WSU EXTENSION
Cowlitz County

Solving Summer Garden Problems

WSU Cowlitz County Extension
Master Gardener Program

Mission

Engaging university-trained volunteers to empower and sustain diverse communities with relevant, unbiased, research-based horticulture and environmental stewardship education.

Our Program Priorities

	**Climate Change:** We teach ways to create resilient landscapes that are adapted to our changing climate.		**Soil Health:** We encourage building healthy soils to prevent depletion and ensure the long-term viability of local food security & natural resources.		**Plant Biodiversity:** We promote stewardship of diverse ecosystems through invasive species management, native species conservation and restoration in landscapes.
	**Clean Water:** We promote integrated pest management to minimize polluted runoff.		**Pollinators:** We teach ways to help native bees and other pollinators thrive in home and community landscapes.		**Nearby Nature:** We seek to increase access to plants, green spaces, and public landscapes to benefit the health & well-being of all members of our communities.
	**Water Conservation:** We promote water-wise gardening and landscaping practices to conserve water.		**Local Food:** We promote sustainable techniques to growing local food to improve individual & community health and wellness.		**Wildfire Preparedness:** We teach landscaping principles to reduce the risk of loss due to wildfire.

A garden requires patient labor and attention. Plants do not grow merely to satisfy ambitions or to fulfill good intentions. They thrive because someone expended effort on them.

Liberty Hyde Bailey

Problems:
If you plant, they will happen!

- Growing problems-Vast majority NOT caused by insects or disease! (operator error and climate)
- Common sense approach to problem solving
- Insect Problems
- Plant disease and disorders

Growing problems

- Soil--
  - **get a baseline soil test--**
    - Proper pH (5.5 to 7) is critical for plants being able to use the nutrients in the soil.
    - Nitrogen (N) is the nutrient most needed in our soil.
    - Soil test will tell you if phosphorus (P) and potassium (K) need to be added.
  - Well draining
- Water--consistently moist like a wrung out sponge.
- Light-6-8 hours minimum.
- Plant nutrition-your plants and your soil test will tell you what you need.
- Temperature--ideal for most warm-season plants is daytime 70°-80° and 60° and above at night
- **Know what your crop needs**--check individual growing requirements!! Best resources I've found:
  - https://extension.umn.edu/find-plants/vegetables#vegetables-a-z-2396210
  - https://extension.umd.edu/resources#!/category/3/subcategory/828
- Insects and diseases

Get a soil test!

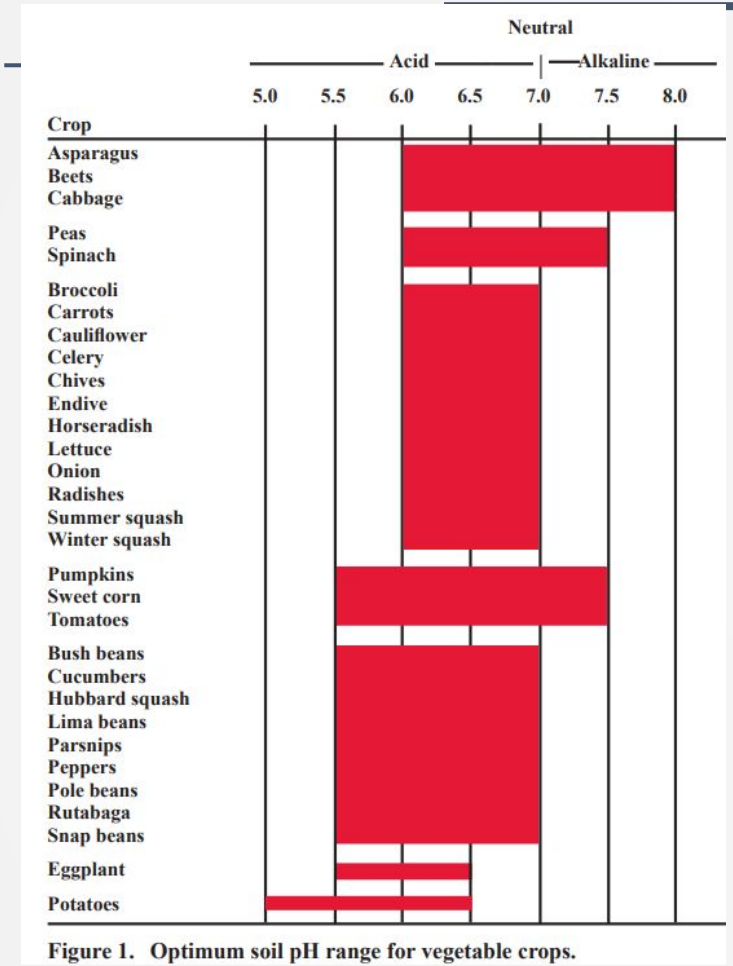


Figure 1. Optimum soil pH range for vegetable crops.

https://extensionpublications.unl.edu/assets/pdf/g945.pdf

Soil Tests and Prices

Basic Soil Test - $16 per sample
Includes pH, lime requirement, nitrate nitrogen, potassium, phosphorus, calcium, magnesium, soluble salts and fertilizer recommendations.

