Limb dieback and leaf scorch of a Japanese Maple – caused by cold damage to new growth in the spring, followed by extreme drought conditions in Georgia (2007) – caused by a non-living factor

Cold damage to blueberry flowers – affect fruit set of the plant – causing reduction in fruit yield – can be devastating (2007)

Blighting of pumpkin leaves due to severe drought conditions/lack of water (2007)

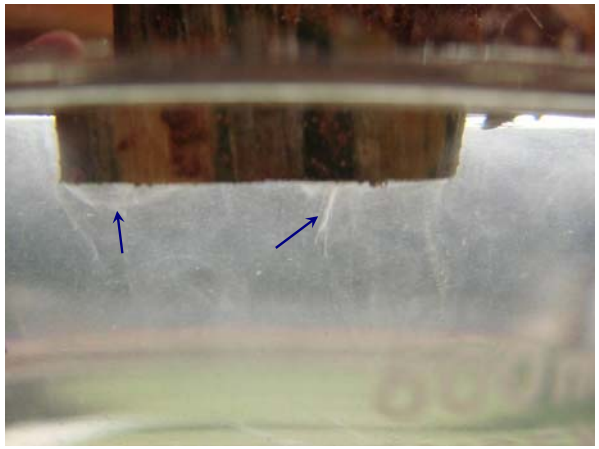
Bitter Rot on Apple – caused by the fungal pathogen *Glomerella cingulata*

Halo blight on green beans – caused by the bacterial pathogen *Pseudomonas syringae* pv. *phaseolicola*

Hosta virus X on Hosta – caused by

SIGN – fungal mycelia – looks like thin, white spider webbing on Dahlia.

Solid, black structure which is composed of a compact mass of hyphae – sclerotia – a sign of infection and disease – on Parsley.

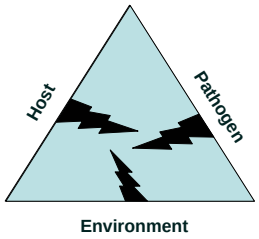


Blue arrows pointing to bacterial streaming – a sign of bacterial infection.

Fungal leaf spot – one of the most common symptoms seen

Limb dieback and leaf necrosis & scorch – on Japanese Maple – a symptom that the tree is stressed.

Stem canker and Shepard's crook – a symptom of infection – Pear tree is infected with the bacterial pathogen, *Erwinia amylovora*.

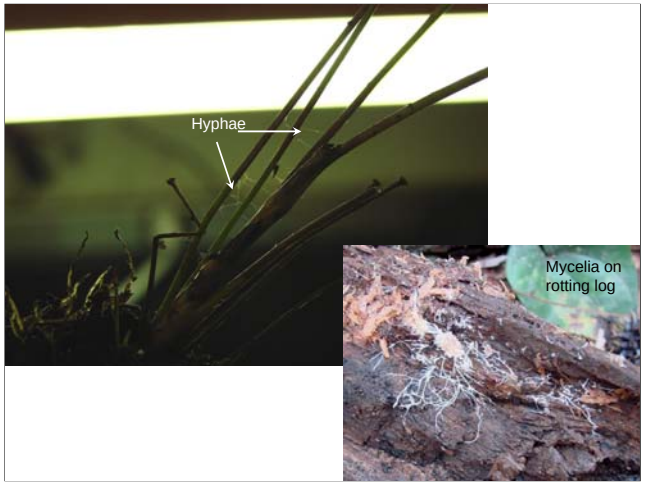


Plant Disease Triangle

Mushrooms

Slime molds are simple fungi that don't really harm plants. They grow on organic material such as mulch. They can also grow on wood. Slime molds don't harm anything and can be washed off with water. No need to spray fungicides!!!

Mushrooms! Are diverse and interesting structures that are the fruiting bodies of a particular type of fungi. They can be a variety of sizes, colors, textures, shapes, and are very beautiful. Mushrooms seen in the landscape are growing on organic material (decaying wood-in soil and thatch) oftentimes hidden from the eye. Undecomposed tree roots, stumps, wood scraps from construction projects, and other organic debris are commonly colonized by fairy ring fungi and should be removed before establishing a new lawn or green. Proper cultural care and maintenance will prevent establishment of fairy rings in your yard. The fairy rings will eventually keep expanding beyond your yard and into your neighbor's.



