



Thrips and Aphids in Alfalfa, One is a Major Concern

What's Inside

Grocery Produce may be Source of New Plant Diseases

Saving Seeds Without Spreading Pathogens

Kitchen Procedure for Hot-Water Seed Treatment

Scouting and Monitoring in Commercial Greenhouses and High Tunnels

Pest Spotlight: Velvet Longhorned Beetle

Abate Ants with Homemade Baits

Organic Options for Common Fruit Insect Pests

National IPM News

News Highlights

NEW VEGETABLE IPM ASSOCIATE

We are pleased to welcome Cami Cannon to the Utah Pests group. Cami was recently hired to reach out to the vegetable industry in Utah through advisories, fact sheets, web content, workshops, and meetings. Before joining us, Cami worked for USU Extension in Cache County and for the USU student organic farm. She is looking forward to making a difference!

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THRIPS

Western flower thrips is the most common thrips species found in alfalfa, and usually occurs at low levels. Recently, two other species have been found in patchy locations in western U.S. alfalfa fields: onion thrips and bean thrips. In general, thrips are tiny, thin insects, and difficult to spot, partly because they hide in the leaf veins and move quickly. Thrips damage to alfalfa is distinct, and includes cupped and crimped leaves. Growers that have seen these foliar symptoms in fields have been very concerned, and some of them have submitted samples to the UPPDL and to colleagues in Idaho. The samples clearly showed thrips injury, but no live thrips were detected on the samples, so the causal species could not be determined.

Although the symptoms may appear dramatic, there is currently no evidence that western flower thrips causes economic impact on yield in established fields. In addition, the effects of thrips do not appear to carry over to subsequent harvests.

While insecticides have been a “go-to” option for many growers in the region, no thresholds for thrips in alfalfa are available to make an informed decision, and in established stands, insecticides do not appear to be cost effective. One of the exceptions is when there are very high populations of onion thrips and bean thrips which are thought to be more destructive to alfalfa. However, these populations have not appeared to be as evident in the Intermountain West, so thrips identification is important.



Thrips have rasping-sucking mouthparts which allow them to feed by scraping the surface of leaves and sucking up exposed plant fluids. Their feeding leads to silvery lesions on the leaf surface with black dots of excrement.

Thrips management includes conservation of beneficial insects, early establishment of alfalfa, and maintaining plant health. Beneficial predators that feed on thrips include lady beetles, damsel and big-eyed bugs, and minute pirate bugs. Disruption of these insects with applications of broad-spectrum insecticides may allow for increases in thrips populations and flare-ups of other pests. Drought-stressed alfalfa fields also favor thrips, but irrigation management is more easily handled in hay production fields. Irrigation management does become more difficult in alfalfa seed production and in dryland alfalfa when irrigation is not preferred or feasible.

Perhaps the most sensitive time for alfalfa to be affected by thrips is when establishing a new crop. Early establishment of alfalfa is key, so that young plants can better handle thrips feeding. Although insecticides are not traditionally recommended for thrips management, an application at the seedling stage may be necessary.

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Thrips and Aphids in Alfalfa, continued from previous page

APHIDS

For some time, aphids have not been a concern to alfalfa growers. Recent years, however, have proven to be quite the opposite. Cowpea aphid and blue alfalfa aphid appear to be the most problematic. We have learned lessons from these outbreaks that can help alfalfa growers in 2016.

The first is that early monitoring is important. In 2015, many growers were not anticipating aphid populations early in the season. Typically, aphids do not show up until after alfalfa weevil populations. But March was a busy month as alfalfa green-up was soon dripping with high aphid populations. The early aphid populations severely stunted plants, lowering first-cut yields and subsequent re-growth. This season, it will be important to get out early and visually inspect green-up.

Another lesson is that not all insecticides are created equal. Many acres of alfalfa were treated with insecticides with varied results. Based on discussions at USU crop schools, aphid control was less favorable with insecticides belonging to the organophosphate and pyrethroid classes (e.g., chlorpyrifos and lambda-cyhalothrin, respectively). Some growers reported having to make multiple applications.

The new active ingredient flupyradifurone (Sivanto) (registered for use in 2015) appeared to have more consistent results and a higher degree of aphid suppression. One point that was brought up by several growers that used Sivanto was that it took up to a week after application before they saw results. Perhaps this may be attributed to the systemic activity of Sivanto for effectiveness against insects with piercing-sucking mouthparts, compared to the direct-kill provided by the contact activity of the traditional organophosphate and pyrethroid insecticides.

