**Organic Pest and Disease Control**

**Why Grow Organic?** Many people choose to grow organically because they do not want to expose themselves, their children and/or their pets to potentially toxic chemicals on their plants and food. Residential gardens are also a huge source of toxic runoff into the environment because of overuse and misuse of chemicals. Farmers cannot afford to overuse chemicals and are thus very cautious about application rates. Many home gardeners don’t bother to read the label and can be exposing themselves and the environment to toxic loads. Even if a chemical is not directly toxic to humans, it can kill beneficials like honey bees, worms, amphibians and fish. Whatever methods you decide to employ, please practice caution and follow all label instructions.

Organic gardening focuses on improving the health of the soil and minimizing the use of chemical inputs, even certified organic ones. By building healthy soils, many problems in the garden will naturally balance out. Healthy soils grow healthy plants! For really great, in-depth info on soil health, visit the NRCS website ([www.nrcs.usda.gov](http://www.nrcs.usda.gov)). For specific organic pest and disease control methods, this discussion will cover Integrated Pest Management strategies for small-scale organic gardeners.

**Integrated pest management strategies (IPM):** Hierarchy of strategies to minimize impact of pests and disease in a garden while also minimizing the environmental impact of control methods. The hierarchy is from most practiced to least: Biological → Cultural → Physical → Chemical. You’ll need to monitor pest activity, know what your damage thresholds are, know the timing of common pests, and have control methods prepared before they arrive.

**Biological Control**: Basically this step focuses on attracting beneficial insects to your garden to control the pests for you. Create lots of habitat for beneficial insects (5% of garden space should be in habitat)--flowers, mulch, hedgerow, brush/rock piles, water elements. Make the “good guys” happy and they will solve a lot of your garden problems for you. Learn to identify “natural enemies” aka “good bugs,” so you don’t try to kill them. Avoid using “broad spectrum pesticides” (anything that isn’t for a specific insect problem) because these will kill far more good bugs than bad. Avoid over fertilizing or over watering your garden as this will make your plants look really tasty to pests. You can inoculate your garden with beneficial pathogens (milkyspore, nematodes) and purchase predators (ladybugs, lacewings, etc), but this is expensive and not always effective. Creating habitat is cheaper and more effective in the long run.

**Cultural Control**: These are growing practices that prevent problems from happening, or at least reduce their likelihood. You’ll want to research these: crop rotation, proper sanitation practices of garden area and tools, selecting pest/disease resistant varieties, intercropping & companion planting, removal of pest habitat & host weeds, using trap crops, don’t over or under fertilize or water, time plantings to avoid pest problems, avoid getting wetting leaves when watering, trellis vining crops off the ground, using allelopathic cover crops.

**Physical Control**: These practices are non-chemical control practices used when a problem has been identified. Using row cover is useful for crops that don’t need to be pollinated (brassicas, greens). Use netting to stop birds from stealing fruit. High tunnels (if you can afford it) will make growing tomatoes and cucurbits much easier. Thick mulch helps to confuse some pests as they emerge from the soil. Plant collars can be fashioned for cutworms. Use pheromone traps and trap crops to monitor pest levels in your garden. Hand picking is extremely effective! Fill an empty quart container with soapy water and drop pests into it for instant gratification. Early morning before the sun has warmed the bugs up is the best time to pick over your plants.

**Chemical Control**: This is your mode of last resort! You need to know what your threshold damage is for using chemical control. For backyard gardens, you can live with some blemished vegetables and should spray only if crop failure is imminent. If you are depending on your crops for income, you need to consider economic thresholds, and you’ll probably have a lower tolerance for damage. Don’t spray at the first sign of damage. This method is the most likely to have negative impacts on the environment and kill beneficial insects! Use the most selective pesticides you can buy and spot spray problem areas instead of coating your whole garden. Avoid broad spectrum or persistent pesticides!!! From safest to least safe:

