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UTAH PESTS QUARTERLY

NEWSLETTER

Utah Plant Pest Diagnostic Laboratory

USU Extension

IN THIS ISSUE

NEW FACT SHEETS

Recognizing Wood Decay in Trees

Winter is the perfect time for arborists and homeowners to prune trees. At that time, defects are visible in the tree structure, especially those caused by wood decay fungi. Understanding how to identify whether decay is present, and the hazards associated with it, will help avoid accidents.

"Decay" is a term that describes wood that is being broken down by the "feeding" action of microorganisms, particularly fungi. Wood decay can occur in any healthy tree, but is most common in older, established trees, and may affect wood in large roots, trunks, and branches.

Decay may be obvious when conks or mushrooms are present on the bark surface. These structures are called fruiting bodies and are only formed under optimal weather conditions (cool and wet or warm and wet). Their presence indicates that the actual body of the fungus (called a "thallus") has already colonized a considerable portion of the wood. When no fruiting bodies are present, decay may not apparent from the outside of the tree, and only detected after a branch falls or after a pruning cut reveals it.

Most wood decay fungi colonize stems or roots of trees when spores land on wounds that expose sapwood or heartwood. Wounds come in many forms, including small scrapes that remove bark, fire scars, canker-causing pathogens, insect feeding, ice damage to branches, poor pruning cuts or arboricultural treatments such as drilling into stems when cabling, bracing, or injecting trees.

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Examples of Wood Decay Fungi

The fruiting body on the surface of the bark will give an indication of the type and amount of wood decay.

The woody conk of *Fomitopsis pinicola* is also known as red belt fungus. It causes a brown cubical rot of aspen and conifers.

Phellinus is a genus of many destructive species, causing a white rot of deciduous and coniferous trees.

Armillaria mellea is known to cause a tree-killing root rot, but it can also cause a white-rot of the trunk and branches, depending on where infection occurs. Urban trees stressed by drought or other disturbances are most susceptible.

The fruiting body of *Ganoderma applanatum* is called artist's conk because etchings on the spore-side of the conk turn black. It is a common fungus, causing a white rot of deciduous trees. On oaks, the presence of a conk is associated with extensive internal decay.

- The fruiting body of *Fomes fomentarius* is called tinder conk. This fungus causes a white, spongy, mottled heart rot, primarily of birch.
- Several species of *Inonotus* cause a white rot on branches, trunks, and roots of several deciduous trees, including oak, maple, and walnut.
- *Laetiporus sulphureus* (chicken of the woods) is an edible conk, and its presence indicates extensive brown, cubical rot.
- *Phaeolus schweinitzii* causes Schweinitzii root and butt, a serious brown cubical rot of conifers.

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Types of Wood Decay

Depending on the decay fungus, it weakens wood by degrading either cellulose or lignin in cell walls. In wood fiber, cellulose is responsible for strength due to its linear orientation, while lignin holds fibers together and holds cellulose molecules together within the fiber cell wall. Because different fungal species may degrade different components of the wood fiber, not all decay is the same, and can be grouped into a brown, white, or soft rot.

Brown rots are most common in conifers (pine, spruce, fir). Brown rot fungi remove the cellulose components from cell walls and leave the lignin behind. This type of rot causes a rapid loss in wood-bending strength (the load that wood can withstand perpendicular to the grain), making the tree very unsafe. The residue from brown rot decay—often cubical and crumbly—is an important component of carbon sequestered in forest soil.

White rots are most common in deciduous trees, where the fungus consumes primarily lignin, followed by cellulose. Because lignin is dark-colored, its removal leaves the wood pale white in appearance, and the pattern of rot can appear pocketed, stringy, or laminated. White rot decay reduces compressive strength of wood (the load that wood can withstand parallel to the grain).

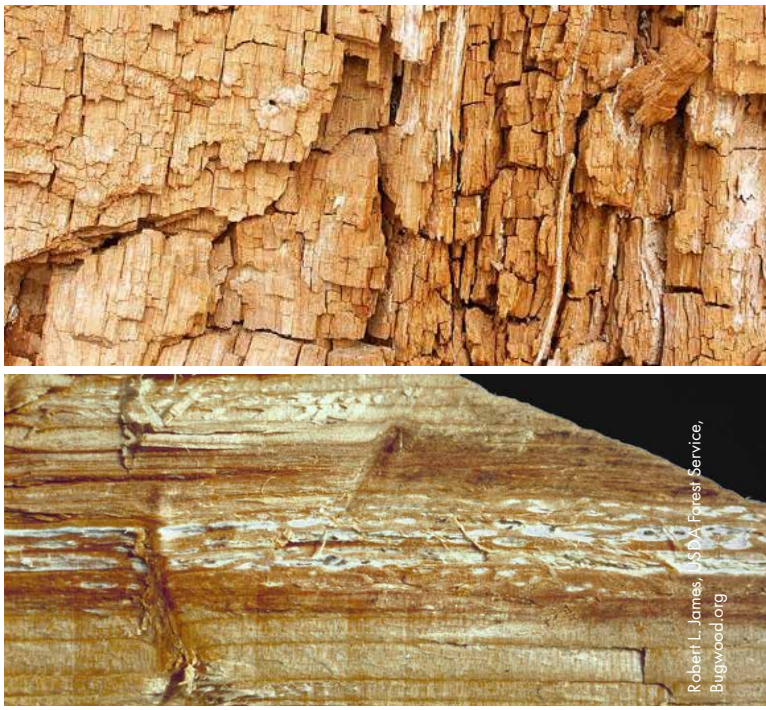
Soft rot fungi also degrade cellulose, but leave behind microscopic cavities in the secondary cell wall. Decayed wood appears straw-colored and looks very similar to white rot. The name is misleading because soft rot in living trees is not noticeably softer than other decay types.

Identifying Wood Decay

Wood decay primarily occurs within non-living, structural wood fibers and non-functional water-conducting tissues, and therefore does not directly affect the vigor of the tree. In addition, trees actively respond to injury and fight the colonization of decay fungi through a cascade of processes. However, the main issue with wood decay is the loss of tree strength and ability to withstand forces, such as wind. Therefore, trees should be carefully inspected before climbing, hanging ropes on branches, or installing furniture or games underneath.

Look for signs or symptoms of decay, including:

- conks or mushrooms (rarer to see in Utah)
- external cavities or visual evidence of decay in exposed wood
- old wounds, poor pruning cuts, and topping or heading cuts, which may or may not indicate that the wood has been colonized by decay fungi



Wood affected by brown rot fungi (***top***) is much weaker than wood affected by white rot fungi (***bottom***).

- activity or nesting of carpenter ants or birds (such as woodpeckers)
- stem bulges, swellings, or stem flattening, which are growth patterns of wood walling off or growing around decay

Determining the location of decay is important for arborists to understand which portion of the tree is affected.

- **Butt rot** decay occurs in the lower portion of the main trunk of the tree and sometimes on larger buttress roots. Trees with butt rot should be considered for removal if they are in high-traffic areas, and should never be climbed in windy conditions.
- **Sap rots** primarily decay xylem, but can also decay phloem and heartwood. Never tie a rope into a limb with evidence of sap rot.
- **Heart rot** decay may be restricted to the center of the trunk. Trees with heart rot are more structurally sound than trees with sap rot, but should never be climbed in windy conditions.

Marion Murray, IPM Project Leader

For more information

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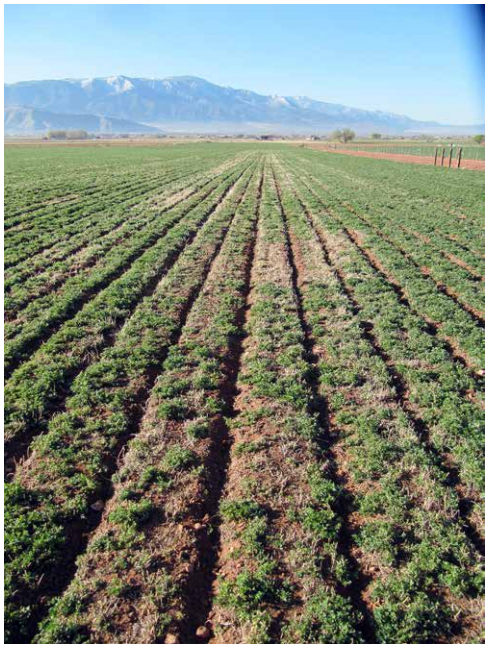
Blue Alfalfa Aphid Biology, Impact and Research in Utah

Steven Price is a USU Extension faculty member in the Carbon County office, specializing in Agriculture, Natural Resources, and 4-H.

Jody Gale is a USU Extension faculty member in the Sevier County office, specializing in Agriculture, Horticulture, and Agricultural Economic Development.

Aphids can be a major pest of alfalfa in Utah. They reproduce much faster than their predators, and can become a secondary pest after broad-spectrum insecticide applications reduce predator populations. The common aphid species observed in Utah alfalfa are pea aphid, cowpea aphid, spotted alfalfa aphid, alfalfa aphid, and blue alfalfa aphid.



Alfalfa stem infested with blue alfalfa aphid (***left***), and a Sevier County alfalfa field showing extensive aphid damage in 2018 (***right***).

Healthy alfalfa stands can withstand high populations of most aphid species. For example, the current treatment threshold for pea aphid is an average of 100 or more per stem when the alfalfa is more than 20 inches high. Below this number, yields are not reduced so much that insecticide treatments are warranted. However, blue alfalfa aphid damage is significant at much lower populations. Their saliva contains toxins which reduces alfalfa growth beyond typical feeding damage. It also causes residual stunting even after populations decline.

The treatment threshold for blue alfalfa aphid on alfalfa more than 20 inches high is an average of 50 per stem. For established plants under 10 inches, the threshold is 10 per stem. To determine the average stem count, aphids on 30 or more stems should be counted. To do this, stems are clipped at their base and vigorously shaken inside a white bucket to dislodge aphids. The total number of aphids are then counted within the bucket and divided by 30 to get an average. Multiple areas of the field should be sampled to develop a representative field average.

Cool late winter weather conditions are ideal for blue alfalfa aphids. They often colonize fields just as alfalfa is breaking winter dormancy, when plants are very susceptible to damage and predator populations are low. Feeding causes stunting, short "bushy" stems, stem mortality, and stand life reduction. Varieties highly resistant to blue alfalfa aphid can have low resistance expression this early in the growth cycle.

Producers have reported to us that traditional insecticides offer little control. Sivanto (flupyradifurone) is a systemic insecticide option that, while more expensive than other products ($36 per acre), has a different mode of action (classified as 4D) making it a useful tool to prevent insecticide resistance. It has also been reported to be less harmful to aphid predator populations which build later in the growing season.

In 2016, blue alfalfa aphid caused Sevier County alfalfa producers to lose an estimated $6 million. Producers had applied multiple insecticide treatments that did not work, resulting in a yield reduction to 1.5 ton per acre. This catastrophe, along with high populations of blue alfalfa aphid in 2017, led to a research trial to determine effective treatments.

A replicated research trial was established that included treatments of Sivanto at high (10 oz. per acre) and low (5 oz. per acre) label rates along with other products at recommended label rates (see graph, next page). Untreated control plots were included, and plant samples

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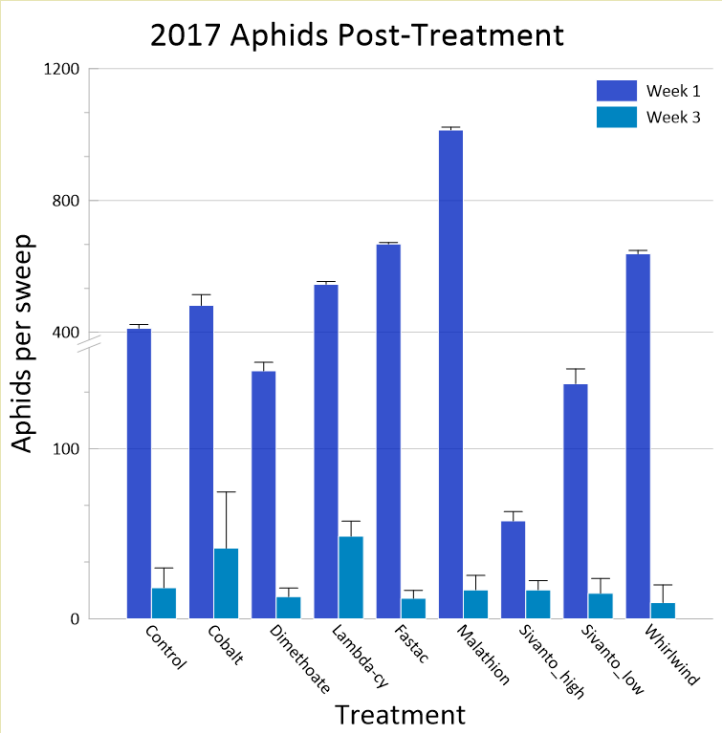
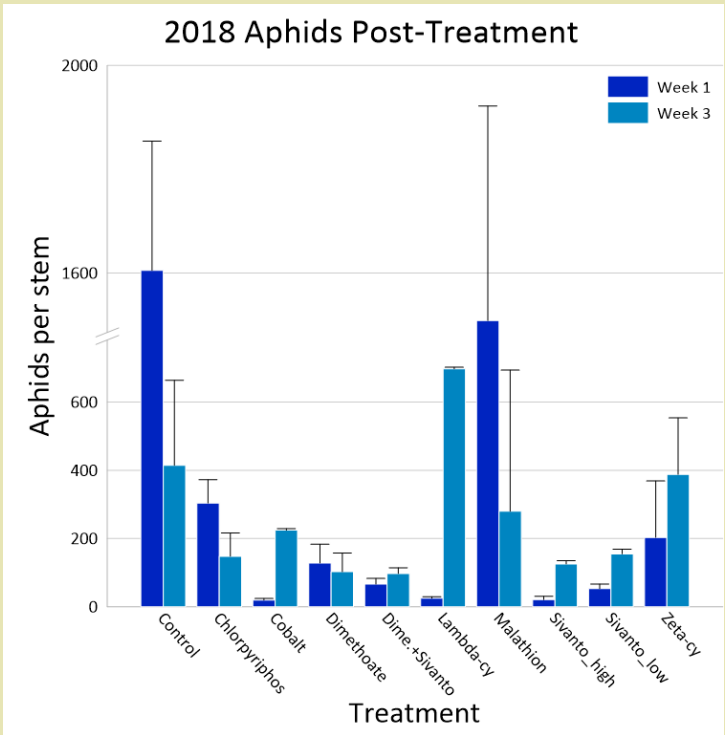




In the 2017 and 2018 insecticide trials, both the high and low rates of Sivanto performed well, with similar results to the more toxic insecticide, dimethoate.

In 2018, overall aphid numbers declined over the summer, so fewer differences were seen between products later in the season. Yields of alfalfa in the plots applied with both Sivanto rates and the dimethoate increased similarly (26.5% average) above the yield in the untreated plot.

were taken weekly to count aphids. Both the high and low rates of Sivanto performed similarly, and significantly reduced aphids by an average of 76% the first week after application, compared to the control. Dimethoate performed similarly to both rates of Sivanto. The first week post-treatment, other insecticides did not effectively reduce aphids, and the Malathion plots had significantly more aphids, which could be due to treatments reducing predators or resurgence, where stressed aphids produced more offspring than they would have otherwise. Aphid numbers dropped over the following two weeks and by the third week, no statistically significant differences between treatments were observed.

In 2018, the trial was repeated in a different field, with the additions of Mustang Maxx (zeta-cypermethrin) and a tank-mix of dimethoate and the low Sivanto rate as additional treatments. Again, the two rates of Sivanto produced statistically similar control (average of 94%) and were also similar to dimethoate. Tank-mixing dimethoate with Sivanto did not increase control. Some conventional insecticides, such as Cobalt (chlorpyrifos/lambda-cyhalothrin), exhibited excellent control in 2018 (98%) but not in 2017. Again, malathion plots had similar aphid numbers than the control by week three. In week three, Sivanto only averaged 80% control which was not significantly different compared to the untreated plots. However, both Sivanto rates and dimethoate applications increased yields similarly (26.5% average) above untreated plot yields.

While Sivanto performed moderately well in these trials, it is not a silver bullet, and research is continuing. In 2019, Transform (sulfoxaflor) was approved for use in Utah alfalfa but it has not yet been evaluated in the central Utah area. Producers should note that while reduced application rates may be more economical in the short-term, repeated use of any insecticide (particularly at reduced rates) can lead to resistance, which reduces its long-term value as a management tool.

Frequent monitoring for blue alfalfa aphid beginning early in the season at green-up and applying insecticides only when populations are above threshold can help prevent resistance in Utah. Natural enemy populations should also be considered as part of an integrated pest management program since aphid predators and parasitoids are still the best long-term solution to managing aphids.

For more information

USU Extension Fact Sheet: Aphids in Alfalfa

UC ANR Fact Sheet: IPM Pest Management Guidelines – Blue Alfalfa Aphid

Profile of a Commercial Nursery Using Biocontrol

Perennial Favorites has been operating as a wholesale nursery since 1992. Located just outside Layton, UT, the operation is home to 8 acres of outdoor production and 100,000 ft^2 of greenhouse space. The facility grows and sells over 1,800 varieties of perennials, 900 varieties of vegetatively-propagated annuals, 200 varieties of edibles (fruits and vegetables), and 150 varieties of ornamental grasses. Around 10 to 15% of the business is greenhouse production of vegetables for transplants that are sold in early spring to wholesale buyers ranging from small businesses to large corporate operations.

Bill Varga, an emeritus USU Extension horticulture agent, works with Tim Freeland, the IPM specialist at Perennial Favorites, to identify the best practices for the nursery. Varga and Freeland use action thresholds of pest injury or pest presence for decision-making. Varga calculates economic losses against the cost of control, and knows when to ignore minimal pest injury. Other factors that are used in decision-making include the plant aesthetics, customer preferences, and public perception. These environmental and social costs are just as important considerations in their pest control decisions.

For the last several years, various biocontrol options have been used in the edibles greenhouse at Perennial Favorites. Two practices have proven successful and have ultimately led to little to no use of pesticides.

- The use of **predatory mites** have controlled thrips, whiteflies, and pest mites. They are applied by the nursery staff before these pests reach damaging levels, either as sachets or in shaker bottles. Sachets are "rearing chambers" contained in a paper pouch, containing bran, mites that feed on the bran, and the predatory mite species that feeds on the bran mite. The sachets (example shown above) are hung on plants throughout the greenhouse, and the predatory mites emerge through a tiny hole in the sachet over a period of three to six weeks. When the preferred mite species is not available in a sachet, Perennial Favorites purchases bottles with a shaker lid, and shakes them directly onto plant foliage.