Finally, having an understanding of aphid predators is important. It was clear that the buildup of aphids early in the season overwhelmed predator populations that typically ramp up later in spring ([see the USU alfalfa insects field guide](#)). Some growers were stuck with the decision of treating for aphids just as the lady beetle populations started building. For those growers that applied broad-spectrum insecticides that killed both pest and beneficial insects, multiple applications were needed, and it was evident that aphid predator populations were not able to recover. Sivanto is thought to be softer on predators and may have been a component of maintaining aphids at low levels for an extended period of time.

For the 2016 season, it will be important to prepare for the worst and hope for the best, as it is not clear whether aphid populations will respond similarly to what was seen in the past few years.



James Barnhill, USU Extension Weber County

It is not clear whether aphids will be problematic to alfalfa growers in 2016, but similarities in early spring warmup and alfalfa green-up between 2015 and 2016 suggest aphids may be a concern again.

Discarded Store-Bought Produce Could be Path of New Plant Disease Introductions

New plant diseases show up in Utah and other states every year. Sometimes the source of the introduction can be traced to contaminated seed or infected transplants brought in from another state. Another potential but overlooked source is store-bought produce that spoils and is then discarded by the consumer on compost piles. It is a major concern for many growers.

Frequently, the fungi that occur on produce are molds like bread mold that colonize the produce in storage. However, sometimes the produce could be infected with a plant pathogen, where symptoms are not visible at the time of harvest, and instead show up after extended storage. It may take a few days to a few weeks after infection for symptoms to appear, depending on environmental conditions.

Fungi can produce spores on the spoiled produce. If that produce has been discarded outdoors, the spores can spread to host plants in the landscape, colonize those plants, and establish themselves. None of these pathogens are harmful to humans but if they infect locally grown produce they can cause significant yield losses for those growers.

To reduce the possibility of a new plant disease introduction into Utah, it is best to put spoiled produce in a plastic bag and throw it in the trash, not on the compost pile.

Two examples of diseased produce that were found at grocery stores in Utah are shown below.

Claudia Nischwitz, Plant Pathology Specialist



DOWNY MILDEW was identified on packaged Romaine lettuce hearts, showing brown lesions on outer leaves. This disease does not occur in Utah. In states where downy mildew on lettuce is a problem, hundreds of dollars per acre of fungicide applications are necessary to avoid quality reduction and total crop loss. Due to the occurrence of different races of this fungus, the use of resistant varieties is very difficult. If the infected lettuce is discarded on a compost pile, the spores can be blown to lettuce plants in the area, or to host weeds like sowthistle.



LATE LEAF RUST on raspberry was also found in a Utah grocery store and is another disease that does not occur here. The bright orange spores are easily visible on ripe fruit. Fall-bearing raspberries can be particularly susceptible. As with downy mildew, spores could be blown to leaves of raspberry plants if the infected raspberries are discarded on outdoor compost. The rust survives on infected raspberry canes and can re-infect raspberries year after year. An introduction of late leaf rust would severely affect Utah's growing raspberry industry.

Saving Seeds Without Spreading Pathogens

Howard F. Schwartz, CSU, Bugwood.org

Seed-saving is popular among those who collect, grow, and share heirloom seeds. In some cases, seed-saving may be the only source of certain vegetable varieties because it is an heirloom or not provided by seed companies. Whether you are currently a seed saver or hope to save seeds in the future, it is important to know how to prevent seedborne diseases with clean seed and seed sterilization practices.

Some of the most common viral, bacterial, and fungal pathogens begin in the seed. These include tobacco mosaic virus, bacterial speck and bacterial spot on peppers, and botrytis neck rot in onions. Keep seed-saving fun and minimize disease risks by following these general tips:

- *Purchase, exchange, or save seeds that have been sterilized or certified disease-free.* Contaminated seed can be the first source of disease and can cause severe localized or large-scale outbreaks.
- *Control insects and diseases throughout the growing season.* Disease control during this time will greatly improve production of disease-free seeds. Controlling insect pests also helps to reduce the transmission of viral diseases (this can be difficult with aphid-transmitted diseases).

- *Only save seed from healthy fruit.*
- *Sterilize the harvested fruit surface with rubbing alcohol or a bleach solution.* This will kill any pathogens that might be on the fruit surface, but will not be effective against diseases living inside the fruit.
- *Sterilize the seed surface with a chemical surface treatment.* Be aware that chemical and heat sterilizations may cause damage to the seed if the treatments are too strong or too long. There is no guarantee that this will provide 100% disease-free seed, but it will lower the risk of spreading pathogens that are carried on the seed surface. Direct sterilization of seeds may be damaging or impractical for pea, bean, cucumber, sweet corn, beet and some other seeds.
- *Treat seeds before planting via a hot-water treatment* (see below and next page for instructions).