Basic Test + Organic Matter - $20

Basic Test + Fe, Mn, Zn & Cu - $20
(iron, manganese, zinc and copper)

Basic Test + S and B - $24
(sulfur and boron)

Complete Test - $32
All of the tests listed above.

Soil Texture - $16
Percentage of clay, silt, sand and gravel in the soil, and classification of the soil type.

Toxic Metal Testing - $24
Levels of lead, cadmium and arsenic in the soil, and interpretation of the results.

http://simplysoiltesting.com

General fertilizer guide

Light Feeders:

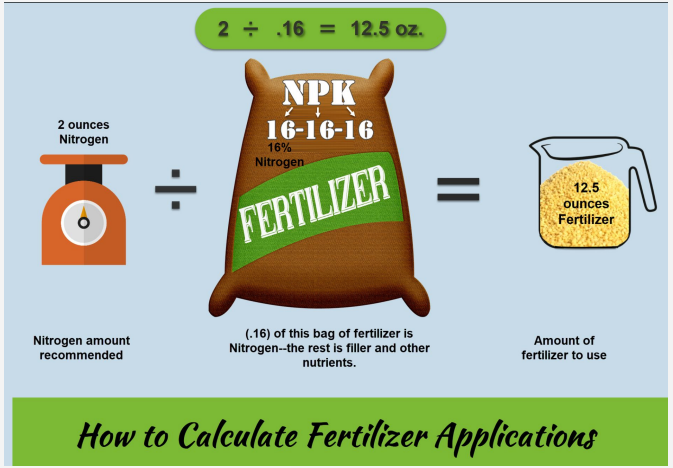
- Radish
- Carrot
- Leek

Medium Feeders:

- Beans (peas produce less nitrogen)
- Cabbage (kale, turnip, collards)
- Lettuce
- Squash family (cucumber, squash, melon, pumpkins)
- Sweet potato
- Asparagus, rhubarb, horseradish (perennial crops)

Heavy Feeders:

- Beet, Swiss chard, spinach,
- Brussels sprouts, broccoli, cauliflower
- Onion (side-dress once as bulbs enlarge)
- Garlic (side-dress twice)
- Okra
- Tomato family (tomato, tomatillo, pepper, eggplant, potato)
- Sweet corn



https://extension.umd.edu/resource/fertilizing-vegetables

– General fertilizer guide

-If indicated, adding lime to increase the pH,can be done in the fall or winter months at least two to three months prior to planting. well into the soil for the lime to work properly, and the rain will do the rest.

- Prepare the bed early and enrich with compost and/or manure.

- Apply one inch of compost around plants yearly.

- In general,vegetable crops nutrient requirements are highest when getting established, and during flowering and fruiting.

- Fertilize in early spring at the rate of 0.2 -0.3 pounds N per 100 sq. ft.

(double that if "mulchy" raised bed "soil" mix).

– General fertilizer guide

- Sidedress fertilizer next to individual plants when needed, ensuring to pull away and replace mulch.

- Follow the **fertilizer label instructions** for the recommended amount to use.

- For spring seedlings and transplants, use a soluble fertilizer mixed with water initially, and switch to granular vegetable fertilizer as the plants grow if necessary.

- If a soil test indicates high phosphorus (P) and potassium (K) levels, opt for nitrogen-only fertilizers (organic) rather than complete fertilizers (N, P, K).

– What about containers?

- Regular fertilization is necessary for container-grown vegetables due to nutrient leaching during watering.

- The amount of fertilizer required depends on factors like plant type, container size, watering frequency, and fertilizer type.

- Long-season vegetables like tomato, cucumber, eggplant, and pepper may need light fertilization every 2 weeks for continuous harvest.

- If the growing media already contains fertilizer, additional fertilization will be needed after a few weeks.

- Slow-release granular or water-soluble dry powder fertilizers are convenient options for container gardening, as they can be mixed into the water or growing media.

https://extension.umd.edu/resource/growing-vegetables-containers

Wilting

Moisture: Too much, not enough, inconsistent moisture

Disease

- Root rotting fungal disease
- Root-infesting maggots
- Vascular wilt disease affecting tomato family--Verticillium)
- Root knot nematodes

Tomato Disease Resistance Codes

V - Verticillium Wilt
F - Fusarium Wilt (FF - Races 1 & 2; FFF - Races 1, 2, & 3)
N - Nematodes
T - Tobacco Mosaic Virus
A - Alternaria Stem Canker
St - Stemphylium Gray Leaf Spot
TSWV - Tomato Spotted Wilt Virus

Solutions

Water deeply. When soil is dry three inches deep, water again. Goal is moisture like a wrung-out sponge. MULCH!

Very hot temps can cause temporary wilting that will correct itself overnight.

If soil doesn't drain well, amend with organic matter, or use raised beds.

Plant disease resistant varieties.

Rotate your crops. Solarizing soil before planting next year may help to kill soil borne disease.

– