



## In This Issue:

Weed Science	2
Wildlife Management	3
Plant Pathology	4
Environmental Plant Damage	5
Greenhouse/High Tunnel IPM	6

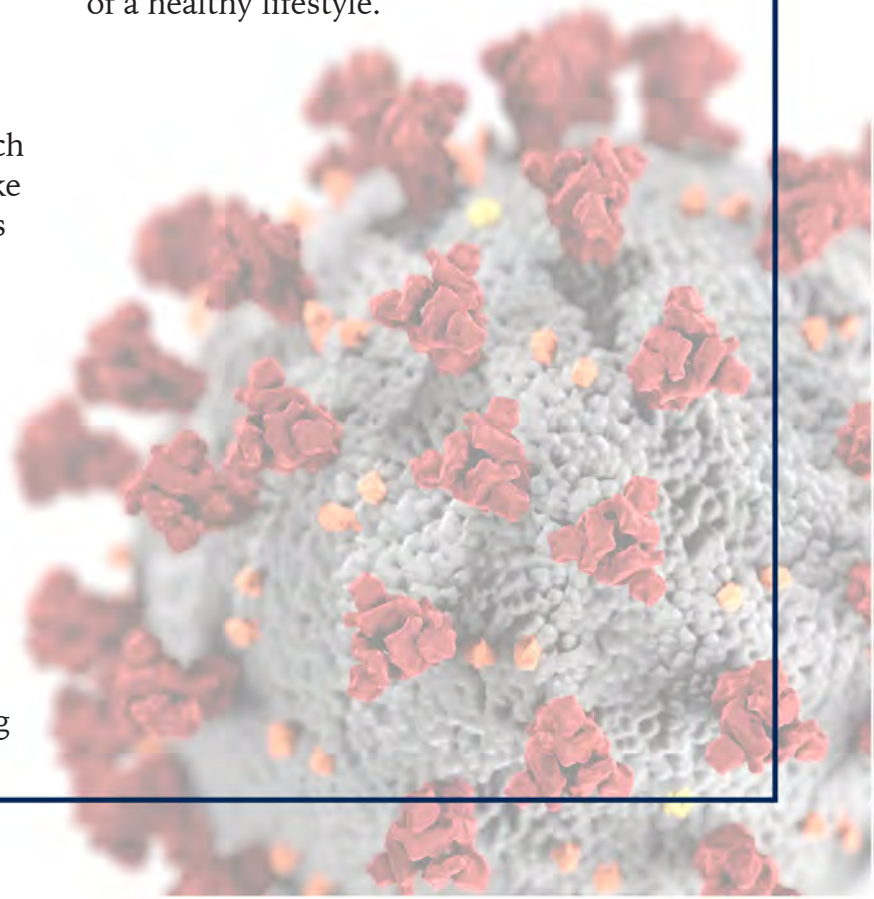
## COVID-19 and pest management

Shortly after publication of the winter 2020 issue of “IPM Chronicle,” the coronavirus became a pandemic impacting all walks of life. By the time this issue is released, hopefully, the peak period of this crisis is over and we are on a path to a slow, but steady, recovery.

Hippocrates once said that food can be considered medicine for the body. The human body is equipped with an immune system to help combat microorganisms, such as viruses and other extraneous particles like allergens. Gardening could be considered as the perfect antidote to raise healthy food, while also providing beneficial exposure to the outdoors – not to mention the physical activity involved in doing so.

Amidst the uncertainty of the current pandemic, the therapeutic effects of gardening can be a welcoming distraction, as well as an opportunity to integrate different methods of pest management into your gardening routine. Engaging in gardening activities, such as pulling weeds, removing insect pest egg masses, discarding

debris that is a potential disease inoculum, or employing other physical and cultural methods, reduces our dependence on pesticides – bringing about positive indirect benefits for our health and environment. Setting aside time to garden could be one of the most rewarding ingredients of a healthy lifestyle.



## Weed management in organically grown vegetables

Weeds compete with vegetables, reducing yield or affecting crop quality. Certain weeds also serve as alternate hosts for disease pathogens. Weed management is easiest to accomplish and most critical early in the season when the crop is young and actively growing.

Weeds emerge from seeds or vegetative propagules present in the soil. Preventing deposits of seeds and/or vegetative propagules is key to managing weeds long term. To do this, sanitize areas adjacent to the garden and ensure that materials brought into the garden are free of weed propagules. Also, keeping the soil covered using a cover crop or mulch material can reduce deposition of weed seed into the soil. Allowing the weed seed bank to deplete over a period of two years can greatly reduce future weed populations.

### Cultural control

Cultural methods to manage weeds involve manipulating practices to favor the crop. Cover crops suppress germination of certain weeds and keep soil covered preventing the germination of certain others. Fast-growing cultivars of certain vegetables planted at closer row spacing also can reduce weed establishment.

### Physical/mechanical control

Physical or mechanical methods involve the use of various materials to reduce weed competition. Applying a suitable mulch during the growing season is a common practice of excluding light to control weeds. Mulches used include straw, newspaper, plastic mulch and grass clippings. These mulches also may help conserve soil moisture.

Based on research at West Virginia University, 6-mil black plastic mulch was determined to be most effective in weed management, followed by 4 inches of straw mulch spread over two layers of newspaper. If using straw or lawn clippings, make sure it was not previously treated with herbicides. Do not use pine needles as mulch because certain chemicals in the needles can affect crop growth. Early mulch application can delay soil warming, so a light cultivation is recommended when the vegetables are later mulched.

Hand-weeding or simple machinery also can be used for weed management. The stale seedbed strategy (cultivating seedbed ahead of time) followed by a secondary cultivation or flaming to kill germinated weeds prior to planting partially depletes weed seeds already present. Specialized cultivation tools, such as finger-weeders, rolling cultivators, brush hoes and



Figure 1. Plastic mulch used to control weeds also may help conserve soil moisture. (Photo credit: R. Chandran)

flex-tine harrow also are effective. Tilling at night has been shown to reduce germination of certain weed species, such as pigweed and giant foxtail, but not others. Tilling soils where perennial weeds are present can do more harm than good, because tilling can chop vegetative propagules into tiny bits spreading them and aggravating the problem.

Natural products, such as vinegar (with a concentration of 12.5% acetic acid), effectively control young broadleaf weeds; but do not control grasses, perennials or larger broadleaf weeds. Droplets of vinegar coming into contact with the plant stem can result in crop injury; therefore, use a shielded sprayer if spraying within rows.

Emerged annual weeds may be easily removed mechanically during the early stages of growth. Use a sharp hoe to help reduce weeding efforts. Growing points of grasses are at or slightly below the soil surface and must be removed for successful control. When flame cultivation is carefully carried out, it is effective in killing young annual broadleaf weeds.

Another physical method is solarization, where clear plastic mulch is used to cover moist soil for 4 to 8 weeks allowing the heat generated by the trapped light to kill weed propagules. However, intense sunlight and duration are required to make this technique work, limiting its usefulness in temperate regions. Similarly, other thermal methods using hot water or steam have been experimented with resulting in limited success.



## West Virginia snakes and staying snake-safe

As the weather warms and more West Virginians are venturing outside, keep in mind that snakes also are on the move. Despite what many people think, the majority of snake species found in West Virginia are nonvenomous. Of the roughly 20 species of snakes found in the state, only two species pose any threat to humans; the northern copperhead and the timber rattlesnake.

Telltale signs of a venomous snake are an arrowhead-shaped head and vertical, elliptical pupils – rather than the round pupils of nonvenomous snakes. Unfortunately, many snakes are needlessly killed due to misidentification and a common fear of snakes.

### Northern copperhead

The northern copperhead boasts an hourglass-like banding patterns on its body and a copper-colored head. Northern copperheads have been known to dwell in places such as forest-field edges, hedgerows, suburban woodlots, ravines along creeks in agricultural and urban areas, upland rocky areas, rock walls and woodpiles, as well as around barns and houses in forest and agricultural areas.

### Timber rattlesnake

The most distinguishing features of the timber rattlesnake are the rattle on its tail and dark, chevron-shaped bands along the length of its body. Timber rattlesnakes typically prefer to hang out in forested areas with rock outcrops, rock ledges or steep slopes.

