**Organic Vegetable Gardening 5-part Series**

**Session #4: Organic Pest Management - What’s Wrong with My Veggies?**

Marybeth Janerich, Community Education Program Director, Wasatch Community Gardens

**Class Objectives**

* Encourage prevention by sharing ways for you to reduce the likelihood of unhealthy vegetable plants in your home gardens
* Encourage observation and monitoring for early detection of problems when they do arise
* Empower you by sharing the tools and resources you need to correctly identify and manage problems in your home garden
  + [www.garden.usu.edu](http://www.garden.usu.edu) – free fact sheets on vegetables typically grown in Utah home gardens
  + [www.ipm.usu.edu](http://www.ipm.usu.edu) – sign up now for the free pest advisory newsletters
* Remind you about an opportunity to participate in a hands-on pest diagnostic working lab on Wednesday, August 20th from 6 to 8pm (this class counts as the required pre-requisite). Separate registration required.

**What this workshop will NOT do for you**:

* It will NOT turn you into a plant pathologist or an entomologist!
* It will NOT provide you with the expertise to immediately recognize and diagnose every possible plant pest and disease, but it SHOULD provide you with the confidence and resources to tackle problems in your personal garden. My hope is that the information presented today will make you feel more confident in preventing, monitoring, assessing and managing a wide range of common plant problems, making you a more savvy and resourceful home gardener.

**Diagnosing Problems in the Garden**

At some point, every vegetable gardener will have a sick or injured plant. It’s OK! It happens to all gardeners.

There are ways to figure what’s wrong and address the situation.

It’s helpful if we learn how to solve the diagnostic puzzle.

* Is the problem garden-wide? Are multiple crops affected? If so, we’ll see that you should consider environmental causes rather than pests or diseases.
* Determine which problems are likely to occur on that particular plant. What is the “host?” Is it a problem limited to tomatoes? Squashes?

Many problems are caused by environmental issues, not by a pest or disease – EVEN IF YOU SEE A BUG! An insect might just be there by happenstance, or take advantage of a sick plant. Don’t believe the illusory correlation:

My plant is weak/damaged/sick.

My plant has a bug on it.

The bug is making my plant sick/damaged.

That’s a false conclusion much of the time!

Learn how to do your detective work!

Keys to solving the diagnostic puzzle:

1. Always try to rule out environmental factors first
2. Examine entire plant. Is the problem limited to old growth, or is new growth affected?
3. Use a magnifying glass for small insects, mites.
4. Check back regularly, looking for patterns of spread over time or decline
5. Write down or photograph the clues you find.
6. Know the culprits most likely to attack that particular type of plant (the host)
7. **Gather all your data and then consult your resources**!

# 6: Know your likely culprits

**Example:**

If specific host (the plant with the problem) is a tomato, determine what the MOST LIKELY PESTS ARE FOR TOMATOES. These include: Aphid, armyworm, cutworm, Colorado potato beetle, flea beetle, spider mite, tomato hornworm, whitefly, wireworm.

If specific host is a tomato and you suspect a disease, determine what the MOST LIKELY DISEASES ARE FOR TOMAOTES. These include: blossom end rot (actually a physiological problem, not a disease, but ….), early blight, late blight, curly top virus, fusarium wilt, verticillium wilt, etc. NOTE: diseases can be fungal, viral or bacterial. (\**so many parallels to human illness*)

**HELP IS ON THE WAY**!

Don’t think you have to learn what all the likely culprits are for each plant host. That’s what your resources are for! Just focus on learning the diagnostic process ☺

So, now what? You’ve identified that there’s a problem, and you’ve gathered your clues. Remember the first step is to rule out any environmental factors, so what are those?

* Soil texture (too heavy or too sandy)
* Water (too much or too little)
* Nutrients (too many or too few)
* Temperature (too hot or too cold)
* Light (too much or too little)
* Herbicide damage

**Integrated Pest Management or IPM**

IPM is an integrated approach to pest management that uses a combination of strategies. **Organic Pest Management** is basically the same thing but without the use of any synthetic chemicals.

**Prevention** is key with vegetable plant health, just like in human or pet health.

**Early detection** is the next best thing, so spend time in your garden inspecting your crops.

* Inspect during the morning hours and see how many bees are present
* Inspect during the evening hours
* Inspect at least once a month at night! Use a flashlight or headlamp. Many insect pests are active only at night.
* Cultural Controls = “Best Practices”
  + Avoid monocultures
  + Increase biodiversity (e.g., plant pollinator-attracting and beneficial insect-attracting flowers)
  + Proper site selection
  + Proper garden sanitation
  + Use crop rotation, companion planting, inter-planting
  + Grow disease and pest-resistant varieties where possible and practical
  + Use correct watering practices
* Mechanical (or Physical) Controls
  + Hand-picking pests (great for hornworms, squash bug eggs, leaf miner eggs, black vine weevils…)
  + Use traps
  + Use barriers like floating row covers, toilet paper tubes for cutworms
  + Use barriers such as crushed eggshells or diatomaceous earth
  + Use repellants (can be useful for rodents and deer)
* Biological Controls
  + Encouraging or introducing natural enemies or predators in the garden, such as ground beetles, praying mantis, ladybugs, lacewings, beneficial nematodes, parasitic wasps.
    - These occur in UT naturally. Don’t purchase non-native species of lady bugs that are often for sale at garden centers. OK to order lacewing eggs from Arbico Organics or other on-line source. Attract beneficials with flowers, herbs (increase biodiversity in the garden).
* Chemical Controls
  + This is where regular IPM and organic gardening diverge! Chemical controls – whether organic or synthetic - should always be a **LAST RESORT**. In organic gardening, there are usually options for fungicides, herbicides, rodenticides, and other pesticides that are not synthetic and that are certified for use in organic gardening, but that does NOT mean that they are perfectly safe or without environmental impact.
  + Many of these products are broad-spectrum and can harm or kill bees and other pollinators.
  + If resorting to an organic chemical approach, please select a product that mentions both the HOST and the PEST that you’re addressing. For example, “this product is effective against spider mites on vegetable plants.”
  + Products that are **OMRI listed** are better choices. OMRI is the Organic Materials Review Institute, an international nonprofit organization that determines which input products are allowed for use in organic production and processing.
    - Note that there is ALWAYS something you can try before resorting to the chemical control method.
    - **Chemicals, even when organic and OMRI-listed, are the**

**LAST RESORT.**

For more detailed information on IPM, read this USU fact sheet: <http://extension.usu.edu/files/publications/publication/ipm-concept%2796.pdf>

**REMEMBER WHAT WE SAID:**

**Prevention** is key with vegetable plant health, just like in human or pet health.

**Early detection** is the next best thing, so spend time in your garden inspecting your crops.

* Inspect during the morning hours and see how many bees are present
* Inspect during the evening hours
* Inspect at least once a month at night! Use a flashlight or headlamp. Many insect pests are active only at night.

**What to look for when you’re inspecting:**

* Look at the overall plant. Does it look healthy? Is it growing appropriately?
* Compare it to other plants of the same type (tomatoes to tomatoes, eggplants to eggplants). Does one tomato look like it’s struggling while its companions are thriving?
* Compare it to other plants of different types (tomatoes to squash, eggplants to beans). Do the tomatoes look terrible while the squash are thriving? Or do multiple types of plants all seem to be having issues?
* Look at individual leaves (on top and underneath!)
  + Are leaves healthy and green? Or are they damaged, chewed, dying? Are they curled upward or downward? Are they yellow or purple? The veins and interveinal spaces (spaces between the veins) should all be green (the same color).
    - If any damage is present, track the pattern of spread over time – is the problem spreading from bottom to top, or from top to bottom?
* Look at fruit quality
  + Is fruit ripening at the appropriate size? Any blemishes, cracks, holes, shrunken spots, etc.?

Once you’ve identified something that doesn’t look right, write down in your garden journal which host plant or plants the problem is with. The “host” is the type of plant within the plant family (e.g., tomatoes, eggplants, potatoes and peppers are in the solanaceous family; cucumbers, squash and melons are in the cucurbit family). So, know which host has the problem.

Let’s use eggplants as an example. Write down the symptoms.

Example: August 20, 2016: There’s something wrong with my eggplants.

Small holes in the leaves. Looks like it’s been riddled with a shotgun! Lower leaves have heavier damage and are starting to die. Plant appears to be struggling. Don’t see this same problem on the peppers, tomatoes, beans, or zucchini, although the beans and zucchini have other issues.

**Rule out abiotic issues first**. Abiotic means something that is a non-living factor – something that is human-caused – something that we super-impose on the plants in our gardens. Think of abiotic disorders as environmental factors, including:

* + Over or under watering- the “watering spectrum”

Enough to Right amount to So much that

keep it alive help it thrive you kill it

* + Soil is too heavy (too much clay) or too light (too sandy) so there are drainage issues
  + Too much or too little sun (because of where we planted them)
  + Too much or too little fertilizer (nutrient excesses or deficiencies)
  + Too hot or too cold
  + Chemical impact, such as herbicide drift
* Abiotic issues account for 80-90% of problems in the garden (most often too much or too little water and herbicide drift).
* If multiple types of plants are all showing similar symptoms, the cause is probably abiotic.

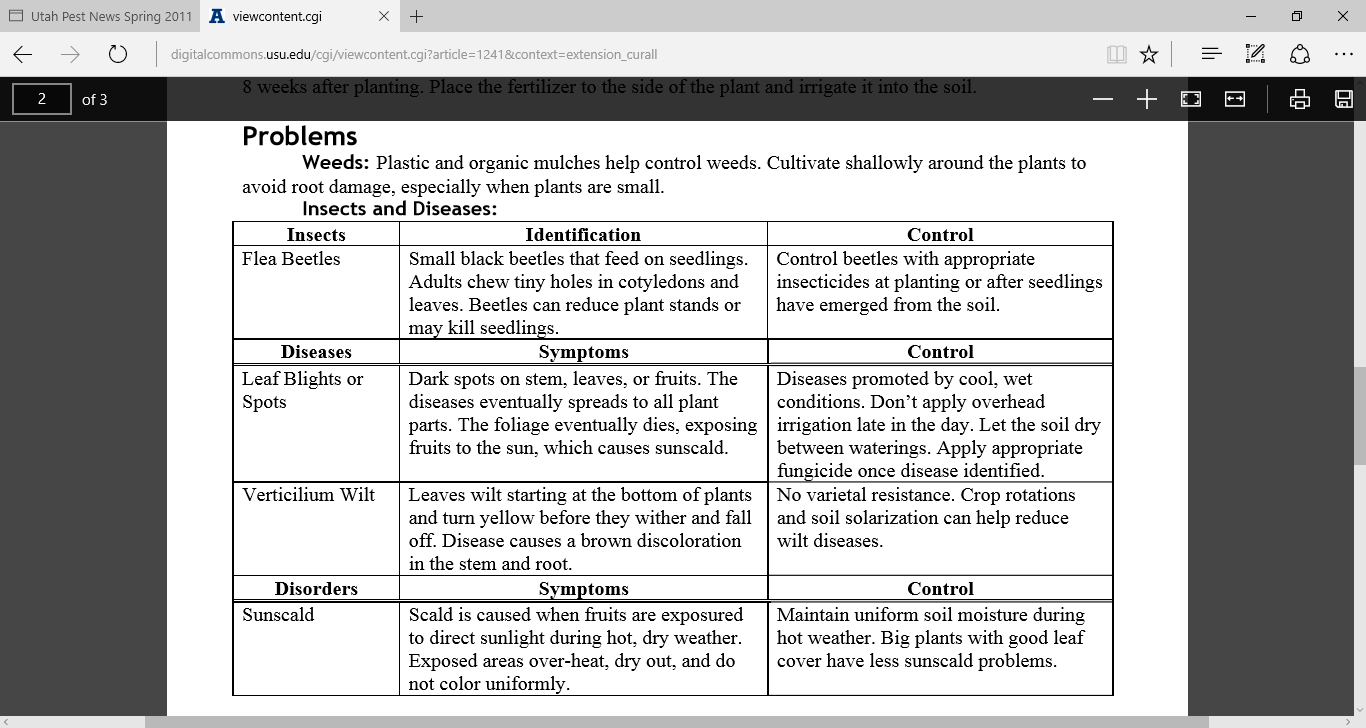
**If abiotic issues don’t seem the likely cause, consider the LIKELY CULPRITS for this particular plant host**.

