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In This Issue:

Be on the lookout for fall armyworms

Fall armyworms are insects of the order Lepidoptera, and they undergo complete metamorphosis. They fly from the south to West Virginia in late June. Shortly after, eggs are laid on the undersides of plant leaves, tree trunks, tree limbs and other structures near suitable host plants. Fall armyworms often go unnoticed, but some years they develop in large numbers causing severe damage to turf, forage grasses and pipeline vegetation cover.

Host

Fall armyworms feed on more than 80 plant species but prefer grasses. The insects damage field crops, including alfalfa, barley, bermudagrass, buckwheat, clover, corn, oats, millet, sorghum, sugar beets, sudangrass and soybeans. They occasionally injure apple and peach trees, grapevines and strawberry plants.

Figure 1. Fall armyworm larva. (Photo credit: Elizabeth Rowen)

Damage

While fall armyworm pupae and adults don't cause damage, the larvae feed as a group and can devour an entire lawn or hayfield in a few days. Damage is caused by the larvae chewing on the plant tissues. The grass may seem to thin out and develop brown spots. This appearance is the result of grass plants rapidly dehydrating after damage; hence, the injury often resembles drought damage. Feeding is reduced in the fall when the insects die in the first frost.

Monitoring

The larvae have a white inverted "Y" mark on the front of the dark head. They vary from light tan to black with three light yellow stripes down the back. There is a wider dark stripe and a wavy yellow-red blotched stripe on each side. Adults have dark gray, mottled forewings with light and dark splotches and a white spot near the end of each.

Scouting for fall armyworms varies depending on the crop. For example, scouting in corn is only necessary in fields where larvae or their damage are noted. Treatment is needed when 10% of the plants are infested. In contrast, treatment in turf is recommended when more than three worms are found in a square-foot area. It is recommended to use an insect net for monitoring and mow prior to treatment.

Management

Insecticides are only necessary during outbreaks or when populations are above economic threshold. Varying active ingredients effectively kill fall armyworms. Spinosad, chlorantraniliprole, azadirachtin, pyrethrins, neem oil and methoxyfenozide are reduced-risk insecticides labeled for use against this pest. Products with the active ingredient Bacillus thuringiensis can be used to control the younger larval instars. Other active ingredients, such as cyfluthrin, bifenthrin, carbaryl, malathion and lambda-cyhalothrin, also kill fall armyworm; however, these broad-spectrum insecticides can be harmful to beneficial organisms.

Many of products are commercially available, but laws indicate that the application site must be listed on the label so be sure to read and follow label directions.

American beaver management

The American beaver *(Castor canadensis)* is the largest rodent in North America. Its body can measure 2 to 3 feet in length with a vertically flattened tail (paddle-shaped) that can reach 1 foot in length.

Beavers have reddish brown pelts and weigh between 30 to 70 pounds. Their back legs are larger than their front legs making movement on land somewhat awkward; however, beavers are excellent swimmers and quite adapted to a semi-aquatic existence (Figure 2).

Figure 2. The American beaver is the largest rodent in North America. Their back legs are larger than their front legs making movement on land somewhat awkward; however, beavers are excellent swimmers.

Habits

Beavers primarily feed on the bark of trees but also will eat aquatic plants and agricultural crops.

They are amazing environmental engineers. The dams they build of sticks, limbs, trees and mud provide them protection from terrestrial predators and create flooded areas that provide access to more food (Figure 3). Beavers occupy much of the forested U.S., damming suitable rivers, streams, ponds and creeks to produce their aquatic homesites.

Population

Historically, beavers were used for food, clothing and trade. Due to overharvest in the early to mid-1800s, beavers were eradicated from much of their land. It is believed that the original beaver populations were wiped out of West Virginia around 1825.

For about 100 years, West Virginia lost this species from the landscape, and the first colony was not reported back in West Virginia until 1922.

Restocking efforts to reintroduce beaver to West Virginia began around 1930. Through these restocking efforts, regeneration of forests and management actions, beavers can now be found in all 55 counties of West Virginia.

Damage and management

Beaver-created wetland habitats provide significant benefits to the environment and other wildlife species; however, the building of dams and beavers' feeding behaviors can cause damage to trees, crops, roads and bridges.

In these nuisance situations, landowners can exclude beavers from chewing on trees by wrapping the trees in hardware cloth or establishing heavy duty fencing around trees or culverts.

Landowners also can continuously remove beaver dams to lower water levels, which might encourage beavers to move to new areas. Landowners also may install water control devices to maintain water levels, while allowing beavers to remain on location (Figure 4).

Unfortunately, both continuously removing dams and installing water control devices may not be 100% effective in alleviating beaver problems, so lethal control may be needed.

West Virginia has a regulated trapping season for beaver that normally runs from early November to the end of March. Outside of trapping season, landowners must obtain a permit to legally trap and remove beavers.