### Snake safety

If you have brush piles, debris or any tin or metal lying in your yard, it may attract snakes because they like to find cover. Also, be alert around old barns or any old structures where snakes can hide and find small mammals for food. Signs of a snake inside a dwelling, barn or other structure include shed snake skins, snake droppings (characterized by hair and bone contents) or strange noises in the walls or vents.

To be snake-safe when hiking, wear boots and long pants. Consider using a walking stick to hit any brush before walking through it. When crossing a log, step on the log first and then step over it to avoid startling a snake that may be lying on the opposite side. If rock climbing, be aware of where you put your hands.

Rocks provide great thermal environments where cold-blooded snakes like to bask. Also, campers should avoid setting up camp around brush, as snakes tend to dwell under the cover of leaves and in thickets.

### Encountering a snake

If you come across a snake, it's best to leave it alone. If you must examine it, do so from a safe distance. Snakes can only strike about one-third to one-half of their body length, so use common sense when inspecting a

snake. If the snake you encounter appears aggravated, back away and try to find a route around it. Don't try to pick it up, capture it or step on it, because these actions may provoke it to strike. Most often, snakes only strike if they feel threatened or cornered. If you need to move a snake, use a long stick to move it or shoo it away; if you give it an escape route, a snake will take it.

Agitated timber rattlesnakes make a rattling sound as a warning. While copperheads don't have a rattle, they still may "rattle" to threaten would-be attackers by repeatedly striking the tip of their tail on leaves and other debris.

If you need help removing a snake from your home, contact the local nuisance wildlife control operator or the local office of the West Virginia Division of Natural Resources.

### Snakebites

If a snake ever bites you, try to remain calm (which is easier said than done) because an increased heart rate will cause the venom to circulate faster. Contact your local health care provider or 911 if you think you've

– continued on page 5 –



Figure 2. WVU Extension Service's Sheldon Owen introduces a corn snake to his daughter Alden Owen. (Photo credit: Sarah Owen)



## Nostoc: The slimy stuff growing on driveways

“What is that slimy stuff growing on my driveway?” is a question the WVU Plant Diagnostic Clinic has been receiving more frequently over the years. Even though people most often see it on paved or gravel driveways, it is not uncommon to see the slimy matter growing in other habitats, such as lawns, landscapes, horticultural fabrics or ground covers in nurseries that receive irrigation from a sprinkler. It is quite the nuisance to people, because it’s unsightly and it’s a walking hazard due to its slippery surface.



Figure 3. Nostoc growing on an abandoned gravel driveway. (Photo credit: MM Rahman)

Depending on the weather conditions, the growth and color of the matter can widely vary. It easily can be confused with common algae or moss, and it’s commonly known by people as blue green algae.

### Identification

In fact, the slimy substance is Nostoc, which is a genus of cyanobacteria found in various environments. It forms colonies composed of filaments resembling a string of beads in a gelatinous sheath.

These bacteria contain photosynthetic pigments in the cytoplasm that they derive energy from by performing photosynthesis. They also can fix nitrogen from the environment.

### Environmental conditions

There are quite a few species under the genus Nostoc that can be found in soil, on moist rocks, at the bottom of both freshwater and saltwater lakes and springs, and occasionally in marine habitats. It also may grow symbiotically within the tissues of plants. However, Nostoc commune is the most

predominant species found in terrestrial environments, such as concrete or gravel driveways, lawns and landscapes.

High rain accompanied by high temperatures and high humidity supports the rapid growth of Nostoc. When dry, it is barely noticeable, forming dark, flaky, paper-like sheets. Even though a Nostoc colony typically goes unnoticed during dry conditions, take a closer look after it rains when the colony swells up into a conspicuous jelly-like mass – especially, if you want to make sure the bacteria is completely killed after an eradication treatment has been implemented.

Although most species of Nostoc contain chlorophyll ‘a’ showing the green color, some species possess other pigments making the Nostoc appear light green, brown, yellow, black or even red. Therefore, when it comes to identification purposes, one color cannot be exclusively considered by default.