On lefthand side – various types of fungal spores; On righthand side – tiny white to brown to black sclerotia (bottom image – cantaloupe with sclerotia & mycelia around the base - *Sclerotium rolfsii*, Southern blight disease)

I often use this as an example for spore dispersal to demonstrate the mass of spores that are produced by fungi and thus, how easily it would be for spores to be spread by wind, rain, insects, or us rubbing past this infected corn cob.

This is another great image to use to demonstrate the mass of spores produced and how easily they can be spread. This is the underside of a Hollyhock leaf. Each of those organe pustules contains an enormous amount of spores. If a rain drop landed on the top of this leaf, it would dislodge those spores. The spores then get blown to adjacent leaves and/or plants and then continue the infection process.

Contaminated tools are another source of spread of plant pathogens – fungi, bacteria, and nematodes! Cleaning equipment and tools plays a big role in disease management as you will see at the end of this unit.

Colletotrichum on infected tissue – black hairs are called setae – which barely visible with the naked eye

Apple Scab

Fruit infection on a rotting peach – adjacent wounded peaches can easily be infected by this fungal pathogen

Camellia leaf gall – caused by *Exobasidium vaccinii*

Rust (*Puccinia malvacearum*) on Hollyhock

Iris Leaf spot (*Heterosporium iridis*)

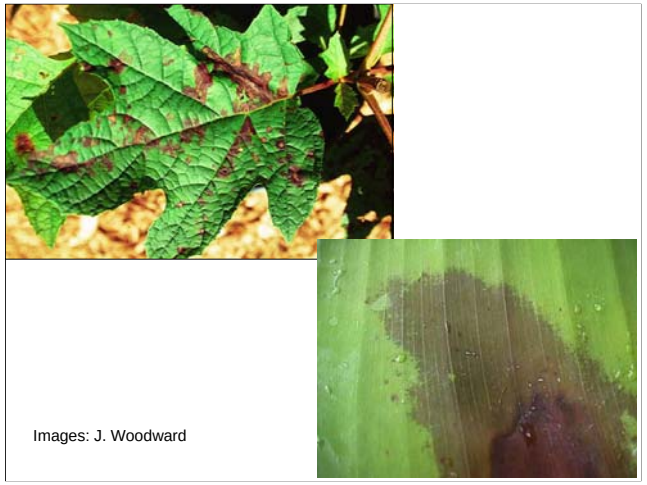
Entomosporium leaf spot on Pear

Sooty blotch and fly speck on Apple (a complex of organisms)

Smut (*Ustilago* sp.) on Wheat

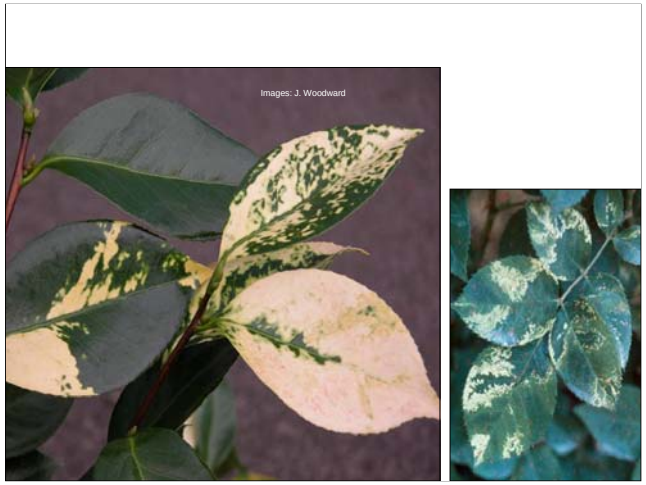
Sclerotinia sclerotiorum (aka white mold) on Parsley

Bacterial soft rot on Iris – *Erwinia* sp.



2 common types of leaf spots produced by bacteria – Angular leaf spot (on Oak Leaf Hydrangea) and water-soaked, greasy-looking leaf spot

This is the best known bacterial disease pathosystem – known as Fire Blight. Fire blight affects any plant in the Roseacae family (apple, crabapple, pear, photinia, pyracantha, indian hawthorne, cotoneaster, quince, etc.). This is fire blight on apple. The bacterium enters the plant via the flowers. Bees carry the bacterium on their bodies and when they visit flowers to collect pollen, they deposit the bacterium as well. During warm, moist, humid springs, the disease is very prevalent. The bacterium enters into the vascular tissue through the flowers, causes a canker to develop that restricts water flow through the branch, killing it. The affected growth turns dark brown to black, and is full of fire blight bacteria.



