated harvest; check your water quality for contamination with heavy metals (water with acidic characteristics (< 6.5) can exacerbate inking due to increased iron availability); test your fungicides for presence of heavy metals early in the season (be aware of the composition of the chemicals you use in your preharvest and postharvest operations); delaying packing for ~48 hours can allow to remove fruit with inking symptoms during grading (as the symptoms do not develop immediately).

June Vegetable Insect Scouting Tips

Emily Zobel, Senior Agent Associate, UME Dorchester County, ezobel@umd.edu

Be sure to check all labels carefully before combining insecticides and herbicides. Thresholds are based on sampling 100 plants (10 plants x 10 locations).

Spider mites can occur in tomato, eggplant, potato, and vine crops such as melons, cucumbers, and other crops. Feeding damage causes leaves to have a yellow-white stippling appearance. Heavy feeding can turn leaves completely pale, dry up, and fall off. They commonly outbreak during hot, dry weather, which also aggravates injury by stressing the plant. However, their populations decline rapidly during periods of heavy rainfall or after overhead irrigation has been used.

Snap beans: Scout for bean leaf beetle, Mexican bean beetle, and potato leafhopper (PLH). Plant leafhopper feeding can cause hopperburn on leaves, reducing photosynthesis and yield. Treated seeds offer protection from plant leafhoppers for about 3 weeks post-planting. The treatment threshold for plant hopper is when adults plus nymphs exceed 100 per 20 sweeps. Bean leaf beetle adults, Mexican bean beetle adults, and larvae chew holes in leaves. The treatment threshold for bean leaf beetle, Mexican bean beetle, is 20% defoliation or 1 beetle per plant.

Onion: Scout for thrips and feeding damage, which looks like whitish or chlorotic streaks. Prolonged feeding reduces bulb size and increases the incidence of leaf and bulb rots. Immature thrips usually feed on young tissue between the leaf sheaths and stem, while adults feed on more mature tissue. The treatment threshold is an average of 2-4 immatures per leaf. High spray pressures and high gallonages are necessary to ensure good contact between the pest and the chemical. Twin flat fan nozzles result in better coverage than single flat fans.

Eggplant & Potato: Scout for flea beetles and Colorado potato beetles. Adult flea beetle feeding creates small feeding holes that create a shot-hole effect. Treatment thresholds are an average of 2 beetles per plant when plants are less than 3 inches high, an average of 4 beetles per plant when plants are between 3-6 inches high, and an average of 8 per plant when plants are above 6 inches.

Colorado potato beetle adults and larvae feed on the foliage of solanaceous crops (potato, eggplant, and tomato). They have 1-2 generations per year, and a large population can completely defoliate plants. The treatment threshold is an average of 0.5 adults, 4 small larvae, or 1.5 large larvae per plant.

Cucurbits: Scout for aphids, cucumber beetles, and squash bugs. Aphids are found on the undersides of leaves. Examine two runners at 10 sites. If 20 percent of runners or more have live aphids, treatment may be needed. Good coverage of the undersides of leaves is needed for control. Hot, dry weather can cause melon aphid populations to increase rapidly. Cucurbit crops that are susceptible to bacterial wilt should be protected from cucumber beetles from seedling emergence to the time vines begin to run. Treatment thresholds are an average of >5 beetles per plant when plants are small (>5th leaf stage). The treatment threshold for plants beyond the 4-leaf stage until vines begin to run is when the average beetle densities are 1 per plant.

Flaming as a Weed Management Tool

Cerruti R Hooks and Dwayne Joseph
Professor and Extension Specialist & Post-Doctoral Fellow, CMNS, Department of Entomology,

Mechanical cultivation and hand weeding are organic producers most preferred choices for weed control. However, repeated cultivation has a negative influence on soil structure and organic matter content, and can make conditions more susceptible to soil erosion. In addition, repeated cultivation promotes new weed flushes. On the other hand, hand weeding which may require a ready supply of field workers can be expensive, especially if conducted over large areas and in less competitive crops that require multiple hand weeding tasks. For commercial producers who mostly rely on herbicides, concerns may arise regarding herbicide-resistant weeds, the potential risk to the groundwater supply, and their effect on food quality. This suggests that alternative weed management tools should be considered. Multiple studies have examined effects of flaming on annual weeds; and successful application of propane flaming to manage weeds has been reported in crops such as cotton, field corn, cabbage, carrots, sweet corn and onions. This suggests that weed flaming may be a formidable tactic for incorporation into an integrated weed management (IWM) program. Its successful integration could result in reduced usage of cultivation, hand weeding and herbicide sprays. Flame weeding or flame cultivation involves using propane burners to create intense heat to manage weeds in the interrow region of row crops or across the whole field in fallow situations. Flame-weeding systems range from handheld flamers for small-scale production to tractor-mounted systems for large-scale, row-crop flaming (**Fig. 1**). Covers or reflectors used to contain the heat energy close to targeted weeds improve energy efficiency by reducing heat loss. Very brief periods [e.g., 125 millisecond (ms)] of exposures to high temperatures interfere with plant cellular processes such as photosynthesis. Practicing flaming to manage weeds was developed for field crops, fruits and vegetables during the 1940s. However, as interest in low priced herbicides became more prevalent, flaming popularity took a hit. After its almost complete disappearance in the 1970s, flame weeding has regained interest especially in organic production.

Fig. 1. *Tractor equipped with propane tank and burners. Attribute: Ian Abbott (CC)*

How does flaming impact weeds?

Flaming differs from burning in that plant tissues are not incinerated, but rapidly heated causing denaturation and aggregation of cellular proteins. The extent to which heat from the flames penetrates plants depends on the flaming technique and environmental factors such as leaf surface moisture. Denaturation of the plant cells starts at roughly 40 °C, depending on exposure time. An increase of temperature above 50 °C inside the plant cells can result in the coagulation of membrane proteins leading to loss of membrane integrity. Lethal temperatures are reported to range from 55 to 94 °C. Plant cells comprise 95% water; and if plant tissue reaches temperatures above 100°C for a split second, it causes water boiling and cell membrane rupture, resulting in loss of water and plant death. Exposure times in the range of 65–130 ms are sufficient to kill many annuals. Plants may survive flaming by avoidance or heat tolerance. To optimize propane flaming as a weed control tool, the effective dose (ED) of propane required to control targeted weed species must be known. Depending on the desired level of weed control, a propane dose can be used to kill weeds or reduce their competitiveness with crops. For fast-growing crops, pre-emergence flame weeding can provide sufficient weed suppression to allow the formation of full crop canopy, which impedes later weed emergence. In addition to open flame units that target emerged weeds, flames may be directed to the soil surface. Direct heat to the soil surface increases soil temperatures to the weed seed thermal death point. The thermal death point is the temperature at which a seed will not germinate after heat application. Many soil attributes influence the efficacy of direct heat and contribute to variations in treatment efficacy. These include planting depth, soil texture, soil moisture thermal conductivity, soil chemical properties and soil porosity. The efficacy of flaming is determined by the amount of heat transferred from the burner and the duration of time that weeds are exposed to the heat. The amount of heat transferred by the flamer to weeds is determined by the number of burners for a given working width, the nozzle size, and gas pressure; as well as exposure time which is determined by application speed.

What influences the flamer?

Timing. The efficacy of flame weeding is influenced by several factors, including the plant's growth stage, the physical location of its growing point during flaming, the presence of protective layers of hair or wax and lignification, and the time of day. Multiple studies have shown that plants are more heat sensitive when flamed in the afternoon than early morning. One study compared the effectiveness of flaming at 8 a.m., 12 p.m., 4 p.m., and 8 p.m., and reported better weed control at the noon and 4 p.m., treatment periods. It was suggested that differences in weed control among flaming times could not be explained by differences in temperature, relative humidity or the presence/absence of dew. Thus, in general, it is believed that flaming will be more effective if conducted during the afternoon period. Though, afternoon flaming may result in better weed control; it is important to note that crops are also more vulnerable to injury during this period. Adjusting the angles of torches and positioning the flames below the crop canopy may reduce risk of crop injury during flaming.

Plant type. Weeds susceptibility to flaming varies among species and in general, dicots are more effectively controlled with flaming than monocots. Further, annual weeds are more vulnerable to flame weeding than biennials and perennials. Annual broadleaf and grass species also differ in their response to flaming. Leaves of annual broadleaf species may turn brown and die within a few days after flaming, resulting in no regrowth whereas leaves of grass species may turn white shortly after flaming, leaving an appearance of a dead plant. However, within a week, grass species begin to recover with the growth of new leaves. These varying responses to flaming between broadleaf and grass species are due to the physical positioning of their growing point at the time of flaming. The growing point in grass species during early growth stages is typically below the soil surface and as such, are protected from flames. In contrast, the growing point of broadleaf species is above the ground where it is exposed to the flame. Grasses also have a sheath that protects their growing point. Weeds with unprotected growing points such as lambsquarters have been found to be more sensitive than those with protected growing points such as shepherd's purse (*Capsella bursa-pastoris*) and that barnyardgrass (*Echinochloa crus-galli*) and green foxtail (*Setaria viridis*) are more tolerant to flaming than velvetleaf (*Abutilon theophrasti;* **Fig. 2**) and ivyleaf morningglory (*Ipomea hederacea*). Broadleaf weeds in their vegetative growth stages require propane doses ranging from 30 to 60 kg ha^{-1}, whereas a vegetative grass such as barnyardgrass can require up to 79 kg ha^{-1} to

Fig. 2. *Velvetleaf (Abutilon theophrasti). Attribute: Dendroica Cerulea (CC)*

achieve the same level of control. Relative to this, crops in the grass family such as maize and sorghum exhibit higher tolerance to flaming than broadleaf crops such as soybean and sunflower when treated at early growth stages.

Plant growth stage and size. A plant's tolerance to flaming varies according to its maturity/growth; and developmental stage is probably the most important factor. The growth stage of weeds at the time of flaming helps determine their sensitivity to heat. The growth stage establishes the type and degree of protective layers, the lignification level and location of growing points. Relative to this, flaming is more effective on most weeds at an early growth stage. Smaller plants typically have thinner leaves, lower biomass and fully exposed meristems (not protected by surrounding leaves). In contrast, older seedlings or bigger plants have larger and thicker leaves and greater surface area and biomass, which requires higher temperature and longer exposure to achieve control. Further, they possess larger amounts of food reserves (soluble sugars, proteins and lipids) in stems and roots, providing them with the increased capacity for regrowth. Another critical part of young plants that determines their heat tolerance is the growing point in the shoot apex. In older plants, the shoot apex is often protected by surrounding leaves. The tolerance of different plant parts to flaming can also be influenced by protective layers of hair and/or wax, lignification level and their overall plant water status.

Fig. 3. *Green foxtail (Setaria viridis). Attribute: Dick T. Johnson (CC)*

Relative to the growth stage, four weed species [green foxtail (*Setaria viridis*, **Fig. 3**), yellow foxtail (*Setaria pumila*), redroot pigweed (*Amaranthus retroflexus*) and common waterhemp (*Amaranthus rudis*)] exhibited more tolerance when flamed at the flowering stage compared with earlier vegetative stages; and popcorn plants flamed at the 2-leaf stage had the highest yield loss. In comparison, flaming popcorn plants at the 5- or 7-leaf stage had less of an effect on ear size. One study found that plant size had a greater influence upon sensitivity to flaming than plant density, with small weeds being more sensitive than large weeds. For example, 42 kg ha^{-1} of propane killed 95% of individuals within a solid stand of white mustard plants with 0-2 leaves. However, 74 kg ha^{-1} was required to kill 95% containing 2-4 leaves.

Fig. 4. *Wheat plots being hand-weeded. Attribute: Fred Miller, Arkansas Agri Media (CC).*

Advantage. Flaming can be a viable weed management alternative to hand weeding and cultivation. From an economic standpoint, labor cost associated with hand weeding is more expensive, time-consuming and labor intensive (**Fig. 4**). Further, flaming can be used when the soil is too moist or stony for hand or mechanical weeding. In comparison with cultivation, flame weeding does not disturb the soil surface or bring buried weed seeds to the surface which makes it compatible with the stale seedbed technique. Further, in some instances, flaming can be as effective or better than cultivation. A study conducted to compare flaming to mechanical cultivation on weed control in popcorn reported that weed control was better with flaming than cultivation. Moreover, flaming helps reduce concerns regarding direct effects of weed suppression tactics on soil, water, and food quality. For instance, flaming does not leave chemical residues on plants, soil, air or water, and produces no hazardous drifts or chemical carry-over to the next season. Flaming does not contribute to herbicide-tolerant or resistant weeds and weeds are less likely to become resistant to flaming. As such, flaming in some situations is a more feasible alternative to using herbicides or mechanical cultivation.

Disadvantage. The main disadvantages of flame weeding are the lack of residual weed control, the lack of selectivity for crop safety, low speed of application, increased application costs, and applicator safety. The efficacy of flaming may be reduced when environmental conditions such as dew is present. It should also be noted that flaming is not as efficient as chemical control. However, it can be repeated as needed during the growing season and more importantly integrated with other weed management tactics. In addition, postemergence flaming can damage the cash crop. For heat-resistant crops such as cotton, corn, and sugarcane, flames can be directed to the plant's base during certain growth stages. This technique, is called selective flaming and controls intra-row weeds. For heat-sensitive crops, postemergence flaming can be applied using a covered flamer to help protect crops from the heat. This technique, also known as parallel flaming, controls weeds between the crop rows. Flaming may also be incompatible for conservation tillage and cover cropping as the heavy plant residue that remains on the soil surface may ignite during flaming. Another drawback is that most flame weeding systems are designed to treat a lower number of rows per pass compared to chemical treatments which makes the process slower.

Summary: Flame weeding uses propane burners to generate combustion temperatures of up to 1,900 degrees Celsius, which raises the temperature of exposed weed leaves very rapidly and kills them without burning. Flaming in the absence of killing weeds can severely reduce their growth, thereby making them less competitive with crops. Weeds and other plants' susceptibility to flaming will vary according to species, plant size and growth stage during flaming. Broadleaves are generally more sensitive than grasses, and older and larger plants require higher energy rates for control than younger and/or smaller plants with fewer leaves. Flaming before crop emergence has been the predominant thermal weed control method in slow-germinating row crops such as onion, leek, carrot and corn. However, preemergence flaming may be of limited value in fast emerging crops because the crop may easily emerge before most weeds. As such, preemergence flaming would only control a fraction of the weeds that will emerge during the cropping season. Still, flaming has shown good results after weed emergence and before crop emergence in crops such as potato, sugar beet, carrot and cayenne pepper. When conducted postemergence, vulnerable crops such as soybean and sunflower must be protected from flaming. Other crops such as corn and sorghum have some tolerance to flaming. Flaming similar to other weed management tactics should not be viewed as a stand-alone tactic. However, it can be successfully incorporated into an IWM plan and thus be used in concert with other tools. For example, weeds in corn were controlled through integration of tillage and flaming. Financial support for the publication of this article is via USDA NIFA EIPM grant award numbers 2021-70006-35384 and NESARE - Research for Novel Approaches (LNE20-406R).

UNIVERSITY OF MARYLAND EXTENSION | AgFS Agriculture & Food Systems

Upcoming Extension Events

- **Ag Direct Marketing School**
  June 29, 2022 at 6707 Groveton Drive Clinton, MD 20735 Cost: $20
  Topics covered include: keys for setting up a profitable business, tips for setting up an eye-catching display at the farmer market, how to set up an online presence, how to accept credit cards and other payments and more. For more information or to register, contact Charlie Sasscer at csasscer@umd.edu, or call 301-868-9366**.**

- **Biological Control for Nurseries, High Tunnels, and Greenhouses Conference**
  June 30—July 1, 2022
  The University of Maryland Extension and Maryland Nursery, Landscape and Greenhouse Association have organized a Biological Control Conference that will help you move forward with biological control in your operation. We are bringing in speakers from Maryland, across the country, and Canada to share information on practical biological control options. The program will be held at the Maritime Institute, Linthicum Heights, Maryland. Registration is $90 for members and $140 for non-members. The agenda and registration link are available online at the Maryland Nursery, Landscape and Greenhouse Association website

- **Delmarva Weed Management Tour:**
  June 28-29, 2022
  A series of field days will be held on June 28th and 29th for farmers, the ag industry, and others interested in seeing the latest results from university weed management trials. These will include tours of herbi-cide demonstration plots, updates on integrated weed management trials, and updates on UAVs (drones) for herbicide applications. Pesticide credits will be available for MD and DE.
  - **June 28:** Virginia Tech Eastern Shore AREC, 33446 Research Drive, Painter, VA from 8:00 AM to 11:00 AM.
  - **June 29:** First stop at the University of Delaware Carvel Research and Education Cen-ter, 16483 County Seat Highway, Georgetown, DE from 8:00 AM to 10:00 AM. Second stop at the University of Maryland Wye Research and Education Center, 211 Farm Lane, Queenstown, MD from 4:00 PM to 6:00 PM.