Remember, in West Virginia wildlife cannot be removed from one location and released in another. Contact your regional West Virginia Division of Natural Resources office to find more information on removing nuisance beavers.

Figure 3. Beaver dams are made of sticks, limbs, trees and mud.

Figure 4. A pond leveler can be used to maintain water levels allowing beavers to remain on location.

Plant disease forecasting: An advanced IPM tool

Plant diseases occur on susceptible plant varieties in the presence of aggressive disease-causing organisms under favorable weather conditions, such as moderate to high temperature and rain/high humidity that keeps the surface of plant foliage wet. The amount of time foliage remains wet after each wetting event is referred to as wetness hours. The presence of tiny water droplets on leaf surfaces not only ensures the survival of the pathogen propagule, but it also helps in germination and infection of the host by the pathogen.

In addition, rain splash contributes to the dispersal of many plant pathogens. A cloudy overcast sky with high humidity prevents pathogens from drying up, and ultraviolet radiation induced death of pathogen propagules during their movement in air. Thus, environmental factors, especially temperature, rain, humidity, cloudiness and direction of air movement, play a critical role in determining whether a disease will occur and how severe it may be.

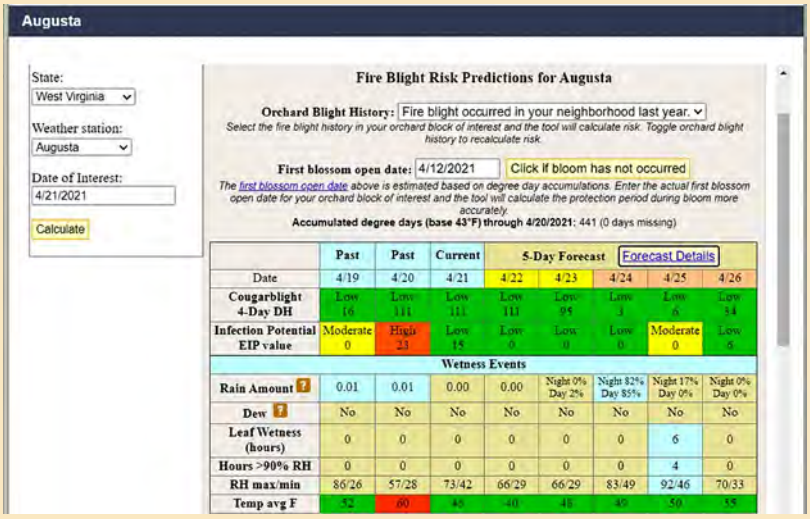

Figure 5: An output from running the fire blight model in Network for Environment and Weather Applications may show the risk of infection and need for spraying as shown in red.

Decision-support systems

Based on the short-term forecast of prevailing weather conditions, scientists are now capable of providing predictive tools on diseases and pests so that managers of large agricultural enterprises and growers can make informed decisions on the kind of action they should take. This has become possible through the application of new information and communication technologies, as well as the use of modern big data analysis techniques.

In a decision-support system, decision makers utilize models that can be fed with current or near future weather parameters to determine disease risk. Decision-support systems have helped growers precisely develop their spray schedule for managing diseases. A few examples of these systems include a web-based advisory system for fire blight of apple *(http://newa.cornell.edu/index.php?page=apple-diseases)*, strawberry anthracnose and gray mold *(https://edis.ifas.ufl.edu/publication/AE450)*, Fusarium head blight of wheat *(www.wheatscab.psu.edu)* and Asian soybean rust *(www.sbrusa.net)*.

Plant disease forecasting has now become a popular tool in the management system used to accurately predict the occurrence or change in plant disease severity. Economic decisions about treatments for disease control are made by growers at the field scale, which saves money and the environment, and more important, makes the disease management and crop production more sustainable.

How it works

Plant disease prediction models process three input parameters: weather data, image processing and data originating from various heterogeneous sources. However, most of the research employed data collected from various sources, because a variety of economically important diseases were influenced by growing season weather conditions.

Weather data is recorded in customized weather stations that are connected to a network like the Network for Environment and Weather Applications *(http://newa.cornell.edu/)*. This network was developed by Cornell University in 1995 and is operated by the New York State Integrated Pest Management program. Weather stations are set up in an orchard or crop field by farmers, commodity groups, agricultural industries, private consultants or state land-grant universities that are capable of uploading data to a network using either an Ethernet or cellular telemetry connection. Sensors are connected to weather stations that measure temperature, humidity, rainfall, leaf wetness, wind speed and direction data every 15 minutes.

Network for Environment and Weather Applications deliver weather data from weather stations to a website, which then calculates and displays weather data summaries and integrated pest management forecast model results when requested by an authorized user (Figure 5).

Did you know fruits can have twins?

If you look closely at your cherries, plums or apples, you may notice some strange looking twin fruit. The immediate question that comes to mind is why did it happen?