One classic virus symptom is leaf mottling. The viruses interfere with the chloroplasts in the cells and prevent chlorophyll production giving the plants the variegated, mottled look. Sometimes this is exploited and cultivars are described because of the virus.

The one symptom that unique for virus infection is the development of a “ring spot”. Ring spots indicate a virus. This is camellia ring spot virus. It will not kill the plants and symptoms are mostly seen in the spring as cooler temperatures allow the virus to express itself.

TSWV (tomato spotted wilt virus) - Geranium

Squash mosaic virus. Often when a sample is sent to the plant disease clinic with leaf distortion symptoms about as far as we can get the diagnosis is that it could be herbicide injury or a virus. Remember the earlier slide with the phenoxy (2,4-D) herbicide damage. Look at the leaf on the bottom left. This leaf is infected with squash mosaic virus. The leaf on the right is a healthy leaf. The more diagnostic evidence that the damage is due to a virus is the on the fruit. Virus-infected fruit show green “island” on the yellow fruit. If zucchini, there would be yellow islands on the green fruit.

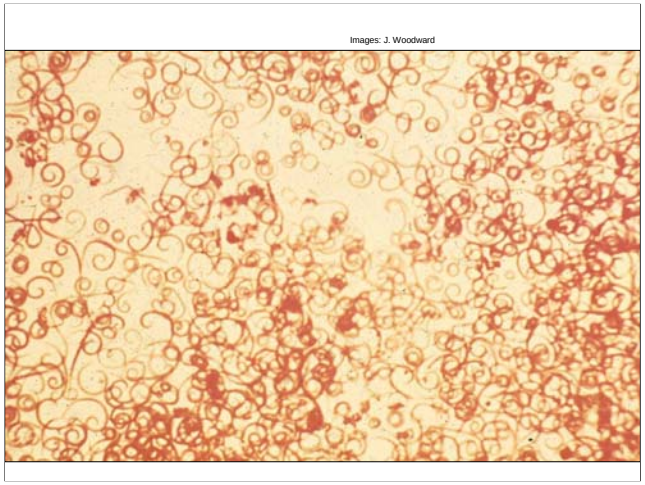
Puckering of leaves is characteristic of a viral disease - Cucumber Mosaic Virus on Tobacco

Symptoms of plum pox virus on apricot fruit and leaves

This is a tomato infected with TSWV (tomato spotted wilt virus) – the tomato will often times have the typical ring spot symptoms but may also look like this an be deformed.

A TSWV infected tomato leaf – necrotic lesions – no real pattern – on both leaves and stems; inset – same plant – yellowing stem & lesions on leaves

This is just one of the many insects that can transmit virus diseases to host plants.

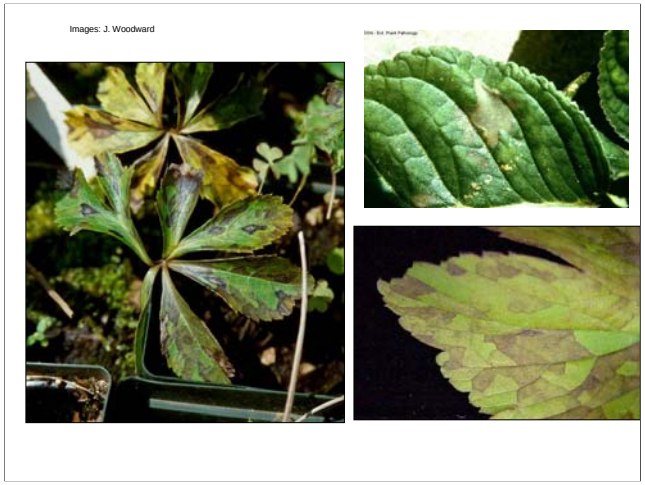


Millions of nematodes in the dissecting microscope

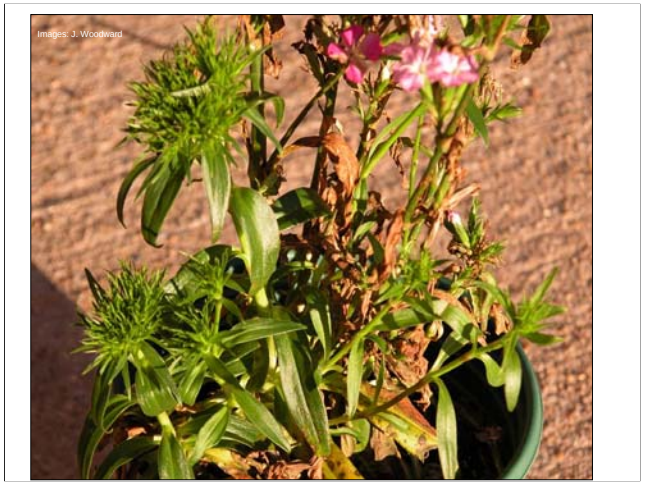
Stunted Holly plant on the left – caused by Root Knot Nematode injury (*Meloidogyne* sp.)