- **Parasitoid wasps** (*Aphelinus* and *Aphidius* spp.) have successfully controlled aphids in the greenhouse. The wasps kill aphids when the female lays a single egg inside an aphid, which hatches into a larva that consumes the contents of the aphid body. The larva then pupates into an adult wasp, turning the aphid into a dead, swollen "mummy" from which it emerges. Perennial Favorites purchases the wasps as pupae inside mummified aphids, sold in bottles mixed with wood chips. This mixture is then spread on rock wool slabs placed throughout the greenhouse or placed inside application boxes until the wasps emerge.

Varga knows there are major gains to be had as Perennial Favorites customers care about how their plants are managed and are willing to pay the price. To ensure these standards, random selections of plants sold from the facility are inspected by the Utah Department of Agriculture and Food for any signs of insect or disease damage.

—— Nick Volesky, Vegetable IPM Associate

For more information

Perennial Favorites Nursery (Layton, UT)
Video: How to Use Predatory Mites in Sachets (Koppert Biological Systems)
Video: How to Release Predatory Mites from a Bottle (Koppert)

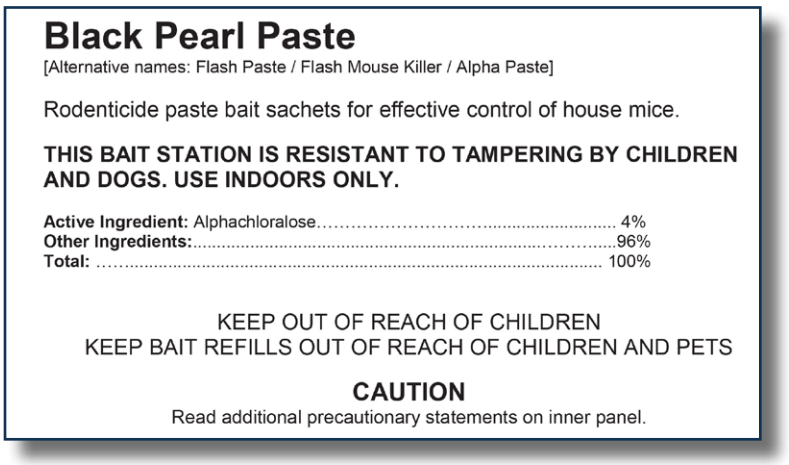
EPA Approves New Rodenticide

On November 19, 2019, something occurred for the first time in over 20 years – the EPA approved a new rodenticide, giving U.S. pest managers another tool to combat house mice. Alphachloralose represents a new class of rodenticide, added to the current list against house mice which include several non-anticoagulants and rodenticides in the first- and second-generation anticoagulants (see examples of each below).

While alphachloralose is new to the U.S. as a rodenticide, it has been used in Europe for years against house mice, as a sedative bait for pest birds to make them easier to move or kill by other methods, and on seed grain as a bird repellent. Due to its sedative properties, alphachloralose was also used in human medicine as an anesthetic, where it produced a stable, long-lasting (8-10 hours), anesthesia but did not prevent feeling pain (Flecknell and Wilson, 2015). Therefore, it was used in human surgical situations where non-painful procedures were used, and is still used in veterinary and animal research applications. As a central nervous system depressant, the drowsiness- and sleep-causing properties of alphachloralose are lethal to mice.

Prior to the approval of alphachloralose as a rodenticide in the U.S., the FDA had approved it for use by employees of USDA APHIS-ADC (animal damage control) to capture waterfowl, coots, pigeons, ravens, and sandhill cranes. It is also used by other certified employees of federal wildlife management agencies for similar purposes (Marsh and Salmon, 2010).

In mice, consumption of alphachloralose leads to a reduction in body temperature, respiratory inhibition, and death within a few hours, essentially, of hypothermia. The EPA states that alphachloralose–as formulated for sale as a rodenticide in the U.S.–is only lethal to small animals like house mice. Even if children or large animals were to ingest alphachloralose, they are unlikely to be affected by body temperature changes caused by this chemical. Because end-use alphachloralose products are required to be placed in tamper-resistant bait stations, the EPA expects non-target exposure to be negligible. It is important to note, however, that alphachloralose is acutely toxic to humans at doses of 1 g/kg body weight (Gerace et. al, 2012). As an example, a 150 lb person would have to consume 68 grams (about 2.4 ounces) of alphachloralose to achieve a lethal dose. The registered consumer product


Black Pearl Paste

[Alternative names: Flash Paste / Flash Mouse Killer / Alpha Paste]

Rodenticide paste bait sachets for effective control of house mice.

THIS BAIT STATION IS RESISTANT TO TAMPERING BY CHILDREN AND DOGS. USE INDOORS ONLY.