-Cami Cannon, Vegetable IPM Associate

Other Resources:

- Vegetable MD online: [Hot water seed treatment](#)
- Vegetable MD online: [Managing bacterial pathogen](#)

Kitchen Procedure for Hot-Water Seed Treatment

Treat seeds with a hot-water bath to help prevent bacterial leaf spot, tobacco/tomato mosaic virus, alfalfa mosaic virus, bacterial speck, botrytis neck rot, and other seed-borne diseases that infect vegetables.

WHICH SEEDS TO TREAT:

- Eggplant, pepper, tomato, carrot, spinach, lettuce, celery, cabbage, turnip, radish, and other crucifers are suggested crops for treatment.
- Do not treat seeds of cucurbits (squash, gourds, pumpkins, watermelons, etc.), as they can be severely damaged.
- Pelleted, primed, or old seed should not be treated.

EQUIPMENT:

- Water bath (preferably two: one for pre-heating and one for treatment) or two stove-top pots
- Precision laboratory thermometer
- Porous containers to hold seeds such as cheese cloth, cotton cloth, nylon bag, tea infusers, etc.
- Screen for drying the seeds

SOURCES:

- Fisher Scientific
- VWR Scientific
- ebay.com

-Cami Cannon, Vegetable IPM Associate

See instructions on next page

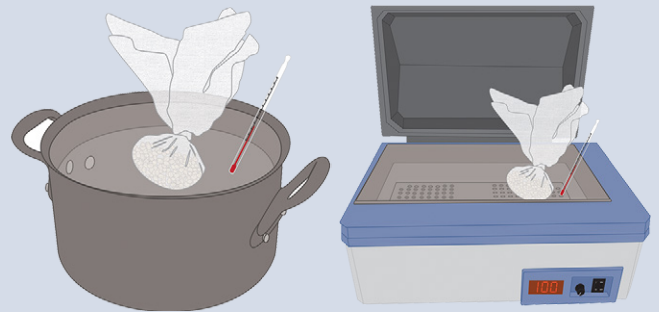
HOT-WATER SEED TREATMENT INSTRUCTIONS

1. Contain Seeds: Place seeds to be treated in the porous containers, leaving enough room for the seeds to move around freely. Label each porous container with the seed type.



2. Preheat Seeds: Preheat the first bath/pot to 100°F. Once preheated, place the contained seeds in the first bath for 10 minutes.

NOTE: If you are using just one water bath or pot, take the seeds out after pre-heating and heat bath/pot to the prescribed treatment temperature before putting the seeds back in for the treatment time.



3. Treat Seeds: Preheat the second bath/pot to the recommended temperature for each specific crop (see link below). The temperature of the second bath/pot will range from 118-125°F and the treatment times will range from 20-60 minutes depending on the crop. Place preheated seeds in the second water bath/pot and be sure to constantly hold the water at the recommended temperature. Ensure that treatment length and temperature are exactly as prescribed to avoid damaging the seeds.



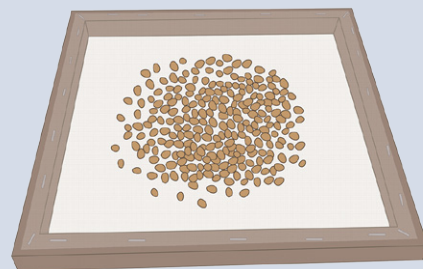
See [this link](#) for treatment times and temperatures.

See [this link](#) for more information.

4. Cool Seeds: After treatment, place contained seeds in cold tap water for 5 minutes to stop heating action.



5. Dry Seeds: Take the seeds out of the container and spread them in a uniform layer on a screen to dry.



6. Plant seeds right away. Do not store heat-treated seed.

Scouting and Monitoring in Commercial Greenhouses and High Tunnels

In order to stay ahead of any pest problems in enclosed environments like greenhouses or high tunnels, it is important to monitor regularly. Sticky traps, visual inspections, and indicator plants are all proven methods to quickly assess insect and disease incidence.

PRE-SCOUTING PREP

- Learn the primary insects and diseases that affect the crops you grow, and consider preparing laminated photographs to help train new employees.
- Develop a map/drawing of your facility, providing a unique identification number of each house/tunnel, and each zone inside the structure.
- Prepare a scouting notebook or binder of blank forms on which to record data (such as date, crop, sticky card ID, insect counts, and other notes).
 - The notebook should include the laminated photographs and the facility map.
- Purchase/organize scouting tools, including:
 - A *hand lens* or minimum 15x magnifier for inspecting plant material
 - *Pruners* to collect plant material for ID
 - *Containers* and a *permanent marker* for samples
 - *Flagging* to mark hot spots
 - *Blank white index cards* for sampling mites
 - A *digital camera* for documentation
 - *Spare sticky cards*

INDICATOR PLANTS

Susceptible varieties of certain plants can provide early detection of some pests by acting as an indicator plant. For example, some petunia varieties are very attractive to thrips, including Carpet Blue, Summer Madness, Red Cloud, and Super Magic Coral.