### Control

With the growth of Nostoc being supported by moist habitats, management options range from improving drainage to preventing irrigation water from reaching the affected areas. This step is specifically important to keep the growth of the bacteria under control for the long-term.

In addition to the cultural control of moisture management, the removal of small infestations with a shovel enhances the effectiveness and prevents the bacteria from growing back. Raking is not recommended, as that just breaks up the filaments and spreads it further; however, cultural controls may not be suitable for every area. In those situations, chemical control can be essential to get rid of the initial infestation, while additional work can be done to prevent the problem from recurring.

A combination of cultural and chemical control provides the best results when managing Nostoc. Baking soda (sodium bicarbonate) and copper sulfate (pentahydrate) are both effective in controlling Nostoc. The herbicide Scythe (pelargonic acid) is known to have better efficacy than baking soda or copper sulfate.

If Scythe needs to be applied in a nursery or landscape environment, care should be taken to avoid spray drift onto desired plants, as pelargonic acid is a broad-spectrum herbicide. These products should be applied in a dry condition to ensure better absorption by the Nostoc for better long-lasting control.



## What is the reasoning behind painted tree trunks?

Painting tree trunks, particularly of young trees, is an old technique to protect trees from a variety of damage. It can minimize sunburn and prevent injury from cracking and bark splitting due to overheating during the day and sudden temperature drops at night. This phenomenon is known as winter scalding, or south-west injury.

In late winter when the trees are entering ectodormancy and the chill-accumulation requirements are satisfied, changes in the environment driven by rising temperatures will trigger movement in the plants.

Warm weather spells during that time can lead to tree overheating, particularly at the south-west side, inducing water uptake and movement through the xylem. This makes the tree extremely vulnerable to freeze injury if there were to be a sudden temperature drop between the end of winter and the beginning of spring.

### Preventing freeze injury and sunburn

To prevent freeze injury, it is important to keep the temperature variances to a minimum. This is where whitewashing or painting the trunks white comes into play. The white color reflects the sun rays and keeps the tree trunks cool; thus, making the trees less susceptible to splinting and cracking.

During summer months, trees are painted to protect them from sunburn. This type of injury allows the introduction of many opportunistic diseases and insects.

### Recommended paint products

There are several products that could be used when whitewashing or painting tree trunks. The most



*Figure 4. Painting tree trunks white helps prevent freeze injury by keeping temperature changes to a minimum. It also prevents sunburn by reflecting sun rays and keeping trees cool. (Photo credit: R. Chandran)*

common are lime (calcium hydroxide) and white or light-colored diluted latex paint. Latex paint should be used at a 50:50 ratio – equal parts paint and water. Never use oil-based paint, because it will clog the lenticels and will not allow the tree to respire.

There are some other organic options offered by IV Organics, such as the 3-in-1 Plant Guard designed to prevent summer sunburns, winter scalding and also serves as a rodent-deterrent. It has iron oxide, limestone, mica, milk and silica with an active ingredient mix of aromatic oils (cinnamon, clove, peppermint, rosemary, spearmint and castor oil).

For more information on preventing sunburn and winter scalding, contact WVU Extension Service Consumer Horticulture Specialist Mira Danilovich (304-293-2620; [Mira.Danilovich@mail.wvu.edu](mailto:Mira.Danilovich@mail.wvu.edu)).

## West Virginia snakes and staying snake-safe – continued from page 3 –

been bitten by a venomous snake. Also, try to get a photo or a good look at the snake that bit you so that doctors will be able to identify which anti-venom to administer.

Venomous snakebites will be accompanied by swelling, intense pain and discoloration. Seek medical attention immediately and refrain from lifting the wound above your head. If bitten, never try to cut the skin or suck the venom out with your mouth. Also, do not apply a tourniquet. These practices do not work and are

no longer recommended by doctors. If you are in the woods, hike to the closest inhabited area to seek help. In extremely rare cases and if left untreated, venomous snakebites can be fatal.