(Most pests and diseases are HOST-SPECIFIC.)

Tomato hornworms won’t bother your butternut squash, and you won’t have squash bugs on your pepper plants. There are some conditions that affect multiple types of plants across plant families, such as spider mites (beans, tomatoes, and cucurbits) and powdery mildew (primarily cucurbits but there are many species of powdery mildew, each capable of infecting different plant hosts).

However, most of the time, there are certain pests or diseases that affect specific plants hosts. Know what these are, or be willing to look them up. **Free, easy resource at** [**www.garden.usu.edu**](http://www.garden.usu.edu). This is the extension website and has free fact sheets on just about every vegetable and fruit that is grown in Utah.

Per the Eggplant factsheet on the extension website, eggplants are often affected by:



Given this list from extension, what could we conclude about our eggplant with the tiny holes in the leaves?

What would help us be more confident about our conclusion?

Take a closer look!

A hand lens or loupe helps you see tiny things like powdery mildew fungus, spider mites, tiny flea beetles, leaf miner eggs, etc.

To find your own hand lens for monitoring, go to Amazon.com or Smile.amazon.com (where you can choose to support Wasatch Community Gardens or another non-profit with every purchase) and search for “loupe 30x 25mm.”

“BelOMO 20x Quadruplet Loupe Folding Magnifier” comes on a lanyard and is a reliable choice but comes at a hefty price of about $30.

The less expensive ones (in the $5 to $10 range) tend to have sharp edges, and the screws can come undone (per the on-line reviews), but the ones starting at about $15 seem to do the trick and be long-lasting.

**Review of Steps**:

1. Prevent
2. Monitor & observe
3. Read your free pest advisories when they arrive in your email
4. Be on the lookout for early signs of problems (early detection)
5. If you notice a problem, identify the host plant
6. Rule out abiotic disorders first
7. If not abiotic, consider the list of likely culprits (pests and diseases) for that host, consulting the extension fact sheets and vegetable pest advisories from USU Extension.
8. If unable to identify the problem on your own, or if you want confirmation that your diagnosis is correct, do one of the following:
   1. Take a sample to the Master Gardener Diagnostic Help Desk anytime between 9 and noon on Mondays, Wednesdays and Fridays at 2100 S. State, Suite S-1300
   2. Send a sample to the USU Analytic Laboratory for diagnosis and recommendations (visit website [www.usual.usu.edu](http://www.usual.usu.edu) for instructions)
   3. Send multiple high-quality photos and a detailed description with questions to [mastergardener@usu.edu](mailto:mastergardener@usu.edu).
   4. Call the Master Gardener Diagnostic Help Desk anytime between 9 and noon on Mondays, Wednesdays and Fridays at (385) 468-4828.
      * When collecting samples or taking photos for the help desk, realize that what you provide is all that the diagnostician will be able to see, so provide as MUCH as possible (e.g., entire branches rather than one or two leaves, or a whole plant with the roots attached).
      * Be ready to answer questions about abiotic (environmental) factors.
      * The more investigative work you’ve done and information you’re ready to provide, the better the Help Desk will be able to figure out what’s going on for you.
      * Realize that they may not be able to diagnose the problem with certainty and that they may suggest sending your sample to the USU Analytic Lab in Logan for analysis.
   5. Consult other resources, such as my two favorite books:
      1. “**What’s Wrong With My Vegetable Garden**?” by David Deardorff and Kathryn Wadsworth
      2. Rodale’s Organic Gardening Book: “**The Organic Gardener’s Handbook of Natural Pest and Disease Control**,” Edited by Bradley, Ellis and Martin
         * + Google searches are fine, but don’t believe everything you read on the internet. Websites with an “edu” extension are often your best bet.
9. Manage situation with the least environmentally impactful method for the particular problem at hand.
   1. Depending on the specific problem:
      1. Pull and dispose of seriously diseased or infested plants.