Other indicator plants include sweet pepper and fuchsia for detecting aphids, and tomatoes, cucumber, and poinsettia for detecting whiteflies. Indicator plants should be placed every 20 to 30 feet at bench or floor level among the crop.

STICKY CARDS

The most commonly used sticky traps are 3x5 yellow cards. They attract the most species of insects, including whitefly, fungus gnats, shoreflies, aphids, and thrips. Blue cards are specific to thrips.

Select where to place sticky cards at the beginning of the season, and label the cards with a unique number. Place them 1 to 2 inches above the plant canopy and move them as the plants grow. Additional cards can be placed near doors or vents where new insect populations may be introduced. Replace cards every 2 weeks.

SOURCES OF STICKY CARDS

- [Olsen Products, Inc. Amazon Store](#)
- [Rincon-Vitova Insectaries](#)
- [Green-Methods.com](#)
- Great Lakes IPM
- Gemplers

SCOUTING PROCEDURES

Scouting should be conducted by the same person, and ideally, on the same day and time of the week, for the duration of the crop. This will ensure that useful information is generated. Record all observations.

1. Scout least-infested areas first, and heavily infested areas last to minimize carryover of pests into cleaner environments.
2. Conduct a quick visual inspection of the entire crop first for any dead or off-color plants and make notes for later diagnosis.
3. Randomly select plants within each crop for closer inspection (about 10 for every 1,000 sq ft of area).
4. Look for symptoms of disease (spots, brown leaves) and insects. Inspect the underside of foliage for thrips, aphids, whitefly, and spider mites.
5. Tap foliage over a white index card to dislodge mites for closer inspection.
6. Count insects on sticky cards.
7. When an insect cannot be identified, take a photograph or collect a sample. Look it up in reference books, or submit it to the Utah Plant Pest Diagnostic Lab.
8. At the end of the crop life cycle, track the data on a spreadsheet to look for trends over the season and to compare results to prior years.

-Marion Murray, IPM Project Leader

Other Resources:

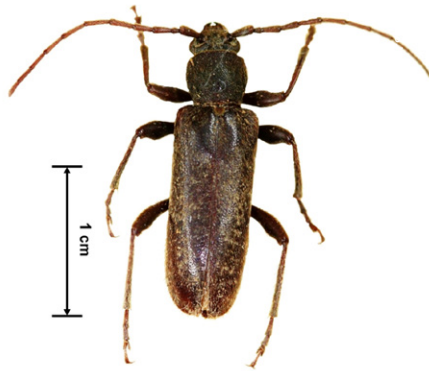
[Greenhouse IPM with an Emphasis on Biocontrols. Pennsylvania Integrated Pest Management Program](#)

Pest Spotlight: Velvet Longhorned Beetle

The velvet longhorned beetle (VLB) (*Trichoferus campestris*) is an introduced pest that is native to Asia and parts of Eastern Europe (Russia). It was first discovered in North America in 2002 (Canada) and 2006 (U.S.). VLB has been found in several states, including Rhode Island (2006), New Jersey (2007), Illinois (2009), Ohio (2009), Minnesota (2010), Utah (2010), Colorado (2013), and New York (2014). This pest is thought to spread into new areas through imported wood-packing material, such as pallets and crates containing construction products.

VLB attacks a wide range of forest and landscape trees, but may have a preference for fruit trees, especially apple and mulberry, and hosts that are medium to large in size. Although it typically attacks dead and dying wood, it has been observed attacking living sweet cherry trees in Utah.

Adults are 3/4-inch long, dark brown to orange-brown in color, and have legs and antennae that are typically lighter in color than the rest of the body. Their body is covered in irregularly distributed fine hairs that form light colored spots, and their antennae are shorter in length than their body. Larvae are 1-inch long when fully grown, yellow-white in color, and have a brown head and short, poorly developed legs.



Signs of VLB damage include thinning or yellowing of the tree's canopy, sucker growth and/or frass (insect excrement) at the base of the tree, larval tunneling underneath the bark, and adult emergence holes on the trunk and main branches. VLB feeding is not believed to cause rapid tree death, but can have an impact on fruit yield, wood marketability, and tree longevity.