Active Ingredient: Alphachloralose..... 4%
Other Ingredients:.....96%
Total: 100%

KEEP OUT OF REACH OF CHILDREN
KEEP BAIT REFILLS OUT OF REACH OF CHILDREN AND PETS

CAUTION
Read additional precautionary statements on inner panel.

will contain 4% alphachloralose, having a maximum of 9.6 g alphachloralose, well below this lethal dose. The EPA approved registration of two products, Alphachloralose Technical and Black Pearl Paste. Alphachloralose Technical (90.27% alphachloralose) is only labeled for use in producing other end-use rodenticide bait products for the control of house mice indoors. Black Pearl Paste (4% alphachloralose) is an end-use product labeled for indoor use against house mice in a supplied tamper-resistant bait station. Alternative names for Black Pearl Paste include Flash Paste, Flash Mouse Killer and Alpha Paste. As packaged, Black Pearl Paste will come with up to 24, 10 g sachets plus a refillable, tamper-resistant bait station.

The advantages of alphachloralose over the existing rodenticides is that it is fast-acting and poses a lower risk to humans, pets, and other animals. Current non-anticoagulant rodenticides (bromethalin, cholecalciferol, strychnine, and zinc phosphide) work rapidly and are useful for combating anticoagulant-resistant rodents but have greater risk to pets and humans. The first-generation or multiple-dose anticoagulants (chlorophacinone, diphacinone, and warfarin) are relatively safe for pets and people, but they can take days to over a week to kill rodents. This is a disadvantage compared to fast-kill chemicals because rodents, such as house mice, continue to defecate and urinate during this prolonged, pre-death period, contaminating areas where they are active. With second-generation, single-dose anticoagulant rodenticides (brodifacoum, bromadiolone, difethialone, and difenacoum), a lethal dose may be consumed within a short period but will still take days to over a week

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for the rodent to die. During this time, the rodent may continue to feed on the rodenticide, leading to increased levels of the chemical within the rodent's body. This is of concern because pets or other animals may consume the rodenticide-killed mice. The chemical has the ability to move up the food chain, where it can negatively impact species, such as some birds of prey (Thomas et al., 2011). Alphachloralose, on the other hand, kills mice rapidly, reducing the spread of biological contaminants as well as over-accumulation in the mouse body.

Black Pearl Paste will carry the "Caution" signal word. This product will be labeled for the control of house mice, indoors only. The EPA has issued the following instructions for use. For full details, see the Black Pearl Paste label.

- The bait station may be used in indoor areas accessible to children and pets.
- Do not use outdoors.
- Do not place this bait station in any area where there is a possibility of contaminating food or surfaces that come into direct contact with food.
- Do not place near or inside ventilation duct openings.
- Black Pear Paste sachets must be used in the supplied tamper-resistant bait stations.

As with all rodenticides and other mechanical devices used for mouse and rodent control, this new product will only be as effective as the expertise of the technician placing the bait station, and the initial rodent inspection. When placing alphachloralose bait stations for house mice indoors, the recommendation is to place bait stations in areas of high mouse activity as determined by a thorough inspection. In an overall IPM program, house mouse management should focus primarily on exclusion, sanitation, habitat modification, and client education, above the sole use of rodenticides.

——— Ryan Davis, Arthropod Diagnostician

For more information

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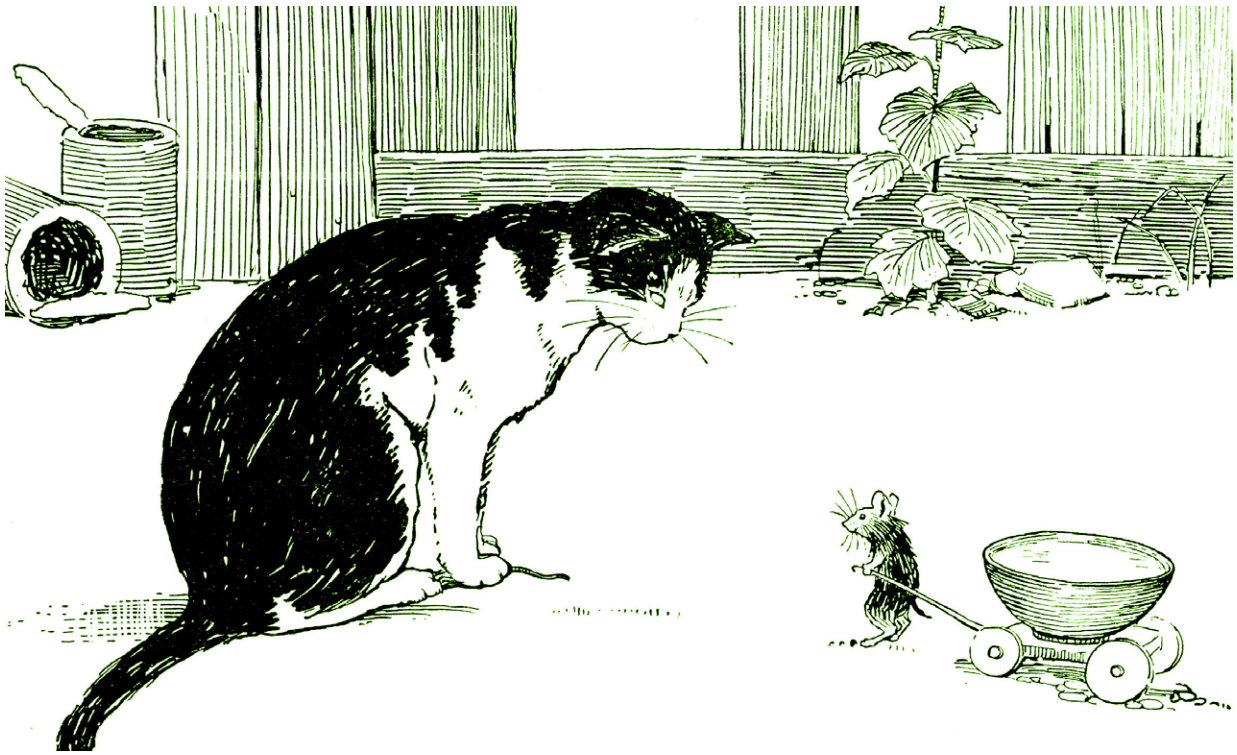
EPA website on alphachloralose