* *Microbial sprays*—strains of bacteria like Bt (caterpillars of all kinds), Milky Spore (lawn grubs), Nematodes (fights bad nematodes). These are very specific pesticides. Bt is great for caterpillars, but they have to ingest it. Spray late in the evening when there is no wind so it doesn’t get on plants that host non-pest caterpillars.
	+ Patented bacterial strains are also great for fungal disease control: Actinovate, Seranade, Mycostop are name brand products. These are effective preventatives but do not stop an ongoing fungal infection.
* *Horticultural soaps, oils, natural botanicals*--insects breathe through their cuticles and the oils basically plug up their breathing pores and suffocate them. The soaps can kill soft bodied insects (like aphids) again by disrupting their cuticles, but is not effective against hard bodied insects. The natural botanicals can repel insects, but can also impact the flavor of your vegetables by remaining on the surface. Neem oil is considered a pesticide and also a mild anti-fungal.
* *Minerals and metals*--iron phosphate for slugs, copper and sulfur for fungal diseases, borax for ants, diatomaceous earth for slugs and other soft bodied pests
* *Insect Growth Regulators*: Azadirachtin is a chemical derived from the Neem tree. I’ve never used this stuff, but researching it for this presentation, it looks interesting! It prevents insects from molting, thus stopping them from maturing and eventually killing them.
* *Your last resort is to use synthetic chemicals*. For organic gardening, this includes Spinosad and Pyrethrin. Both of these are broad spectrum insecticides that will kill beneficial insects and bees if used improperly! Follow label directions and use in the late evening when the wind is not blowing. If you can, cover sprayed crops for 24 hours in order to exclude honey bees, after that, it will be safe for them to land on plants.

**Disease Management:**

For a list of common diseases, see other handout.

Plants are capable of fighting off diseases, unless conditions become such that they overwhelm the plant’s immune system. Our hot, humid summers favor the development of a lot of fungal and bacterial diseases. Some common cultural practices to reduce disease are:

* Creating good airflow around plants by using trellises and good spacing. Water on the leaf surface creates good conditions for fungi and bacteria to grow. Locate your garden on a slight slope for good airflow. Don’t put gardens at the bottoms of hills or in places surrounded by dense trees with no air circulation.
* Not wetting the leaves when watering and not letting leaves touch the soil surface, through trellising, pruning and thick mulch. Don’t overwater your garden and focus on watering the roots, not the leaves. Drip irrigation is best, but if you do use an overhead sprinkler only water in the morning before 10am. Never water in the evening.
* Work on improving soil health: healthy soils will grow healthy plants. Use lots of mulch, cover crops, increasing plant diversity, and crop rotation. Don’t over fertilize and minimize use of chemicals.
* Weed removal is important. Weeds compete for space, nutrients and water, so keeping them out of your beds is critical for healthy plants. Weeds in the same plant families as your crops can also harbor diseases, so get them out of your yard too.
* Remove infected leaves and plants immediately and burn or trash. Do not try to compost diseased plants or you will just spread the disease around when you use it.
* Keep pests under control and/or excluded from your garden. Many pests carry diseases around and will infect your plants with them. Row cover on cucurbit family crops will protect them from bacterial wilt transmitted by cucumber beetles.
* Good sanitation practices include regularly cleaning your tools, boots and your hands. If you are removing infected plants, wash your hands before touching uninfected plants.
* Spray anti-fungals at first signs of disease and after it rains. Don’t handle plants when they are wet and avoid entering your garden after a heavy rain.
* Practice good crop rotation year to year to prevent soil born disease from accumulating in the soil. A minimum three year rotation is recommended. If major a disease outbreak occurs practice longer rotations, up to 10 years in some cases.
* Look for disease resistant varieties. Local seed breeders are working on varieties that do well in our conditions. Breeders in North Carolina (NCSU) and Virginia (Commonwealth Seed) are working on tomato and cucurbit varieties respectively that thrive in our hot humid summers.

Prevention is your best strategy for plant disease! You need to monitor conditions in your garden daily to observe when pests and disease first arrive. That’s when physical and organic chemical interventions will be most effective. After a problem becomes severe, you will likely have to destroy a crop to remove the problem. There is not much that will cure fungal and bacterial infections after they’ve set in.