The Utah Department of Agriculture and Food (UDAF) has been monitoring this pest's activity in Utah since its arrival in 2010 (see table at right), and will continue to gather information on the distribution of this pest in the state. To date, VLB has been detected in Utah, Salt Lake, and Davis counties in orchards (peach and cherry trees), riparian areas (golf courses), and industrial sites. If you encounter this insect or a host tree with the symptoms described above, please contact Lori Spears (lori.spears@usu.edu) at USU or Kris Watson (kwatson@utah.gov) at UDAF.



Number of VLB Adults Collected in Utah

Year	Total
2010	4
2011	0
2012	11
2013	142
2014	408
2015	1,893

VLB adult emergence holes are round (**top**). Trees under attack will slowly die back (**right**).



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-Lori Spears, USU CAPS Coordinator

Abate Ants with Homemade Baits



Spring has arrived and warming temperatures have caused pavement ants to swarm, make small mounds of excavated soil, and find their way indoors. Often, the gut reaction is to grab a can of insecticide and spray swarming ants or ant trails. While this method may kill visible ants, the queen and most workers remain in the nest and will quickly rebound from such an application. One way homeowners can deal with ants is to use baits – commercial or homemade – in conjunction with IPM tactics such as exclusion and improved sanitation. Ant baits are an effective chemical solution to dealing with pavement ants and other pest ants.

WHY BAITS WORK

Ants are social insects. Worker ants take care of developing brood, other workers, and the queen. Foraging ants seek and collect food and share it with members of the colony, including the brood and queen. This social feeding is known as trophallaxis. Ant baits exploit this behavior by allowing their slow-acting active ingredients to be distributed around the colony where traditional pesticide applications sometimes can't reach. Because the active ingredients in baits are slow-acting, it can take a few days to a few weeks to eliminate a colony. This is especially true of larger pavement ant colonies that contain thousands of workers.

FAVORITE FOODS

Different ant species prefer different food types. Pavement ants prefer a variety of foods, including sweets, greasy foods, protein (dead insects) and seeds. Anyone who has had pavement ants knows that nearly any morsel of food dropped on the floor or outside will be quickly engulfed. In nature, pavement ants frequently tend aphids and soft scales for the sweet honeydew they produce. Food preferences can vary by the time of year and by the needs of the colony. Colonies with large, developing broods will seek protein-based foods to supply the growing larvae with the nutrition they need. Typically, this occurs in spring and early summer. During the summer and fall, the colony begins to mature and the food preference switches to sugar-based options.



Winged pavement ants swarming near a window.



Typical pavement ant mound near cement crack.

To determine the food preference of the ants, try a variety of food types. On a 3x5 index card, or similar object, place various food items and put the card along a trail of foraging ants or near an obvious mound. Some options include Crisco, bacon grease, peanut butter, mint apple jelly, and syrup. Choose options that can be mixed with boric acid to create a homemade bait. Another benefit of “bait testing” is that it allows the ant trail to be readily located and followed. Points of entry into the home from the outside can be treated with boric acid or silicate dust and permanently sealed with an appropriate, long-lasting caulk or sealant after the ants have been successfully baited to prevent future entry. For detailed information on selecting caulks and sealants, [see this IPM Institute publication](#). Do not apply residual or contact insecticides when conducting a baiting program. The goal of baiting is to keep ants alive to carry the bait back to the nest, not to kill them immediately.

BAIT INGREDIENTS AND FORMULATION

The ideal active ingredient to use in a homemade bait is boric acid. Boric acid is highly effective, and found in many commercial ant and roach baits. It works primarily as a stomach poison, but also as a desiccant against some pests. If desiccants are desired for control of other pests, such as bed bugs, products containing silica gel, silica aerogels or diatomaceous earth are more effective.

continued on next page

Abate Ants with Homemade Baits, continued from previous page

Boric acid has a very low toxicity if eaten or if it contacts the skin, but care should be taken when handling boric acid. When consumed, boric acid can cause nausea, vomiting, stomach aches, and diarrhea. Inhaling boric acid can cause dry mouth, nose, and throat, coughing, sore throat, shortness of breath, and nose bleeds. Always follow the label to reduce risk and always keep boric acid, boric acid applications, and homemade boric acid baits out of reach of children and pets. Please refer to the [National Pesticide Information Center fact sheet](#) for more information on boric acid.

If you choose a commercial bait, look for pavement ants on the label. Consider purchasing multiple types to test them. Commercial baits are available with various active ingredients, including boric acid, sodium tetraborate decahydrate (borax), hydramethylnon, fipronil, methoprene, and abamectin. Pavement ants can be finicky, so it is important to select a bait that they want to feed on at that particular time.



