UTAH PESTS News

Utah Plant Pest Diagnostic Laboratory and USU Extension — Vol. 1, Winter 2007-08

Plant Diseases Cheer Up the Holiday Season

Not many people know that some plant diseases are actually beneficial (at least to humans, not necessarily the host plant). Did you know that the poinsettia you are used to seeing with its prolific and dwarf growth habit is actually the result of a plant pathogen? Poinsettia, native to certain tropical regions, is scientifically known as *Euphorbia pulcherrima*, which means "the most beautiful euphorbia." In the wild, it grows to an upright, medium-sized tree or shrub. In cultivation, however, a microscopic pathogen called a phytoplasma induces the plant to grow in a dwarf, free-branching nature that transforms it into the potted plant with which we are all so familiar. The "flowers" are actually showy bracts or modified leaves.

Plant diseases are most often thought of in the negative sense, but the phytoplasma infecting poinsettia is an exception that does not stand alone. Another example is the virus that causes color-breaking in tulips. We now know that there are several viruses that can induce color-breaking and that they are vectored by aphids. Tulips with the viral disease once sold for inflated prices in the Netherlands during the 1630s. One tulip was recorded for selling around $1,500 (price adjusted for historical comparison), about the price of a large home in Amsterdam at that time.

One other plant disease that can be regarded as beneficial to some is the pathogen that causes corn smut, a disease that often disgusts homeowners when they see the lumpy disfigured ears of corn in their garden. But the young galls of these same infected corn ears are considered a delicacy in Mexico and other countries of Central America. There, the disease, as well as the delicacy, is called huitlacoche. The infected galls are priced much higher than healthy corn, and are cooked into a recipe that includes garlic, onions, and epazote (a Central American herb *Chenopodium ambrosioides*). It was once regarded as ambrosia to the Aztecs. The popularity of huitlacoche is increasing, and is now marketed in the U.S. as "maize mushrooms," "Mexican truffles," or "caviar azteca." So this year, a plant disease may be cheering up your living room as well as your dinner plate!

-Kent Evans,
Extension Plant Pathologist

A disease caused by a phytoplasma causes poinsettias to grow short and stout, and the fungus of corn smut disease is a delicacy to some.

UPPDL Seeks State Legislative Funding

The Utah Plant Pest Diagnostic Laboratory is the only service lab in Utah to provide diagnoses and management recommendations for insects, spiders, and plant diseases.

Although the Lab has been in existence for nearly 30 years, it has suffered from a

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What's Inside

News Highlights

NEW *UTAH PESTS* FACT SHEETS:

Asparagus Beetle and Spotted Asparagus Beetle

Cereal Leaf Beetle

Lygus Bug in Alfalfa Seed

Soft Scales

***UTAH PESTS* STAFFS BOOTH AT FARM BUREAU TRADE SHOW**

The hobo spider projected on a computer monitor awed several hundred people at this year's Farm Bureau Trade Show. The Utah Pests group displayed a dissecting microscope and laptop to highlight common insects and spiders up close and personal. The free pens and pads were an added bonus for visitors.

www.utahpests.usu.edu

UPPDL Legislative Funding, continued from page 1

lack of adequate funding. Without more funds, the Lab will be unable to provide high quality pest management services to the growing population of Utah. Utah has experienced extensive population growth resulting in increased demand for information and education on caring for landscape ornamentals, turf, small pastures, and specialty fruit and vegetable crops. National accreditation standards will require the Lab to upgrade technology and real-time diagnoses. Legislative funding will stabilize the Lab and allow staff members to increase continuing education opportunities for Extension agents, Utah Department of Agriculture and Food staff, plant industries, homeowners, and others. Therefore, USU Extension is undertaking a funding request initiative in the 2008 General State Legislative Session. The Lab is looking for support from the agricultural, horticultural, and green industries for this funding effort. Please let your local state legislator know that you rely on the support and services of USU Extension Service and the Utah Plant Pest Diagnostic Lab.

-Diane Alston, Extension Entomologist

FDT and DDIU Programs Are Off and Running!

This Fall marked the beginning of two new programs offered through the Utah Pests group of Extension Specialists Diane Alston, Kent Evans, and Erin Hodgson, in association with the Utah Plant Pest Diagnostic Lab's (UPPDL) Arthropod Diagnostician, Ryan Davis. Both programs are interrelated but are different in their emphases.

FIRST DETECTOR TRAINING

First Detector Training is a national program that trains individuals in agricultural industries and state agencies to recognize and report recent pest introductions to ensure the security of our food and environment. First Detector Training (FDT) was conducted in Utah this past October at the Kaysville Botanical Center's Utah House. Dick Hoenisch was the invited speaker from the University of California at Davis, representing the offices of the Western Plant Diagnostic Network (WPDN). Other speakers included Specialists Diane Alston, Erin Hodgson, and Kent Evans. Dick presented modules of FDT regarding general, and some specific, issues in the WPDN. The WPDN is one of five regional divisions of the National Plant Diagnostic Network which is part of the USDA/APHIS Homeland Security Department. There were 26 Extension agents and Master Gardeners in attendance representing most of Utah's counties. The training was a success and participants received a certificate of completion for First Detector Training. Future programs of FDT will be arranged through the county Master Gardener programs. Please contact Kent Evans for details of future training and collaborative program development that can be tailored to fit our state's programs.

DISTANCE DIAGNOSTICS IN UTAH

Sometimes it isn't the big picture that counts most but more importantly it is the unseen details. This past October saw the beginning of the Distance Diagnostics in Utah (DDIU) program. DDIU is a new program where digital dissecting microscopes were disseminated among 12 Utah counties as a new Extension program to facilitate rapid diagnostics for plant pests. Counties receiving the scopes were selected based on agricultural productivity, populace, and equipment need. The scopes are capable of digital imagery to 3-megapixel resolution and magnifications from 8-35x. The scopes are also capable of being attached to digital projectors or computers for presentations to larger groups, such as 4-H and Master Gardeners, and for training programs that can be initiated at the county level.

Beyond diagnoses, there is much room for creative application with the new scopes, ranging from simple imaging for clientele to developing publications from the images these scopes can generate. The scopes also come with a software program with a

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FDT and DDIU Programs, continued from page 2

County Ag Agent Matt Palmer learns about Distance Diagnostics in Utah (DDIU).

suite of options that facilitate image processing (color, lighting, and sharpening), on-screen measurements, and image time stamping. Images can be transmitted via e-mail attachment(s) to interact with the Arthropod and Plant Disease Diagnosticians at the USU campus or national diagnostic networks as well. The continuing emphasis of the program will be to acquire two additional scopes annually for dissemination to the remaining Utah counties until the state is covered with DDIU capabilities. Annual and regional trainings will be part of the Utah Pests and UPPDL groups' programming each season. The future looks bright for this newer technology and how County Extension offices will be able to interact with the Utah Plant Pest Diagnostic Laboratory and local clientele.

-Kent Evans, Extension Plant Pathologist

Trip to Ohio Will Help Utah Diagnostics

Recently Ryan Davis and I traveled to Columbus, Ohio for a customized insect diagnostics workshop. As a Co-State Survey Coordinator for the CAPS (Cooperative Agricultural Pest Survey) Program in Utah, I felt it was important for us to have this specialized training. We coordinated our trip with two members of the Utah Department of Agriculture and Food, Clint Burfitt and Dan Clark, and visited the Ohio State University Museum of Biological Diversity. For two days, we received intense training on Microlepidoptera of economic importance. Microlepidoptera, often abbreviated as "microleps," represent 37 out of the approximately 47 superfamilies of Lepidoptera. Dr. Steven Passoa, Lepidoptera Specialist, works for USDA-APHIS and is an expert in identifying exotic microleps from other countries. Dr. Passoa is a native New Yorker and his spirited commentary about his unique position helped us all learn more about pest detection in the U.S.

Dr. Passoa began by teaching the group how to properly prepare specimens for examination. As the name implies, microleps are generally less than 5.5 mm and require careful preparation for accurate identification. Generally, moths are collected on sticky cards and require a series of solvent saturations to remove dirt and adhesive; alternating ethanol and histoclear baths is a common protocol. Extra dirty moths need an ultrasonic bath to further remove debris. In some cases, body characters are still hidden by dense scales (hairs), and so gently brushing off the scales is mandatory. An important diagnostic feature for most microleps is the male genitalia. We watched several video clips of genital dissections (pulling out the male reproductive organs from inside the abdomen). This is very delicate work, and a technique for Ryan and I to practice this winter (yes, you can all stop being jealous now!).

Next, we learned to recognize major characters for superfamilies of economically important microleps. We worked through couplet keys, constantly referencing moth body parts through a microscope, and drawing our observations. Dr. Passoa would often mix in native moths with exotic species to point out diagnostics features and how not to confuse similar-looking moths. He discussed microleps of potential concern to Utah, including light brown apple moth, Egyptian cottonworm, silver Y moth, and false codling moth. These moths are or will be part of the annual CAPS surveys, and therefore screening for these moths should be more efficient now that we have insights on diagnostic characters to look for when sorting sticky traps.

Dr. Steven Passoa, USDA-APHIS Lepidoptera Specialist (standing, center), trains Extension and UDAF employees.

Before departing, we visited the Plant Pest Diagnostic Clinic at OSU where they receive over 3,000 samples a year! Barb Bloetscher, Entomology Diagnostician, gave us a tour of their multipurpose facility. It was a great end to our trip to Columbus. Ryan and I hope to continue to improve our diagnostic skills by attending more training workshops.

-Erin Hodgson, Extension Entomologist

Onion Thrips Research in Utah: Egg Hatch, Survival, and Dispersal Influence Insecticide Performance

In Utah and many of the onion production areas of North America, onion thrips (*Thrips tabaci*) is an economically damaging pest. Characteristics of onion thrips life history and ecology that contribute to its pest status include parthenogenesis (females reproduce asexually), short generation time, high mobility of adults, rapid development of resistance to insecticides, and life stage survival strategies. The later larval instars are non-feeding and resistant to adverse conditions. Females insert their eggs into leaves, thereby protecting eggs during the development period. A major challenge facing onion producers is the often rapid reestablishment of thrips in onion fields following insecticide treatments, leading to frequent reapplication of insecticides. For the last three years, research in my Lab has focused on gaining a better understanding of the contribution of onion thrips life stage survival and adult dispersal to populations on plants, especially following insecticide applications. Following is a summary of some of the recent findings.

Suppression of motile life stages (adults and larvae) by insecticides can vary tremendously within and across growing seasons and is influenced by many factors. Targeting only motile stages for suppression will likely lead to variable success in population management. Targeting eggs within leaf tissue or 1st-instar larvae soon after hatch may help reduce re-infestation of onion plants. In 2007, the number of *Thrips tabaci* eggs that hatched per 3rd youngest leaf before and at one to three weeks after insecticides were applied, ranged from 1 to 54 in two trials in July and August. After collection from the field, leaves were held in hatching chambers for two weeks to allow hatch. By one to three weeks after treatments were applied, some insecticides reduced hatch as compared to the untreated control (results only for Trial 1 shown, Fig. 1). The insecticides Lannate® and spirotetramat (unregistered insecticide from Bayer CropScience) showed the greatest reductions and kept total hatch below 14 thrips per leaf for up to three weeks after treatment. Both Lannate® and spirotetramat have systemic activity and seem to exhibit longer-lasting effects on thrips eggs.

Thrips within neck of onion plant upper left; thrips adult, upper right, stained thrips egg on onion leaf, lower right.

Another critical aspect of insecticide performance is prevention of re-infestation from immigrants. The use of exclusion cages (made from no-see-um screening) allowed comparison of thrips populations with and without dispersal and influence of natural enemies. Interestingly, the effects of exclusion varied over time. By two weeks after insecticide applications, there was an interaction between presence of cages and insecticide treatments. Thrips counts were greater on caged than open plants

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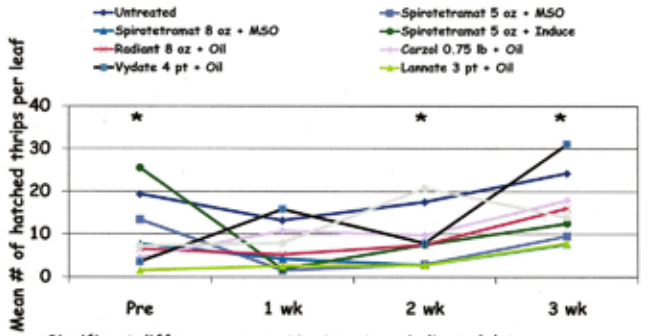
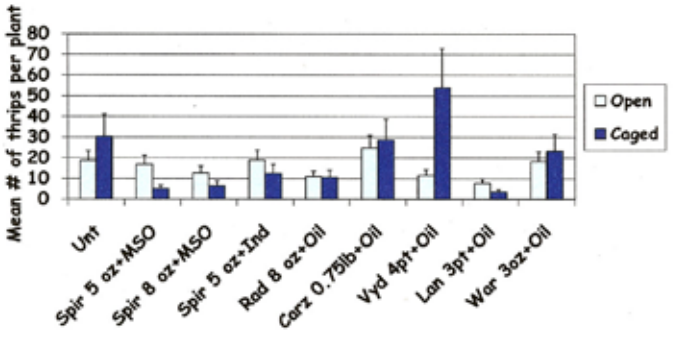
Fig. 1. Influence of insecticides on *Thrips tabaci* egg hatch



•Significant difference among treatments on indicated dates
Insecticide rates are per acre, MSO=methylated seed oil, Oil=horticultural mineral oil, and Induce=non-ionic surfactant

Fig. 2. Influence of exclusion (caging) on *Thrips tabaci* densities (adults and larvae) on plants two weeks after treatment



Presence of cage X insecticide interaction: $p = 0.007$

for some treatments, such as the untreated control, Carzol®, Vydate®, and Warrior® suggesting that these treatments were not as suppressive to egg hatch and larval survival as the other insecticides (Fig. 2). By three weeks after treatment, more thrips were present on caged than open plants for all treatments suggesting that more thrips had come from egg hatch, survival, and exclusion of predation than from new immigrants as insecticide residues diminished.

In summary, these results suggest that suppression of thrips populations on onion plants requires not only short-term (1-2 weeks) suppression of motile life stages (adults and larvae), but also longer-term (2+ weeks) suppression of immigration and egg hatch (and/or larval mortality upon hatch). Egg hatch rates of up to 54 larvae per 3rd youngest leaf on a plant over a two week period (without continued egg-laying) are impressive and suggest that the egg reservoir in leaves is an important factor in re-infestation of onion plants. Sustainable thrips population suppression strategies should incorporate prevention of egg-laying and hatch to enhance population management in onion fields.