Remember, snakes play an important role in West Virginia ecosystems. If you leave them alone, they will return the favor. For more information on snakes, contact Sheldon Owen, WVU Extension Service wildlife specialist at [sheldon.owen@mail.wvu.edu](mailto:sheldon.owen@mail.wvu.edu).

## Tomato brown rugose fruit virus: A concern for tomato and pepper growers

Tomato brown rugose fruit virus (ToBRFV) is a new virus affecting tomatoes, peppers and other related crops. This virus first appeared in Israel in 2014 and has since been identified in the United States, as well as several other countries.

To protect the U.S. tomato and pepper production, the United States Department of Agriculture-Animal and Plant Health Inspection Service released a federal order in November 2019 that imposes restrictions on imports of tomato and pepper seed lots, as well as transplants including grafted plants from all countries where the virus exists. These restrictions include proof the seed lots, transplants and fruit are tested and certified free of the disease. In addition, APHIS and the U.S. Customs and Border Protection have increased inspections of tomato and pepper seed, plant and fruit imports.

### Tomato brown rugose fruit virus

Tomato brown rugose fruit virus is in the same group as tobacco mosaic virus (TMV) and tomato mosaic virus (ToMV). Unfortunately, plants that carry the resistance to those viruses do not provide resistance to ToBRFV; however, peppers with tolerance to TMV and pepper mild mottle virus do show some tolerance. Currently, there is no genetic resistance available to combat the virus.

### Symptoms

If plants are infected with ToBRFV, the leaves will be deformed and crinkled along with mottling, flecking chlorosis and/or necrosis.



Figure 5. Symptoms found on the fruit include discoloration and rough brown patches or ringspots. (Photo credit: [https://commons.wikimedia.org/wiki/File:ToBRFV\\_Tomato\\_Symptoms01.jpg](https://commons.wikimedia.org/wiki/File:ToBRFV_Tomato_Symptoms01.jpg))

Symptoms also may be found on the fruit. These include discoloration and rough brown patches or ringspots with possible irregular shapes, as well as a reduction in yield.

### Control

Management practices to control the spread of ToBRFV are similar to that of other viruses. Start with using a high degree of sanitation to control the virus by avoidance. The most important step is planting disease-free seed or seedlings. This is especially important with ToBRFV, because

the disease is found in the sap of plants, as well as the seed, and easily can be spread using contaminated tools or staff handling infected seeds, plants and/or fruit.

Recommendations include starting with certified seed from a reputable dealer, having your staff wash and sterilize hands and tools more often, and disposing of symptomatic plants.

Due to the restrictions with importing seed lots and transplants (which includes grafted plants), consider contacting your sales representative to determine what varieties will be available for your operation.

#### About IPM Chronicle

Rakesh S. Chandran,  
IPM Chronicle Manager  
304-293-2603

#### WVU Extension Service Contributing Authors:

Rakesh S. Chandran,  
Weed Scientist and  
IPM Program Coordinator

Mira Danilovich,  
Consumer Horticulturist

Sheldon Owen,  
Wildlife Specialist

MM (Mahfuz) Rahman,  
Plant Pathologist

#### Other Contributing Authors:

Barbara E. Liedl,  
Associate Professor,  
Plant Breeding and  
Genetics; West Virginia  
State University

#### WVU-ES Creative Team:

Greg Jacobs,  
Graphic Designer  
Lindsay Wiles, Editor

This work is supported by the Crop Protection and Pest Management Program [grant no. 2017-70006-27157/project accession no. 1014109] from the USDA National Institute of Food and Agriculture (NIFA).

WVU is an EEO Affirmative Action Employer. Underrepresented class members are encouraged to apply. This includes: minorities, females, individuals with disabilities and veterans.

The WVU Board of Governors is the governing body of WVU. The Higher Education Policy Commission in West Virginia is responsible for developing, establishing and overseeing the implementation of a public four-year colleges and universities.

Trade or brand names used in this publication are for educational purposes only. The use of such product names does not imply endorsement by the WVU Extension Service to the exclusion of other products that may be equally suitable.

Reasonable accommodations will be made to provide this content in alternate formats upon request. Contact the WVU Extension Service Office of Communications at 304-293-4222. AG20-25