Pavement ants feeding on a commercial boric acid bait

HOMEMADE BAIT RECIPES

There is no exact formula for making homemade boric acid ant baits, but a few general recipes and guidelines exist. Be aware that too much boric acid in a bait or the underlying food material may cause bait aversion. If bait aversion or reduced bait consumption happens, reduce the boric acid rate to less than 1% of the bait mixture or use a different food substrate. Bait failure may also be due to alternative food sources that compete with your bait. Practice good sanitation and food storage when baiting. Place ant baits along ant trails indoors or out. Monitor baits every few hours to make sure the ants are taking the bait. Replace baits as they are consumed or dry out. Continue baiting until feeding ceases or slows significantly. These baits, especially the sweet ones, could also be used to combat carpenter ants. Apply baits out of reach of pets and children.

Grease Bait

- 2 ounces (4 tablespoons) peanut butter
- 3 ounces (6 tablespoons) honey
- 3/4 teaspoon boric acid dust (99%)

Sugar-Water Bait

- 1 cup of water
- 4 tablespoons table sugar
- 1/2 teaspoon boric acid dust (99%)

This recipe makes 1 cup of liquid bait with 25% sucrose. Sucrose concentrations of sugar-water baits for ant species have ranged between 10% and 34%. You can adjust sugar concentrations for the best results. Sugar-water baits with greater than 1% boric acid may cause pavement ants to avoid the bait.

Apple-Mint Jelly Bait

- 1/3 cup apple-mint jelly
- 1 teaspoon boric acid dust (99%)

It is important to remember that ants come indoors primarily to consume the food you provide them. If you have trouble with ants, be extra thorough when cleaning areas where food may accidentally fall on the floor. In bathrooms and kitchens, be sure there are no leaks that may attract ants, and seal areas where pipes and wires enter the room. If ants are accessing your trash, store the trash in another place until the baits have taken effect, or use a waste basket that is inaccessible to ants. In the pantry, clean all food particles off shelving, behind shelving, and on the floor. Store all accessible food in pest-proof containers. When baiting, take note of ant entry points and seal those areas to prevent future access by ants.

-Ryan Davis, USU Insect Diagnostician

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Organic Options for Insect Pests of Fruit

Many commercial producers and home gardeners are interested in using organic pest management practices. To successfully grow fruit crops organically or 'organic-like,' intensive use of cultural, mechanical, and biological tools is needed to prevent pests from damaging the crop. It is challenging to grow organically by simply replacing synthetic or conventional pesticides with organically certified pesticides (one-for-one replacement); typically, a comprehensive, or integrated pest management (IPM) approach is needed. The table on the next two pages provides a summary of organic options for common insect pests of tree and berry fruits in Utah.

For more details on how to use IPM and organic options, check out the plethora of USU Extension resources. Subscribe to the IPM Pest Advisories to receive timely seasonal newsletters for assistance with pest identification, proper timing of control options, and recommendations for effective **IPM practices**. Read specific **fact sheets on insect and plant disease pests**. Access the commercial and backyard **tree fruit production and pest management guides**. Look up insect development timing information for a location representative of your farm or garden site on the Utah **Temperature Resource and Alerts for Pests (TRAPs) website**.

-Diane Alston, Entomologist

Examples of Non-Chemical Practices to Reduce Pests



Floating row cover over raspberries and other crops excludes insects such as **grasshoppers**.



Fruit bags placed over apples exclude **codling moth larvae**.



Yogurt container sunk into the soil and filled with 2 inches of vegetable oil and tuna juice traps **earwigs**. Holes are punched in the upper top (just under the lid) to lure them to their death.



Beneficial insects can target pest insects. Shown above are pupae of a wasp parasitoid that attacked a raspberry horntail larva (note shriveled, black, horntail carcass in center).

See table on next page

ENTOMOLOGY NEWS AND INFORMATION, continued

Organic Options for Fruit Pests, continued from previous page

Summary of organic practices that are effective in reducing common insect pests in fruit crops in Utah, including optimal timing of implementation.