This is one of several physiological disorders seen in fruits, like split or shattered pits, button fruit and blind wood, as well as double fruit and cleft suture.

Figure 6. Double fruit in apple. (Photo credit: M. Bulatovic-Danilovich)

Fruit formation

Genetics are not the only thing that has a profound influence on fruit formation; environmental conditions, primaril temperature during the flower bud initiation, hormonal levels, carbohydrates and plant growth regulators, also play a part in the formation.

Floral initiation is just the beginning of the two-year process of flowering and fruit development that ends with the harvest. High temperatures in the early stages of flower bud initiation, pistil and stamen primordial development lead to the reduced activity of enzymes and disturbed metabolic activity – both of which play a major role in determining what type of tissue the uncommitted meristem will become.

Figure 7. Cleft suture with the spur-like smaller fruit of the two, which developed from double pistil. (Photo credit: M. Bulatovic-Danilovich)

Twin fruits

High temperatures during that period (≥ 95 F or 35 C) cause double pistil formation, and consequently twin fruits (Figure 6). In cherries, double fruits develop in such a way that one is very small and spur-like creating the cleft suture (Figure 7).

Bud differentiation takes place in June to early July, approximately six weeks after the full bloom. It is important to mention that the high temperature does not have any effect on double pistil formation if the exposure to the high temperature occurs either before or after the bud differentiation.

Certain cultivars are more prone to this anomaly. With warmer temperatures and apparent climate change, expect to see more of this type of disorder.

While interesting, unfortunately these fruits are not marketable. Having a high percentage of double fruits can and will have a negative impact on the sales and the producer's bottom line.

Figure 8. Unequal size twin apple fruit from the Dabinett cultivar. This anomaly where the small, spur-like fruit shares the stem with the larger fruit is most often found in cherries and plums – not in apples. (Photo credit: M. Bulatovic-Danilovich)

Common groundsel

Common groundsel *(Senecio vulgaris)* is a weed encountered in landscapes during the early spring and fall months. It begins to germinate and bloom following the first few weeks of warm weather, which typically is from mid-March to early April in many parts of the state. Common groundsel is an annual weed that belongs to the aster family (Asteraceae) but can behave as a winter annual or as a summer annual. It completes three to four generations during a year with blooms in the late summer and fall months. While it is considered to have originated in Northern Africa or Eurasia, it is a cosmopolitan weed globally.

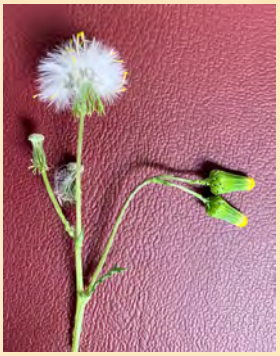

Figure 9. Common groundsel in bloom. (Photo credit: R. Chandran)

Identification

Common groundsel usually is seen in gardens, along roadsides and in fallow fields. The leaves of common groundsel are oval or lance-shaped with deep lobes and toothed margins. Shortly after emergence, it produces tiny flowerheads with yellow ray florets enclosed in cup-shaped sepals. Mature seeds are soon formed with a pappus of hairs (resembling dandelions but smaller) that easily can detach from flowers to be dispersed by wind (Figure 9).

Groundsel spends about one-third of its total energy toward seed production. Seeds do not persist in disturbed soils for more than two years; however, in undisturbed soils, they can thrive for more than six years. The root system is shallow with a short taproot and branched fibrous roots. The weed prefers moist soils and is seen during both spring and fall months.

As an herb, common groundsel has been documented to be an anthelmintic, diuretic and to treat certain sicknesses of the stomach.

Control methods

During early stages of growth, the shallow root system can be taken advantage of by hand-weeding or mechanical control. Mechanical control is effective when carried out before the flowers open. Opened flowers are known to form viable seeds, even after the plant is killed by cultivation or by an herbicide. Other physical control methods may include applying mulches prior to seed germination.

Biological control is not widely adopted, although certain organisms, such as the cinnabar moth larvae *(Tyria jacobaeae)* and ragwort flea beetle *(Longitarsus jacobaeae)*, have been documented to be herbivorous. Groundsel plants infected by rust *(Puccinia lagenophorae)* can be killed through secondary inoculation with a fungus *(Botrytis cinerea)*.

Chemical control options prior to germination of common groundsel in landscape ornamentals include indaziflam (Specticle, Marengo), flumioxazin (Broadstar) and oryzalin+oxyfluorfen (Rout).

Apart from directed (spot) application of glyphosate, flumioxazin also can be used to control emerged groundsel in landscapes (Figure 10). When applied prior to germination, the herbicide isoxaben (Gallery) can be used to control this weed in cool-season turfgrasses.

Figure 10. Common groundsel in the landscape. (Photo credit: R. Chandran)

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