Tomato Brown Rugose Fruit Virus: A New Pest of Concern

Mosaic pattern on foliage of an infected cluster tomato variety (***A, B***) and narrowing of leaves (***C***). Dried peduncles and calyces on Shiran cherry tomato, leading to fruit abscission (***D***). Necrotic symptoms on pedicle, calyces, and petioles (***E***). Typical fruit symptoms with yellow spots on Mose (***F***). Variable symptoms on Odelia tomato fruits (***G-I***), with typical coloration symptom (***G***), mixed infection with tomato spotted wilt virus (***H***), and symptoms of a unique virus isolate found at a single location in Israel (***I***).

Tomato brown rugose fruit virus (ToBRFV) is a new emerging pathogen that can cause severe tomato and pepper loss in greenhouses and open fields. It was first detected in tomatoes in Israel in 2014, and has since been reported in several countries, including China, Italy, Turkey, the Netherlands, Mexico (the largest worldwide exporter of tomatoes), as well as the U.S. It was detected on grafted tomato plants in a Santa Barbara, California greenhouse in 2018, but is now considered eradicated (Chitambar 2018; Ling et al. 2019). In October 2019, the virus was intercepted in packaged tomatoes from Mexico in Florida by Florida agricultural inspectors (FDACS 2019) and in Utah by Dr. Claudia Nischwitz with Utah Plant Pest Diagnostic Lab. Despite these detections, ToBRFV is not known to be established in these areas.

This virus causes mottled, wrinkled, yellowed, deformed and/or narrowed leaves; and fruit with yellow-to-green spots, irregular brown rugose (wrinkled) patches, and/or necrotic (dead) lesions. Fruit may also be deformed and undersized, drop prematurely (abscise), and ripen late. Symptoms develop within about two weeks of infection; however, fruit can go asymptomatic until the fruit turns red.

ToBRFV is closely related to the tobacco and tomato mosaic viruses. Unlike its relatives, however, this virus can overcome genetic resistance and cause symptoms on otherwise resistant tomato varieties (ASTA 2019). It is transmitted through direct physical contact (e.g., plant-to-plant contact; contaminated items including hands and clothing) and soil, seed, and vegetative propagation. The virus can also be spread by honey bees and bumble bees when they collect pollen. Further, ToBRFM can remain viable and virulent in the environment for months. Current control efforts focus on following strict sanitary measures (e.g., clean clothing, tools) and destroying infected plant debris (FDACS 2019; USDA 2019). The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service is tightening restrictions on imports of tomato and pepper seed, transplants, and fruit from countries where ToBRFV exists and that are approved to export fruit to the U.S., including Canada (USDA 2019). The virus has not been reported in Canada, but some fruit imported into the U.S. goes through Canada first. In addition, there is a big push nationwide for state and federal personnel to survey production greenhouses this winter and beyond for symptomatic plants.

Contact the Utah Plant Pest Diagnostic Lab if you find a suspicious fruit, whether it be in the field (during the growing season), in a greenhouse, or even at your local grocery store.

Lori Spears, USU CAPS Coordinator and
Claudia Nischwitz, Extension Plant Pathologist

For more information

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IPM In The News

Conclusions on Pesticide Residues in Food

The non-profit scientific organization, Council for Agricultural Science & Technology (CAST) conducted a review of pesticide residue in foods. The paper focuses on pesticide residues in the food supply and describes several complex yet poorly understood aspects that are key to evaluating scientific papers, media food safety stories, and consumer advice, regarding which foods consumers should (or should not) consume. The authors acknowledge questions that are raised regarding human consumption of food with pesticide residue and whether they cause health risks, and conclude that there is no direct scientific or medical evidence indicating that typical exposure of consumers to pesticide residues poses any health risk.