Pest	Crops	Organic Options	Timing
Codling moth	Apple Pear Quince	Sanitation – pick up and destroy dropped fruit	June and late July to August
		Mass-trap larvae in corrugated cardboard bands placed around trunks	Late June to mid-September
		Place fruit bags over fruit to exclude CM	When fruits reach ¾ inch diameter
		Horticultural oil (1%)	Before egg hatch (200 DD*)
		Codling moth virus (Cyd-X) or spinosad (Entrust)	Beginning of egg hatch (220-250 DD); repeat to protect fruit until mature
Cherry fruit fly	Sweet and tart cherry	Place landscape fabric or thick mulch barrier under canopy of tree; prevents larvae from accessing the soil to pupate	Summer and fall
		Spinosad (Entrust), spinosad + bait (GF-120 NF), or pyrethrin (Pyganic)	When fruits first begin to turn a salmon or blush color; repeat until harvest
		Place fowl, such as chickens, guinea hens, ducks, geese, or turkeys, in orchard	After cherry fruit harvest is complete
Peach twig borer	Peach Nectarine Apricot	Horticultural oil (2%)	Just before or at spring bud break
		<i>Bacillus thuringiensis</i> var. <i>kurstaki</i> (Dipel, Thuricide, Javelin)	Two times: at early and full to late bloom
		Spinosad (Entrust), pyrethrin (Pyganic), or neem (AzaDirect, Bioneem)	Early egg hatch (300 DD); repeat to protect fruit until mature
Aphids	All tree fruits	Horticultural oil (2%)	Just before or at spring bud break
		Horticultural oil (1%), insecticidal soap, neem, or pyrethrin	When aphids are observed, but before excessive leaf-curling occurs
		Biological control from aphid predators and parasitoid wasps	Natural enemy populations typically increase by mid- to late spring
		Stiff spray of water from hose-end nozzle	When aphids are observed, repeat every 2-3 days until aphid numbers decline
European earwig	Peach Nectarine Apricot Raspberry Blackberry Strawberry	Traps containing vegetable oil + smelly ingredient (tuna juice, bacon grease, soy sauce)	When first leaf- or flower-feeding injury is noticed in the late spring to early summer
		Avoid dense mulches	Earwigs hide in protected sites during the daytime
		Spinosad, neem, pyrethrin, or insecticidal soap	When fruit feeding injury is first observed
		Predation by fowl	Allow fowl to roam through berry patch early and late season when fruits are unavailable for the fowl to eat

ENTOMOLOGY NEWS AND INFORMATION, continued

Organic Options for Fruit Pests, continued from previous page

Pest	Crops	Organic Options	Timing
Grass-hoppers	Raspberry Blackberry Strawberry	Protect plants with floating row cover or other cover barrier	Before fruits are mature, or when grasshoppers are observed on fruit
		Pyrethrin, spinosad, or <i>Nosema locustae</i> bait (NoLo)	Apply bait in summer when young grasshoppers are observed, or protect fruit with pyrethrin or spinosad
		Predation by fowl	Allow fowl to roam berry patch when grasshoppers are active and fruit isn't susceptible to feeding by fowl
		Cultivate soil around base of plants to destroy overwintering egg pods	In the fall or spring
Raspberry horntail	Raspberry	Select less susceptible cultivars	See the USU Extension fact sheet
		Prune and destroy entire canes with hole in the pith	By early May
		Prune out tips of infested summer canes (with wilted tip)	June and July
		Several native wasps parasitize horntails in the mid- to late summer	June to August
Rose stem girdler	Raspberry	Remove nearby wild roses (alternate host)	Spring or fall
		Neem or pyrethrin	Apply in May and June when adult beetles are active
		Prune and destroy infested canes (break at girdling site; larvae in base of cane)	Mid- and late summer when observed (remove overwintering larvae)
Raspberry crown borer	Raspberry	Use clean planting stock	At planting
		Dig out infested crowns	Spring and summer when entire canes wilt
		Apply entomopathogenic nematodes to base of plants	In July when soils are warm
		Drench crowns of plants of neem oil or pyrethrin	In October for two consecutive years (crown borer has 2-yr life cycle)

*DD = degree-days; heat units based on cumulative daily temperatures above insect's lower threshold for development; used to time critical insect activity periods for optimal pest management.

Diane Alston, Entomologist

In the National News

NATURAL CLAY FOR WHITEFLIES

Kaolin clay (aluminosilicate clay), a commonly used ingredient in cosmetic and personal hygiene products, also has a use for insect management. A recent study published in *HortScience* looked at kaolin to control whitefly on tropical beans. The authors used four treatments: no insecticide, synthetic chemical insecticide, kaolin at 2.5%, and kaolin at 5%. Both foliar application rates of kaolin controlled 80% of whitefly eggs, nymphs, and adults compared to the synthetic chemical insecticide, which controlled 90%. The surprise was that kaolin did more than just control whitefly. It reduced transpiration by 40% and increased leaf chlorophyll content by 43%. The findings show that use of kaolin particle film can be an alternative tool for managing whitefly on bean crops.