-Diane Alston, Extension Entomologist

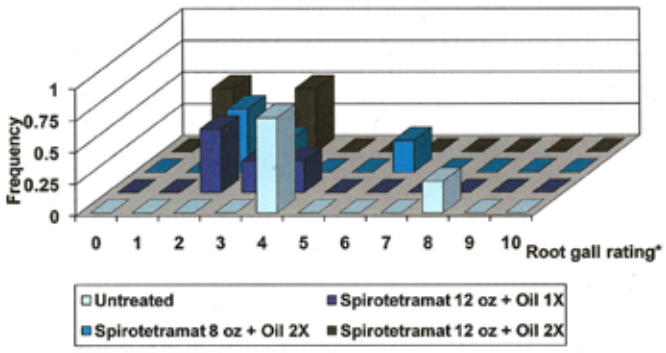
Woolly Apple Aphid Suppression on Apple Roots

The decrease in use of broad-spectrum insecticides in apple orchards in Utah and the western U.S. appears to be correlated to an increase in some insects that were secondary problems in the past. Woolly apple aphid is one of these secondary pests that are more common today. Woolly apple aphids feed in the phloem of limbs and roots and cause galls that decrease the efficiency of nutrient uptake and fluid transport. The aphids are covered with a grayish-white waxy material that protects them from the environment, natural enemies, and insecticides. Recent research in Utah has evaluated the efficacy of a still unregistered systemic insecticide, spirotetramat (Bayer CropScience). Spirotetramat has demonstrated good suppression of woolly apple aphids on tree limbs. In 2007 the opportunity arose to evaluate suppression of aphids and galling on roots.

Eighteen-year-old apple trees were pulled from the ground and the roots of root suckers evaluated for galls. As compared to untreated trees, there was a significant reduction in root gall ratings (Fig. 1) and numbers of galls (Fig. 2) on trees that were sprayed with spirotetramat (8 or 12 oz per acre + 1% horticultural mineral oil) either once at petal fall (May 9) or twice (May 9 and June 11). Bayer CropScience is pursuing registration of spirotetramat on apple. These results are encouraging that an effective product may soon be available to assist apple producers with managing this challenging pest.

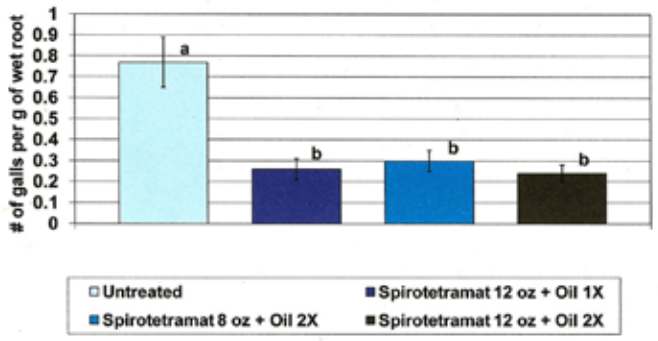
-Diane Alston, Extension Entomologist

Fig. 1. Frequency of apple root gall ratings



*0 = no galls, 1 = 1-10% of roots galled, ... 10 = 91-100% of roots galled

Fig. 2. Number of galls on apple roots



Twig gall caused by aphid feeding

Root galls caused by woolly apple aphid

Woolly apple aphid colony on apple stem

Insects: Where Are They Now?

Maybe you've wondered where insects go in the winter. It's a great question and a huge obstacle for insects to overcome every year. Some insects can't survive the winter (especially in northern Utah) and simply have to overwinter to warmer climates every year. A great example of this is the monarch butterfly. They overwinter in Mexico, and adults travel north to the U.S. and Canada every summer. Monarch butterflies migrate back to Mexico every fall; individuals have been known to fly almost 2,000 miles in four months. Some insects try to find harborage in human structures where there is heat. Boxelder bugs are a good example of insects that become a nuisance in the fall as they seek winter shelter.

In most cases, insects have adapted to cold temperatures by evolving a cold-hardy life stage. The optimal overwintering life stage is variable between species, but could be an egg (e.g., aphids, some mosquitoes), a larva or nymph (e.g., white grubs, borers), a pupa (e.g., lace wings, most butterflies and moths) or an adult (ants, lady beetles, most true bugs). Often insects will bury themselves in soil, leaf litter, under rocks or other debris to offer some protection from the elements. Others will stay on or near the plant they will feed on the following year.

The rose stem girdler overwinters as a larva in the pith of its host plant.

Katydids survive the winter as eggs on branch stems.

The spring cankerworm spends its winter as a pupa in the soil until late March.

Perhaps the real question is HOW do insects survive the winter? Some have adapted to humans and seek warmth of buildings; often these insects are perceived as pests. But most insects go through diapause, which is a quasi-dormant period often triggered by cold temperatures and photoperiod. Wikipedia defines diapause as "a neurohormonally mediated, dynamic state of low metabolic activity." Diapause slows down or stops all bodily functions, including eating. Sometimes diapause is a mandatory resting period, meaning that an insect must go through dormancy to continue the life cycle. To further enhance the survival rate of overwintering, insects will purge most of their gut contents and frass to minimize any unnecessary water in the body. Dehydration will lessen the chance of ice crystals forming inside the body. Also, insects will start to produce glycerol, acting like antifreeze to help winterize the body for cold temperatures. A combination of these body changes provides the greatest likelihood of surviving temperatures below freezing.

Several factors can influence the chance of insects surviving the winter, including how soon freezing temperatures begin in the fall and subsequent warming/cooling events. For example, if a sudden freeze hits the Wasatch Front in the fall, insects will not be properly prepared in purging water and finding secluded sites. Most certainly an early freeze will kill a small portion of insects before they can enter diapause. But even if insects have enough time to prepare for diapause, repeated warming and cooling periods during the fall and spring can bring insects out of their resting state too soon. If insects emerge before plants are growing, they will likely starve or not survive subsequent freezes.

Where insects go during the winter will affect their survival the following spring. Some migrate, others try to find hiding places in human structures, while most simply "grin and bear it" by finding secluded areas and producing antifreeze. All are major obstacles for insects to overcome each winter. I wonder if they ever tried wearing gloves and hats?

-Erin Hodgson, Extension Entomologist

Managing Drought Stress in Landscape Trees

Author Mike Kuhns is Extension Forestry Specialist in the College of Natural Resources. More information about drought stress and trees in general can be found at the Extension Forestry Web site: http://extension.usu.edu/forestry/.

Water is the most critical factor limiting growth and survival of trees nearly everywhere in the world. As you travel across North America from east to west you see the effects of water on natural forests: dense eastern forests with occasional non-forested areas to scattered forests mostly at high elevations west of the Missouri River. This change in forest cover is mainly a function of decreasing precipitation. When natural precipitation drops below about 15 to 18 inches a year there is not enough water to sustain even the most drought-hardy trees.

So what is drought? Drought is a period of "prolonged dry weather." To give you some perspective on drought and what dry weather is, consider that a desert typically gets less then 10 inches of precipitation a year. Forests, on the other hand, need greater than 15 to 20 inches a year, and many of the tree species we grow in our cultivated landscapes need 25 to 40 inches.

Prolonged drought stress on this linden has led to reduced growth, and a noticeably thin crown.

HOW DOES DROUGHT AFFECT TREES?

In dry Utah, lack of water exposes plants to the effects of drought. Drought affects plants through a sequence of events that looks like this:

Prolonged dry weather (drought) causes...
- drying soil, which leads to...
  - decreased plant water uptake, resulting in...
    - plant tissue dehydration, which ultimately affects the plant through...
      - reduced food production (photosynthesis) & storage
      - reduced shoot/root growth
      - reduced membrane integrity
      - reduced self defense ability
      - reduced survival

Reduction in some or all of these factors results in poor survival of young, newly transplanted trees, and weakens older, established trees. Drought can kill mature trees if it is severe enough and lasts long enough, but more often weakens them, opening the door to insects or diseases that come in and finish the job. Thankfully, many trees have mechanisms to tolerate lack of water. Trees tolerate drought either by keeping their tissues moist by maintaining water uptake and decreasing water loss, or they develop tolerance to tissue dehydration when tissue drying cannot be avoided.

WHAT CAN BE DONE ABOUT DROUGHT AND TREES?

Whether growing trees in a large-scale production nursery or taking care of a residential landscape, short-term and long-term droughts have to be dealt with to keep our trees healthy. With climate getting warmer and drier in some areas, and population growing, sources of irrigation water are becoming more limited. Here are some ways we can plan for and deal with drought in landscapes with trees:

1. Tree Selection

The best way to deal with drought is to favor trees and other plant material that can tolerate drought. Look for species native to drier regions of the U.S. and the rest of the world - they likely are adapted to dry conditions. Very drought tolerant tree species include most oaks, elms, hawthorns, locusts, some maples, many pines, and junipers. Species that are intermediate in drought tolerance include some oaks and pines, many maples, lindens, ashes, firs, and spruces. Examples of trees that are low in drought tolerance include willows, most cottonwoods, and birches. Regions that are home to many drought tolerant species include much of the western U.S., the Great Plains, the U.S. Southwest and Mexico, the Mediterranean, and drier portions of Asia. Be careful to avoid use of species that are pest-prone when drought stressed unless you can deliver them extra water. A prime example is blue spruce, that does fine when well-watered, but is bark beetle-prone when water stressed.

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Drought and Landscape Trees, continued from page 7

2. Irrigate to Promote Drought Tolerance

As with turf, deep, infrequent irrigation of trees promotes deep, extensive root systems that can access more water when the soil begins to dry. Also, gradually exposing many trees to some drying in early to mid-summer will actually encourage them to adjust the chemical makeup of their cell contents and membranes, and can help prevent the membrane leakage and chemical disruptions that happen when drought gets worse later in the summer.

3. Create Landscape Zones Based on Water Needs

Most landscapes contain plants with varied levels of drought tolerance. If you are in a position to design or redesign landscapes, group plants at least partly by their drought tolerance. This makes it much easier to irrigate according to specific plant needs.

We in Utah know what it is like to grow plants in landscapes that are exposed to drought. Understanding how it affects trees and other plants, and how they react to it, can make the task of coping with drought easier and more likely to be successful.

-Mike Kuhns, Extension Forestry Specialist

Grower Profile: IPM Practitioner and Apple Orchardist Dale Rowley

Spring brings abundant blooms to the Rowleys' Cherry Hill Farms orchards.

For the past 16 years, Dale Rowley and his two brothers have run Cherry Hill Farms, a 600 acre orchard located in the heart of Utah's fruit growing region. There they grow apples, tart and sweet cherries, and peaches. Dale manages the 110 acres of apples, which include 'Fuji,' 'Golden Delicious,' 'Gala,' and others.

Dale and his family are at the forefront of pest management, and strongly believe in using the least toxic materials available. He has been a member of the Utah State Horticultural Association (USHA) for the past 22 years and stays current on the newest technologies and materials. "We have made a practice to be involved in the industry by attending meetings in other states and learning what is going on," says Dale. "We have friends in other areas that we visit with and ask for suggestions. Our local farm supply store helps us with new products, and Utah State University has a great Extension program and we work closely with them."

Dale was one of the first growers in Utah to use mating disruption to manage codling moth on his apples. He learned about the technique from entomologists at Washington State University, and in 2000, set up a small experimental plot to test its effects in Utah. He expanded the program to his entire apple acreage the following year.

"Using mating disruption has changed the way we manage many of the apple pests," says Dale. "We now hang pheromone traps and scout the orchard regularly for a variety of other pests, including fire blight." When Dale's schedule is too hectic (he manages 40 summer employees), his daughter or niece will fill the role of scout. They both have been trained to identify the major pests in Dale's apples, including spider mites, leafhopper, and aphids. "Since using mating disruption, some other pest problems have increased, such as thrips and woolly apple aphid. We're using fewer chemicals; the "traditional" codling moth spray program would normally knock down those pest populations."

Dale knows the importance of monitoring when not following a traditional spray program. He has codling moth traps throughout his orchard. If the moth count exceeds six in one trap, then a spray is applied to that specific block, not to the entire orchard. "I feel that using mating disruption has greatly reduced the amount of infested fruit on our farm. But you have to be careful. If you don't monitor your traps and stay on top of it, you could get a lot more damage than a standard spray program."

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Grower Profile: Dale Rowley, continued from page 8

And the Rowley's apples are some of the best around. Dale says that Utah County is prime fruit-growing country due to the ample water supply (underground wells and the Strawberry Reservoir), good soil, and optimal year-round temperatures. Although nature has not always been nice. "We have had total freeze outs where no fruit was harvested at all. Each year brings its own challenges and we have grown from each one. Hopefully we have become better because of having gone through them."

Interested in some of the Rowley's apples? You can find them at Wal-Mart, Smith's Foods, local markets, and fruit stands in Orem, Layton, and Santaquin. (The USHA also maintains a Web site on where to buy Utah fruit at utahfruit.com.) Dale, however, has his fill of apples every day, and loves every minute. "But I escape from the apples when I come home. We have such long days that the apple trees I used to have at home died from lack of attention." He certainly cannot say that about his farm! To learn more about Cherry Hill Farms, visit cherryhillfarms.com.

Dale has been a cooperator on several USU Extension's research projects for many years, and we are grateful to him for his service.

-Marion Murray, IPM Project Leader

Featured Picture of the Quarter

This female fall cankerworm laid her eggs on an elm branch in late October. The eggs are adapted to survive the winter fully exposed. They will hatch in mid-spring as the leaves begin to emerge. Look for them early in the season by banging a branch over a tray.

A new fact sheet about cankerworms (spring and fall) is coming soon.

-Photo by Marion Murray

Calendar of Pest, Disease, and IPM-Related Events

January 7-9, Western Plant Diagnostic Network Annual Meeting, Phoenix, AZ

January 7-8, 66th Pacific Northwest Insect Management Conference, Portland, OR

January 9-11, Western Orchard Pest and Disease Management Conference, Portland, OR

January 8-10, Western Disease Conference, Portland, OR

January 22-23, Utah State Horticultural Association Annual Convention, Provo, UT

January 28-30, Utah Green Industry Conference & Trade Show, South Towne Expo Center, Sandy, UT

February 4-7, Weed Science Society of American Annual Meeting, Chicago, IL

March 25-27, SARE 20th Anniversary Conference, Kansas City, MO

April 1-8, The National Women in Agriculture Educators Conference, Oklahoma City, OK

March 24-26, 2009, 6th National IPM Symposium, Portland, OR

HOBO OR NOT A HOBO–*THAT* IS THE QUESTION...
A Photographic Key to Discerning Hobo From Non-Hobo Spiders

ABOUT THE KEY

This key is intended for use with, at a minimum, a microscope with 8-35x zoom capability. In addition to couplet choices based on anatomy, this key is accompanied by pictures taken with a Leica EZ4D stereoscope (the same scopes given to selected Utah Extension offices) to aid in identification.

The main purpose of the key is to identify the hobo spider (Agelenidae: *Tegenaria agrestis*) as compared to other *Tegenaria* species and members of the wolf spider family (Lycosidae). It does not include common Utah spiders such as the yellow sac spider (*Cheiracanthium inclusum*), members of the widow genus (*Latrodectus*), recluse spiders (*Loxosceles*), jumping spiders (Family Salticidae), ground spiders (Family Gnaphosidae), wood-louse spiders (Family Dysderidae), cellar spiders (Family Pholcidae), crab spiders (Family Thomisidae), running crab spiders (Family Pelodromidae), etc. For an excellent key to these other families, please see Alan Roe's photographic key to the common spiders of Utah, which will be available in the fact sheets section of the Utah Pests Web site.

For those not familiar with dichotomous keys, below is a brief example of how to use them. Also provided are commonly encountered terms associated with spider taxonomy, and a detailed list of characters that will help you work through the key.

USING DICHOTOMOUS KEYS

Dichotomous literally means "divided into two sharply distinguished classifications." When using a dichotomous key the user chooses between two identifying characters (e.g., 2 legs or 4 legs) and then is directed to another couplet containing two more identifying characters (e.g., hooves or no hooves), etc., until the correct taxon (group) is determined. Please see the brief example below:

Example: Key out a dog.

1. Organism with 2 legs..... 2
   Organism with 4 legs..... (3)

2. Organism with feathers..... Bird
   Organism with hair..... 4

(3.) Organism with hooves..... Ungulate
   Organism without hooves..... (5)

4. Organism walks upright and with well-developed speech
   ..... Human
   Organism with long arms and swings from trees
   ..... Monkey

(5.) Furry, barks, and demands walks twice a day
   ..... (Dog)
   Furry, howls, and would like to eat you
   ..... Wolf

While this example is not the most scientific, it does illustrate moving between couplets, and ending at the correct group. The hobo screening key that follows is short–only four couplets–but requires some knowledge of hobo spider taxonomy. Following is an overview of critical characters and terminology used in the key.

SPIDER TERMINOLOGY AND TAXONOMY

Unlike the key above, dichotomous keys are usually very technical, but with an explanation of the terms and labeled photographs anyone can be an expert. Please read all of the information that follows before attempting to identify a spider. For this key, understanding what plumose setae look like at 35x is paramount, so try to understand that concept before continuing.

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GLOSSARY FOR TERMS RELEVANT TO THIS KEY:

Anterior Eye Row (AER) - the bottom row of eyes.
Chelicera - the anterior appendages of a spider consisting of a large basal segment and an apical fang.
Cheliceral Furrow - the area between the cheliceral promargin and retromargin where the fang is positioned at rest.
Cheliceral Promargin - the margin of the cheliceral furrow that is in front (anterior) of the fang.
Cheliceral Retromargin - the margin of the cheliceral furrow that is behind (posterior) the fang.
Macrosetae or Spines - pointed rigid structures situated in a socket and capable of articulating; large thick hairs compared to standard setae.
Plumose Setae - feather- or fern-like setae that lay flat (recumbent) against the body.
Posterior Eye Row (PER) - top row of eyes.
Setae - erect or recumbent, simple, serrate, feathery, plumose, or clavate to broad scales (hairs).

All other words relating to spider body parts are illustrated below in the pictures.

SPIDER TAXONOMY

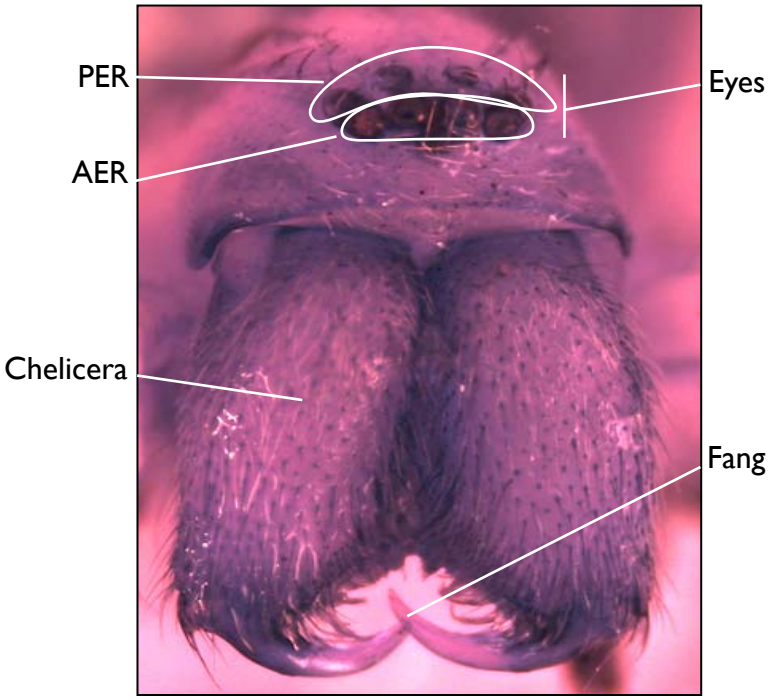

Figure 1. Front of head.

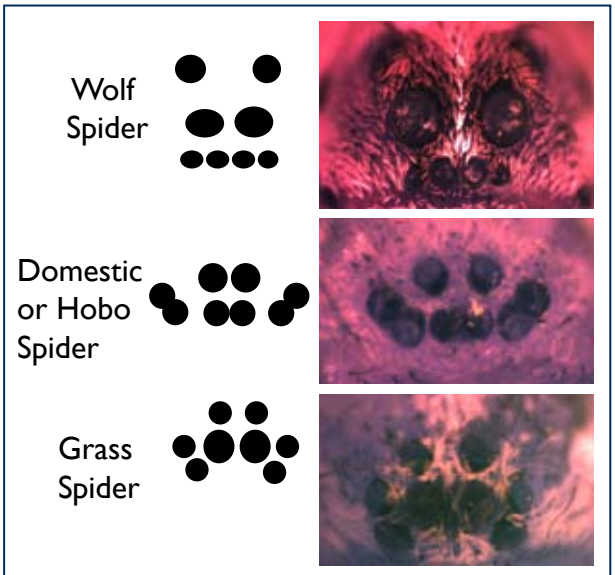

Figure 2. Spider eye patterns relevant to this key.

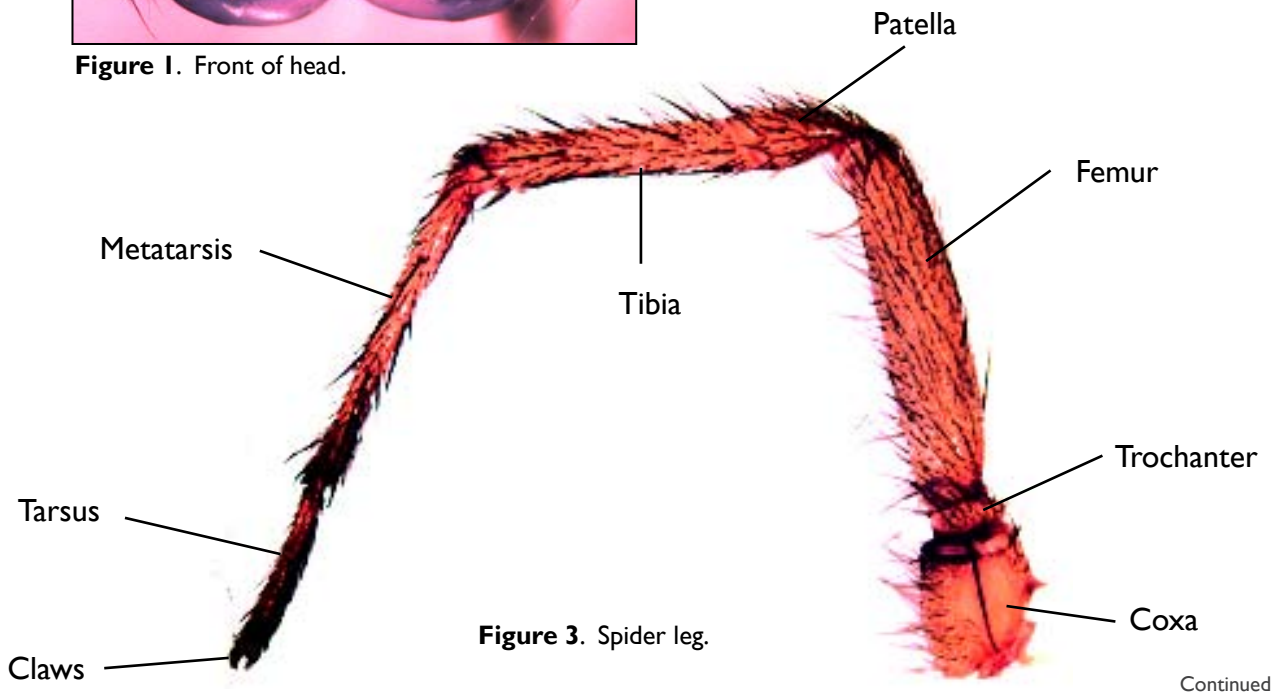

Figure 3. Spider leg.