* What kind of “control” method is this?
  + 1. For some insects, such as aphids and spider mites, you might try hosing or washing off the insects and then babying the plant along with applications of diluted worm casting tea. Don’t automatically reach for a chemical control!
* What kind of “control” method is this?
  + 1. Prune off affected foliage to stay ahead of the problem and help minimize spread (such as with powdery mildew on members of squash family).
* What kind of “control” method is this?
  + 1. Set traps (slug traps, earwig traps, flea beetles will be attracted to yellow sticky traps) –
* What kind of “control” method is this?

From Horticulture and Home Pest News, Iowa State University Extension and Outreach:

<http://www.ipm.iastate.edu/ipm/hortnews/2003/9-12-2003/stresses.html> - article appears on next page

**Biotic vs. Abiotic - Distinguishing Disease Problems from Environmental Stresses**

by Paula Flynn, Department of Plant Pathology, 9/12/2003

**Biotic plant problems are caused by living organisms, such as fungi, bacteria, viruses, nematodes, insects, mites, and animals**.

**Abiotic disorders are caused by nonliving factors, such as drought stress, sunscald, freeze injury, wind injury, chemical drift, nutrient deficiency, or improper cultural practices, such as overwatering or planting too deep**.

Unfortunately, the damage caused by these various living and nonliving agents can appear very similar. Even with close observation, accurate diagnosis can be difficult. For example, browning of leaves on an oak tree caused by drought stress may appear similar to leaf browning caused by oak wilt, a serious vascular disease, or the browning cause by anthracnose, a fairly minor leaf disease.

When the cause of a plant health problem is not readily diagnosed, it's important to take a systematic approach and carefully consider site conditions, weather conditions, care of the plant, and the known biotic disease agents of that plant. The first important step is to determine the identity of the plant and its requirements for healthy growth.

There are a few clues to look for that will help you distinguish between abiotic and biotic disease problems.

* Abiotic damage often occurs on many plant species. Drought stress or chemical drift will likely cause damage on several types of plants in a yard or garden. In contrast, biotic disease problems are more limited to a certain species. The fungi that cause tomato leaf blight do not cause damage on sweet corn, for example.
* Abiotic damage does not spread from plant to plant over time. Biotic diseases can spread throughout one plant and also may spread to neighboring plants of the same species. Wind-blown rain is a common way for disease agents to spread from plant to plant.
* Biotic diseases sometimes show physical evidence (signs) of the pathogen, such as fungal growth, bacterial ooze, or nematode cysts, or the presence of mites or insects. Abiotic diseases do not show the presence of disease signs.

**An important take-home message is to remember that there may be several factors, abiotic and biotic, contributing to a plant health problem.**

**This parallels human health and illness. For example, a person can have diabetes and suffer from an allergy attack at the same time.**