These events are free and open to the public. For more information, contact Kurt Vollmer at kvollmer@umd.edu, Mark VanGessel at mjv@udel.edu, or Vijay Singh at v.singh@vt.edu.

Northeast Sustainable Agriculture Research and Education (SARE) is accepting preproposals to distribute $5 million in funding across its three largest grant programs.

Research and Education, Research for Novel Approaches, and Professional Development Grants begin at $30,000 and provide as much as $250,000 for sustainable agriculture projects. The deadline to submit preproposals is 5 p.m. EST on August 2, 2022. All three grant programs currently accepting preproposals are open to **anyone who works with farmers.** Professional Development Grants are also open to service providers who work with farmers.

Northeast SARE has allocated:

- **Research for Novel Approaches Grant** confirm the efficacy of practices and approaches related to production, marketing, business management, human resource management and other social issues.
- **Research and Education Grant projects** include an education program for farmers that seeks to achieve a "performance target" that describes the changes in practices, behaviors or conditions among farmers expected to result from the proposed project.
- **Professional Development Grant projects** fund train-the-trainer projects that develop the knowledge, awareness, skills and attitudes among the full range of service providers who work with farmers.

Preproposals are preliminary concept documents evaluated by independent review teams. Roughly **one-third to one-half of preproposals are invited to submit full proposals.**

Both invited and not-invited applicants receive feedback from reviewers. Northeast SARE reviewer feedback is an invaluable resource for any organization looking to write grants related to sustainable agriculture.

Northeast SARE will be examining its grant programs and procedures as part of its Diversity, Equity, Inclusion and Justice Strategic Plan. To accommodate that work, **these grant programs may not reopen for preproposals in 2023.**

A **Preproposal Grant Webinar** will take place at noon on June 23, 2022. The webinar will explore the different grant programs, application process, and frequently asked questions.

For more information please visited the Northeast SARE website: https://northeast.sare.org/

FREE Produce Safety Rule Compliance Resources

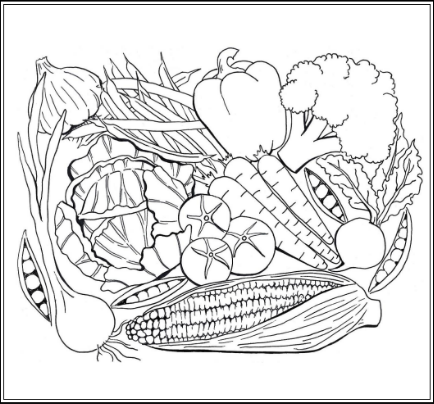
The Maryland Food Safety Network wants to send you customized resources to help you implement the Produce Safety Rule on your farm. Please complete our Google Form and let us know what you need to stay in compliance.

Scan the QR Code with your camera or go to https://go.umd.edu/ProduceRuleForm to access the Sign Up Form

QUESTIONS? CONTACT SARAH EVERHART
SEVERHART @LAW.UMARYLAND.EDU
410-458-2475

University of Maryland Extension | University of Maryland Agriculture Law Education Initiative

2022/2023
Mid-Atlantic Commercial Vegetable Production Recommendations



The 2022-2023 Mid-Atlantic Commercial Vegetable Production Recommendations Guide is available for free at https://go.umd.edu/MidVegGuide

University of Maryland Extension | AgFS Agriculture & Food Systems

Header photo By E. Remberg

Fruit & Vegetable News is published by the University of Maryland Extension, Agriculture & Food Systems Team.

Emily Zobel, Editor

Agriculture Extension Agent

To subscribe or more information: www.extension.umd.edu

University of Maryland Extension

(410) 410-228-8800

EZOBEL@UMD.EDU