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SPIDER TAXONOMY, continued

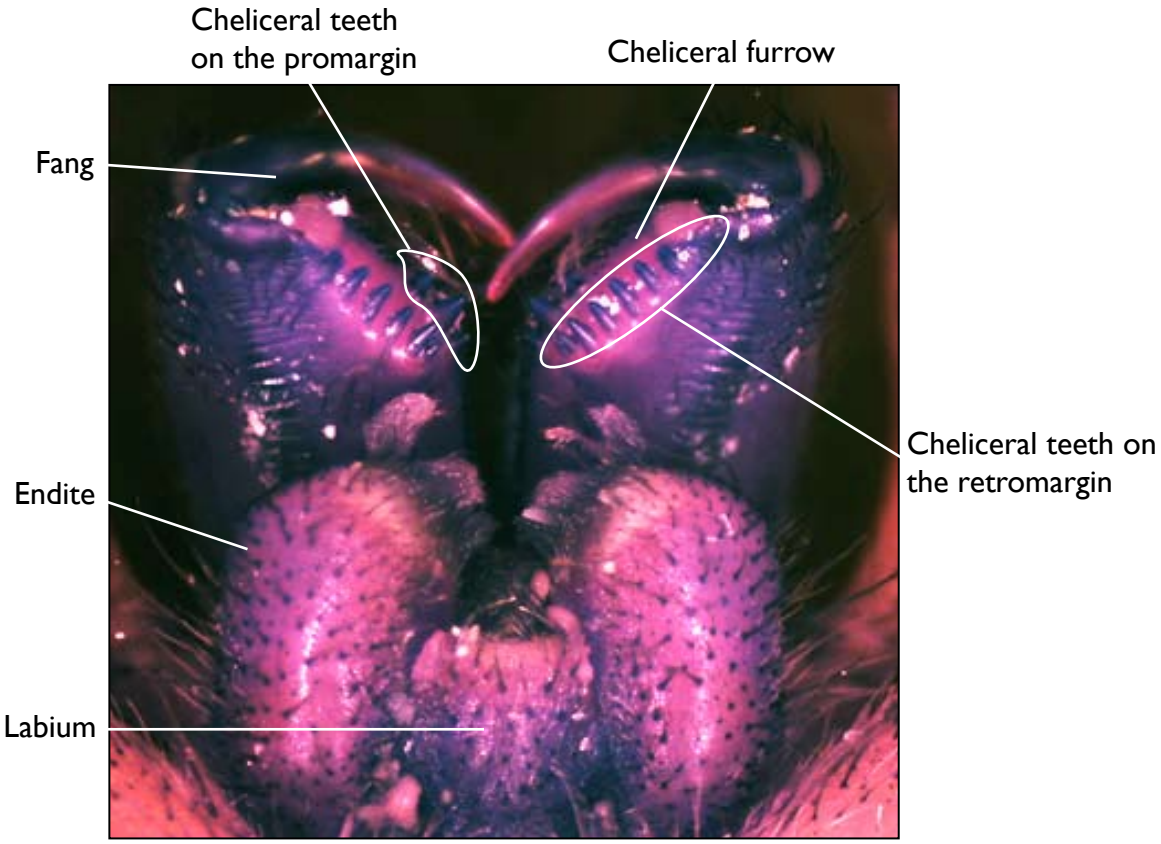


Figure 4. View of chelicera and fangs from behind (relative to Figure 1).

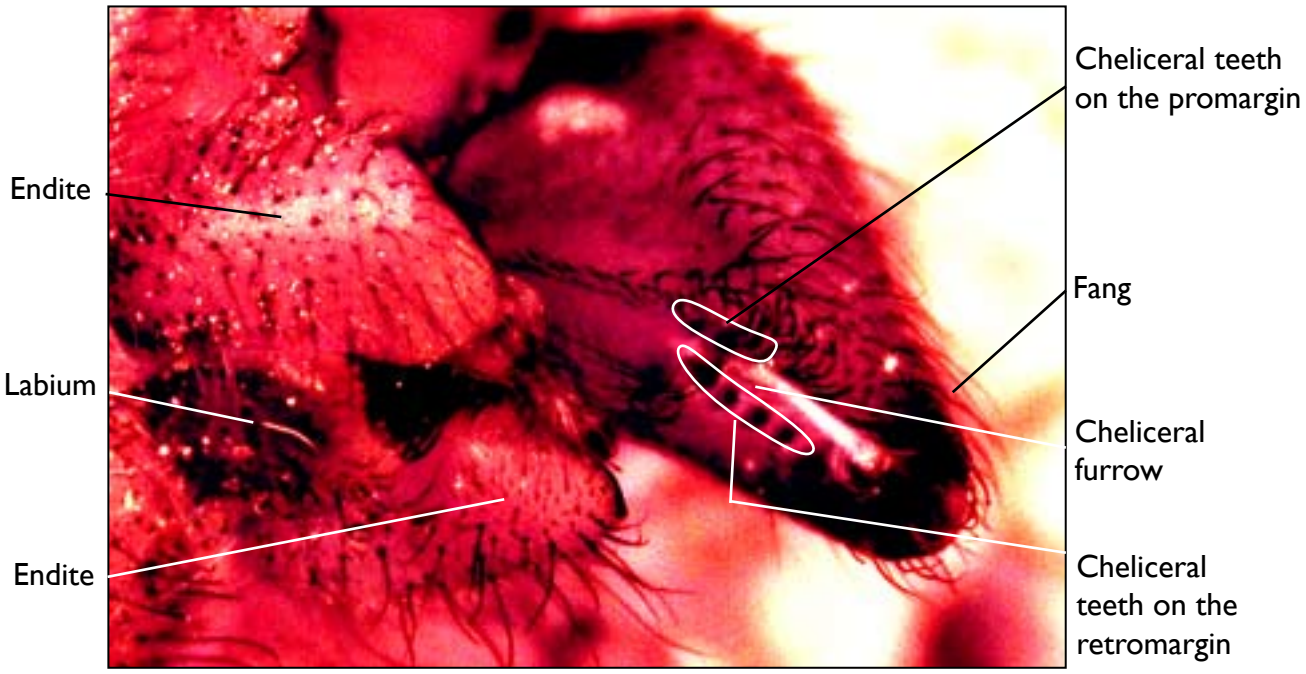
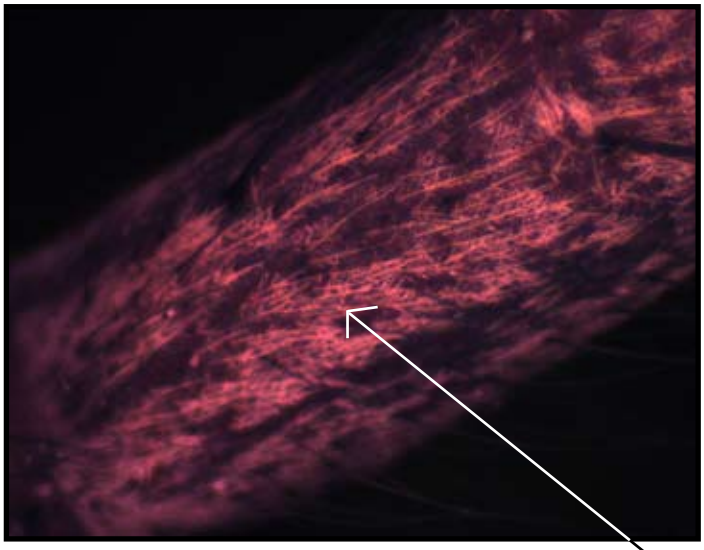


Figure 5. View of chelicera and fangs from the side. Match the mouthparts with those in Figure 4 to understand the angle of the photograph.

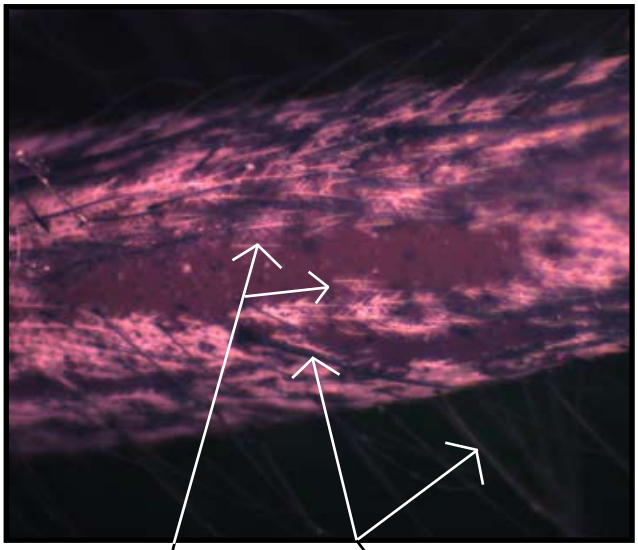
Continued on page 13

PLUMOSE SETAE: A FAMILY-LEVEL CHARACTER FOR THE FUNNEL WEB SPIDERS (AGELENIDAE)

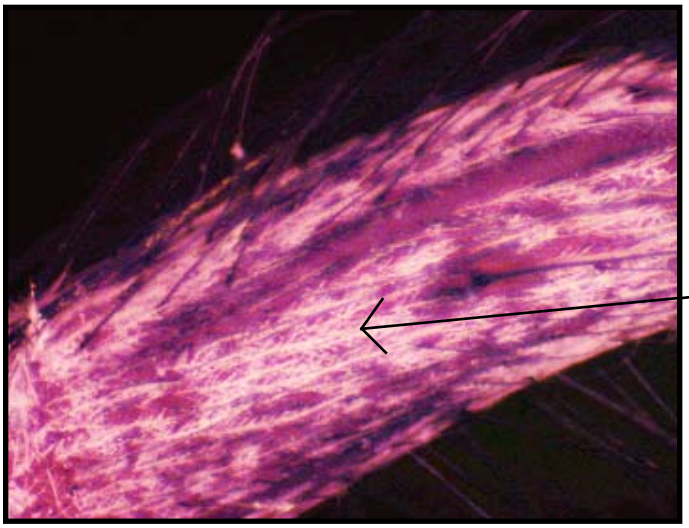
The key presented below is short and simplistic; however, for the key to work the user must be able to recognize plumose setae. The section below is designed to help the user understand what plumose setae look like at 35x, and compare them to macrosetae, with which they may be easily confused.



Picture 1. Plumose setae on grass spider (*Agenelopsis* sp.) leg (35x: Leica EZ4D).

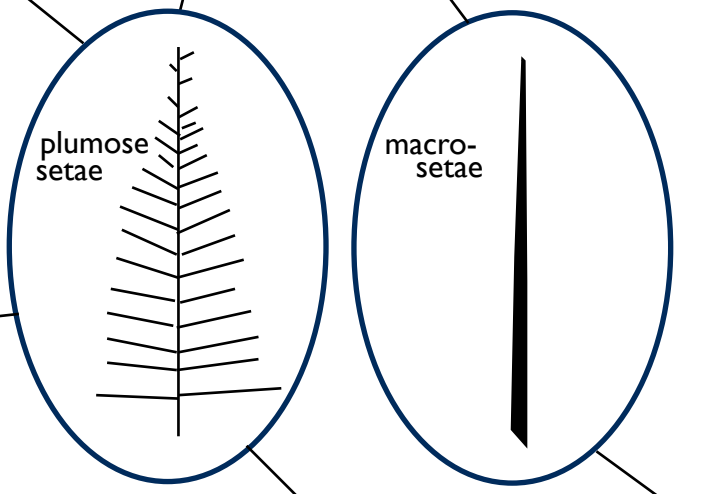


Picture 2. Plumose setae on grass spider (*Agenelopsis* sp.) leg (35x: Leica EZ4D).



Picture 3. Plumose setae on grass spider (*Agenelopsis* sp.) leg (35x: Leica EZ4D).

Picture 4. Plumose setae (translucent hairs) and macrosetae (dark hairs) on grass spider (*Agenelopsis* sp.) leg (23x: Leica EZ4D).



Picture 5. Plumose setae on hobo spider (*Tegenaria agrestis*) leg (65x: Zeiss Stemi 2000-C).

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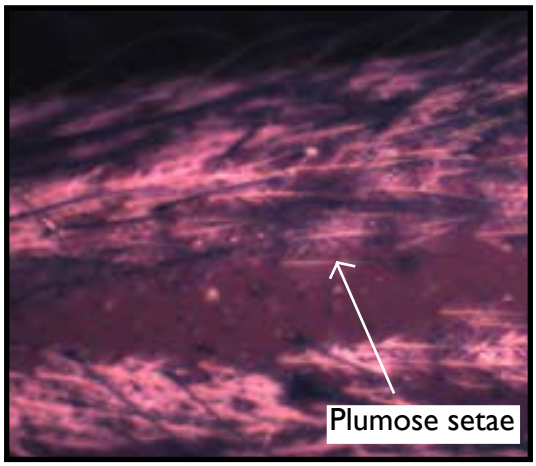
Hobo Spider Screening Key (Agelenidae: *Tegenaria agrestis*)

1. Spider with plumose setae (picture 6). 3

Spider without plumose setae (picture 7). 2



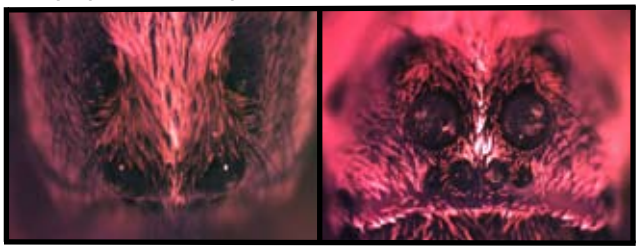
Picture 6. Plumose setae on grass spider (35x: Leica EZ4D).

Picture 7. Straight hairs (without plumose branching) on a wolf spider leg (35x: Leica EZ4D).

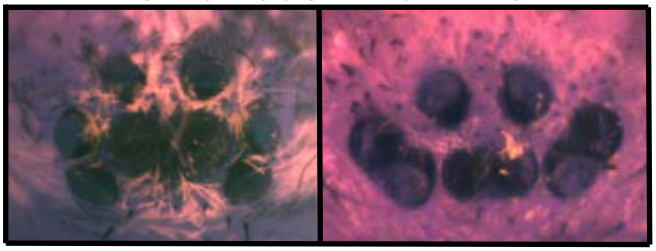
2. Eye pattern as in pictures 8 and 9 . . . . . Lycosidae: Wolf Spiders

Eye pattern not as in pictures 10 and 11 . . . . . See Roe key online

3. Eye pattern as in picture 12 . . . . . *Agenelopsis* sp.(Agelenidae): Grass Spider

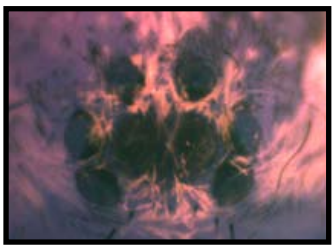


Pictures 8 and 9. Dorsal and anterior views of wolf spider eye pattern (35x: Leica EZ4D).

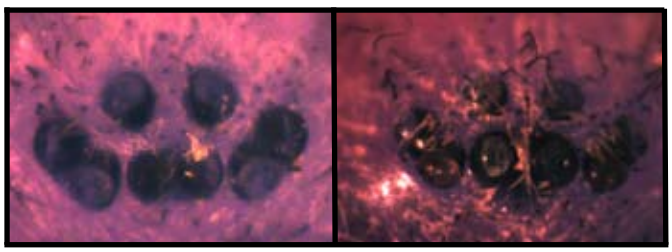


Pictures 10 and 11. Anterior view of grass spider, and hobo/domestic spider, eye patterns (35x: Leica EZ4D).

Eye pattern as in pictures 13 and 14 4



Picture 12. Grass spider eye pattern (35x: Leica EZ4D).



Pictures 13 and 14. Anterior view of domestic house, and hobo spider, eye patterns (35x: Leica EZ4D).

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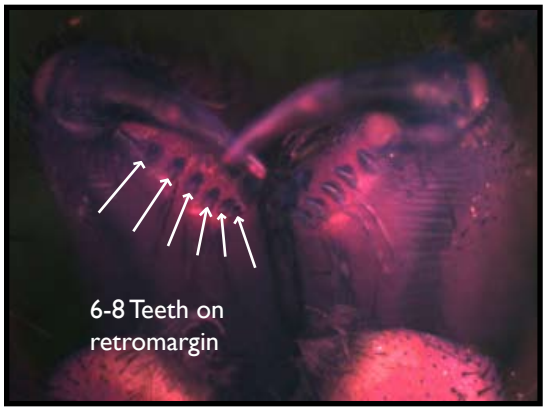
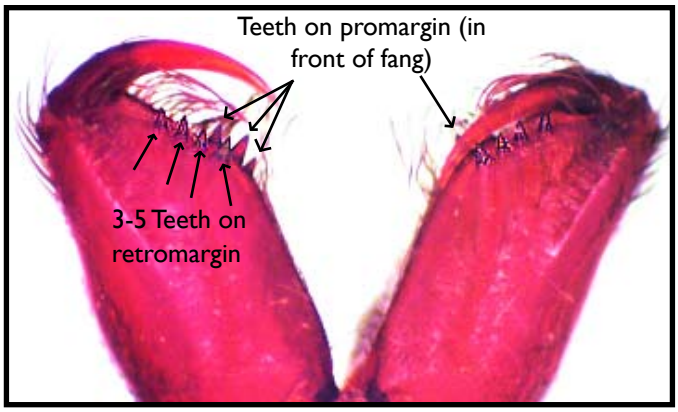
4. Cheliceral retromargin with 6 to 8 teeth with medial 2 teeth usually smaller (picture 15); legs without black bands (picture 17-B)
   ..... *Tegenaria agrestis* (Agelenidae): Hobo Spider

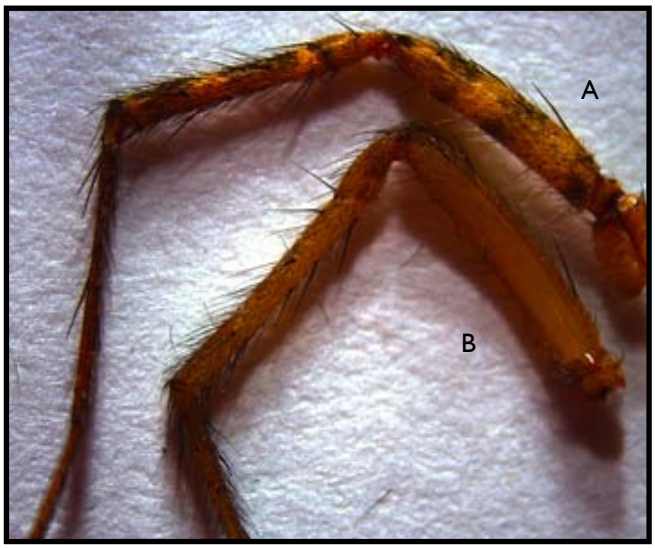
   Cheliceral retromargin with 3 to 5 teeth (picture 16); legs with black banding (picture 17-A)
   ..... *Tegenaria domestica* (Agelenidae): Domestic House Spider



Picture 15. 6 teeth on hobo spider cheliceral retromargin (35x: Leica EZ4D).



Picture 16. 4 teeth on domestic house spider cheliceral retromargin (35x: Leica EZ4D).



Picture 17. (A) Banding on domestic house spider leg; (B) no banding on hobo spider leg (8x: Leica EZ4D).

-Ryan Davis, Arthropod Diagnostician

Author's note: This article, as well as the "Key to Common Utah Spiders" by Alan Roe, will be available as fact sheets on the Utah Pests web site in the near future.

In the National News

EFFORTS TO STAVE OFF Bt RESISTANCE

Researchers at the University of Mexico and University of Arizona have modified the Bt toxins produced by *Bacillus thuringiensis*. Unlike the natural toxins, the "new" toxins do not need to bind to a receptor on the host insect to kill it. Although resistance to the Bt toxins is rare (only two cases exist), most believe that more and more insects will develop resistance as Bt use increases. These modified Bt toxins will significantly reduce the chances of insects developing resistance.

SPINACH PLANTS TOLERANT OF LEAFMINER ATTACK

Agriculture Research Service geneticists have bred two strains of spinach plants that have shown tolerance to attack by leafminers. Compared to control plants, the new spinach cultivars showed significantly fewer mines. Natural plant resistance to insect attack results in lowered pesticide use.

PEST MANAGEMENT STRATEGIC PLANS

The Western IPM Center (one of four regional pest management networks in the U.S.) produces Pest Management Strategic Plans that address pest management needs of specific crops for individual states or regions. The newest plans include a revised plan for potatoes, and a new plan for non-rangeland forages (excluding alfalfa). A new plan for sweet cherries should be available soon. All plans may be viewed at http://pestdata.ncsu.edu/pmsp/.

PROTECTING BEES FROM SMALL HIVE BEETLES

Small hive beetles have been in the eastern U.S. since the late 1990s causing damage to honey bee hives. The beetles lay their eggs in cracks and crevices within the hive, and the larvae tunnel through the comb, destroying the honey and pollen. The honey bees eventually vacate the hive.

Entomologists in Gainesville, FL, have developed a trap baited with yeast that lures these beetles away from the hive. The traps are targeted to small-scale beekeepers because they need to be cleaned regularly. Once in use, they should significantly reduce the honey and bee colony losses caused by small hive beetles.

HERBICIDAL COMPOUND DISCOVERED IN COMMON FESCUE

Scientists have long known that certain varieties of common fescue, when grown in certain environmental conditions, produce natural herbicidal compounds, and release them from their roots. Recently, chemists at Cornell University identified the herbicide as an amino acid called meta-tyrosine. The amino acid was shown to be safe to mammals, fungi, and bacteria. The mode of action on broadleaved plants is unknown. The next step is to breed new lines of fescue that more effectively inhibit weed growth.

Useful Web Sites and Publications

WEB SITES

- www.greenbook.net: an online database of pesticide product labels, MSDS safety sheets, and supplemental labels.
- nematologists.org.au: twice-yearly newsletter published by the Australasian Association of Nematologists on recent nematology news and research.
- www.ent.iastate.edu/pest/rootworm/: a central clearinghouse for all information on corn rootworm.
- isnap.oregonstate.edu/: OSU's Integrated Soil Nutrient and Pest Education Program (iSNAP) provides the latest information on emerging nutrient and pest management alternatives. "Pesticide Drift Management" is the newest online publication, available in English and Spanish.

NEW PUBLICATIONS

- *Compendium of Brassica Diseases* is the newest plant disease compendium offered by APS Press (www.shopapspress.org). *Compendium of Onion and Garlic Diseases and Pests* is forthcoming.
- *Handbook of Small Grain Insects*, and *Pests of Fruit Crops: A Color Handbook*, are two new, fully-illustrated books published by the Entomological Society of America and APS (www.shopapspress.org).
- "Mysteries of Organic Farming Revealed" is an online publication with simplified information for going organic, published by the National Sustainable Agriculture Information Service.
- "IPM Jump Start–Integrated Pest Management: An Exploration into IPM" is an online elementary school teacher's guide to IPM, published by Penn State.