Typical knotty roots caused by the root knot nematode.

Peanut infected with root knot nematode – notice the knots on the roots (blue arrows)



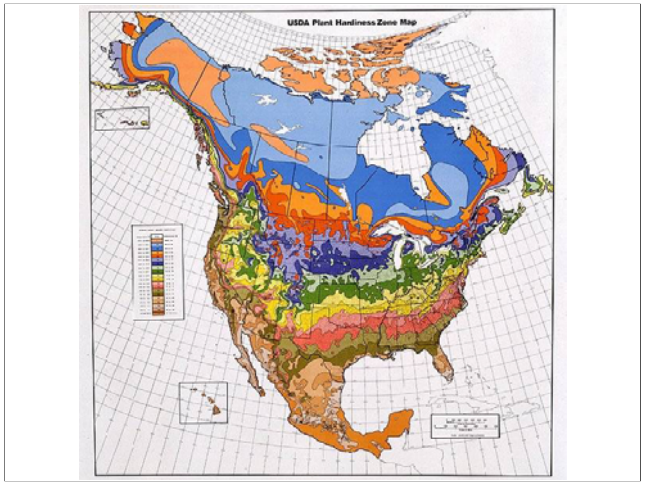
Foliar nematodes live 95% of their life inside infested leaves. Their feeding causes discolored lesions (purplish to tan to black) that are confined between the veins. Plants with net veination have angular lesions. Plants with parallel veination (hosta) have strip-like lesions. All damage is between the veins because the nematode cannot move through leaf veins when feeding. In order to move to a new area, the nematode has to swim out of a stomate, cross the leaf, and re-enter the leaf through another stomate. The nematode readily moves out of the leaf if water is present, such as dew, rain or irrigation water on the leaf surface. Once inside the leaf surface water, the nematode can be splashed to adjacent leaves or plants or roll off the leaf in the water droplet. The one diagnostic feature about foliar nematode infestation is the color gradient of the leaf lesions. Some will be very dark (where the nematodes have been the longest) to very light in color (where the nematodes have just started feeding). The plants here are helleborus (left) and anemone (right) showing angular lesions.



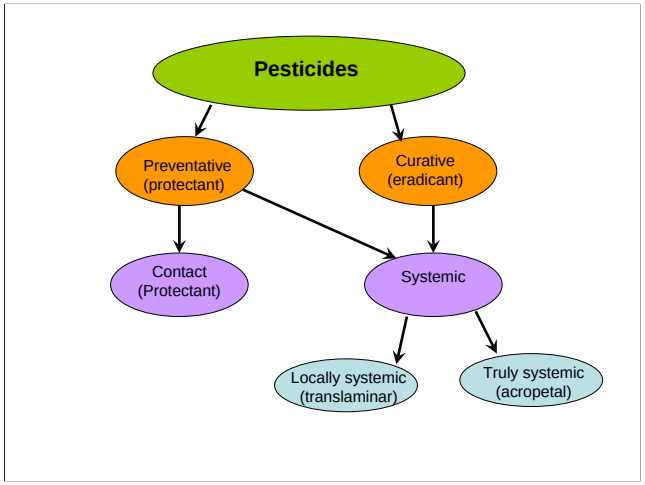
Aster yellows on Dianthus – floral parts are green and bushy

Aster yellows on Echinacea (cone flower) – vegetative parts growing from floral parts; floral parts turn green like vegetative tissue.

Same as last one – aster yellows on Echinacea



This is an example of the USDA Plant Hardiness Zone Map. This map can be found online through Google to find the Zones for GA.



A sample of our clinic homepage.

Specialist	Commodity/crop
Holly Thornton	All homeowner samples
Dr. Jean Williams-Woodward	Commercial ornamentals & forestry
Dr. Phillip Brannen	Commercial Fruit
Dr. David Langston	Commercial Vegetables
Dr. Bob Kemerait	Commercial row crops – cotton & peanut
Jason Brock	Commercial pecans