BENEFICIAL FUNGI PREVENT DUTCH ELM DISEASE

Some endophytic fungi improve the health of the plant in which they live, or protect it from pathogens by secreting harmful substances and/or boosting the defense mechanism of the host plant. A European research team compared the nutritional niches of endophytic fungi from healthy elm trees to the niches occupied by the fungus that causes Dutch elm disease (DED). The results showed that certain endophytes compete with the DED pathogen for the same carbon sources inside the plant. This suggests that the action of these beneficial fungi in the phloem and xylem of elms would limit growth of the pathogenic fungi.

NATIVE FRUITS AND VEGETABLES CAN HELP COMMERCIAL VARIETIES

There has been growing interest in traditional and wild varieties of fruits and vegetables to preserve biodiversity, but there are other valid reasons. Research led by Newcastle University, UK has shown that wild tomatoes are not affected by whiteflies due to defenses including repellency and prevention of

feeding. Other researchers showed that given free choice, whiteflies were 80% more likely to settle and feed on commercial varieties over wild tomatoes. These findings show the importance of 'breeding some of that wildness back in' to commercial tomato varieties. If the whitefly-resistant genes can be bred back into commercial varieties, plants not only have all the characteristics we expect from a tomato, but will also be naturally resistant to the whitefly.

PHEROMONE ATTRACTANT IMPROVES ANT BAITS

The invasive Argentine ant has become a major nuisance in California and southern U.S. states because it can form super colonies with hundreds of queens and it out-competes native ants. A 2007 survey published in *Sociobiology* found that 85% of all urban pest control services in California were focused on the Argentine ant. The authors of a new study published in the *Journal of Economic Entomology* found that adding pheromones to commercial ant baits dramatically improves their effectiveness. They placed baits in residential sites for 4 weeks, and found that the baits with pheromones reduced ant activity by 74% while baits without pheromones reduced ant activity by only 42%.

PRESERVING BUTTERFLIES IN UNLIKELY PLACES

The Florida Department of Transportation (FDOT) traditionally mows along highways for aesthetics and the safety of pedestrians. But new research sponsored by the FDOT has shown that mowing less frequently boosts butterfly pollinators and reduces costs. University of Florida entomologists surveyed butterflies and flowers in road sections that were mowed every six weeks, every three weeks, and not at all. They found that the no-mow treatment yielded the greatest populations of butterflies and reduced costs by 30%. The FDOT is committed

to creating an environment that fosters biodiversity and the ecological services that roadsides can offer, and this study suggests that reducing mowing during peak seasonal butterfly activity can increase butterfly numbers.

WASPS' HOME LOCATOR

Researchers at the The Australian National University in Canberra have gained new insight on how ground-nesting wasps find their way home. After 10 years of trial and error, they have reconstructed a wasp's-eye view of the world using a system of high-speed stereo cameras and a panoramic imager to build 3D models of the wasps' environment. They then simulated homing flights of wasps in virtual reality to test predictions about what wasps learn during flight arcs. The findings demonstrate wasps' amazing ability to understand their current location and to know the correct path back home.

BATTLING BEAN BLIGHT

Common blight, caused by two species *Xanthomonas* bacteria, is the most severe and widely occurring bacterial disease of bean production worldwide. The bacteria are spread on infected seeds and plant material, and multiple strains can be found on an individual seed. In some areas, a single bean field can yield more than 200 strains of *Xanthomonas*. The primary control option needs to be the use of resistant varieties, because chemicals are not effective. It has been a challenge to breed a common bean that is resistant to multiple strains of the blight bacteria while maintaining high yield and quality. Researchers at the University of Idaho are dedicated to finding an answer, and are aiming to cross bean cultivars with different resistance genes. In this way, they hope to generate new cultivars with multiple resistance genes.



Featured Picture of the Quarter

Lady beetles overwinter as adults and are one of the earliest predators to be seen in spring, searching for newly hatched aphids. After mating, females will lay clusters of bright yellow eggs on the undersides of leaves. Because both adults and larvae are predators, a single lady beetle may eat up to 5,000 aphids in its one-year lifetime.

-Image by Marion Murray,
IPM Project Leader

New Publications and Apps

- The paper, **Managing the Evolution of Herbicide Resistance**, describes causal factors for the occurrence of glyphosate resistance. Results highlight that herbicide mixing—not herbicide rotation—mitigates resistance evolution. The findings also suggest that resistance can be mitigated in one’s own field, regardless of the presence of neighboring resistant populations.
- UC Davis has revised and expanded the book, **Pests of Landscape Trees and Shrubs**. It is a comprehensive IPM resource for landscapers, arborists, home gardeners, retailers, and parks and grounds managers, covering cultural practices, resistant varieties, ways to conserve natural enemies, monitoring practices, and selective pesticides.
- The **AgWeed ID** mobile app is a tool for farmers to help identify weeds during scouting season. It was created by the experts at Penton Farm Progress Group.

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