Collapse of Fish Industry in a Japanese Lake

To understand the long-term impacts of the use of neonicotinoid pesticides, a team of Japanese scientists studied the ecosystem of Lake Shinji, Shimane Prefecture, Japan. In that area, neonicotinoid insecticides (seven different chemicals) were first used in the rice paddies surrounding the lake in 1993. The team analyzed 10 years' data before application and 20 years' afterward, representing the area's chemistry, biology, and fishery harvests. The results, published in the journal, *Science*, track the impacts up the food chain from arthropods such as aquatic insect larvae, to zooplankton, and finally to the collapse of the commercial smelt and eel harvest. The authors investigated many alternatives into the cause of the fishery decline and rejected them all. The data showed that the insecticide applications in 1993 coincided with an 83% decrease in average zooplankton biomass, causing the smelt harvest to fall from 240 to 22 tons. This study demonstrates a trade-off of pesticide use between one type of food production (agriculture) and another (fisheries).

Ability of Nematodes to Avoid Prey Defenses

In the U.S., the native western corn rootworm has caused over $2 billion in economic losses, and this pest is currently invading Europe. Researchers from the University of Bern, Switzerland previously identified that western corn rootworm is successful because it can detoxify corn's defense compounds stored in roots (called benzoxazinoids). Furthermore, the rootworm absorbs these chemicals to use for their own defense against predators, particularly nematodes. The researchers collected nematodes from rootworm-infested areas and non-infested areas. They found that nematodes from infested areas were resistant against benzoxazinoids and those from uninfested areas developed resistance within a few generations after exposure to rootworms. The results of the study, published in the journal *PNAS*, indicate that plant defense compounds may influence the evolution of entire food chains, and that beneficial organisms could be improved by focusing on their capacity to resist plant defense compounds.

Fungus Could Help Control Emerald Ash Borer

The invasive emerald ash borer has killed thousands of trees in the eastern U.S., and is working its way west. A team of Canadian scientists investigated the use of *Beauveria bassiana*, a common insect pathogen, as a control option. In laboratory studies, they first allowed male beetles to walk across *Beuveria*-covered pearl barley, where they picked up the fungal spores. The spores germinated through the male cuticle and colonized the body. The researchers then found that when the infested males were exposed to females during mating, they passed the fungus on, and soon after, both sexes died. The research, published in the *Journal of Economic Entomology*, emphasizes that males are better transmitters of the fungus than females, especially since some males mate with at least two females, multiplying the control impact.

Spotted Lanternfly in North America

Spotted lanternfly, an invasive planthopper, was first discovered in North America in Pennsylvania and is now established in five eastern U.S. states. Heavy infestation results in large amounts of honeydew deposition on host trees and understory species, which promotes growth of sooty mold that hinders plant photosynthesis and contaminates agricultural and forest crops. Entomologists from the Pennsylvania Department of Conservation and Natural Resources report on this insect's life cycle in the *Environmental Entomology Journal*. The authors found that, from 2015-16, females laid their eggs on 24 different substrates (both living and non-living). The tree-of heaven, black cherry, black birch, and sweet cherry, were the most preferred for egg-laying. The substrate with the highest success in egg-hatch was bark of black locust. The paper also describes the dates of hatching, length of each life stage, and preferred hosts of nymphs and adults for feeding.

Featured Picture of the Quarter

In Utah, cytospora canker is a disease most often associated with peach, nectarine, apricot, and landscape trees such as poplar and aspen. In 2018 and 2019, several reports of dieback and decline of **apple trees** in Utah revealed cytospora canker causing significant damage.

The symptoms on these trees resembled winter sunscald, but the cankers occurred in areas of the tree that could not have been wounded by sunscald. Cytospora canker is opportunistic, and a common theme of most of the affected trees was poor tree vigor due to competition with weeds, deficient irrigation, and heavy pruning. Producers were advised to prune out affected branches, and correct these conditions to reduce further spread of the pathogen.

Image by Marion Murray, IPM Project Leader

New Publications, Websites, Apps

Wild Farm Alliance has created a Beneficial Birds Multimedia Story Platform highlighting support for wild birds that are beneficial to agriculture. The online resource features farmer success stories, research showcasing beneficial birds, videos, and tools that farmers can use to implement practices that support beneficial birds.

Scientists at Iowa State University have produced the document, Establishing and Managing Pollinator Habitat on Saturated Riparian Buffers. The publication guides landowners in establishing a buffer with pollinator habitat, including costs, funding, and technical information.

A report by the Endangered Species Coalition describes ten species that are most impacted by the effects of pesticides, including two amphibians, two birds, one fish, one mollusk, two insects, and two mammals.

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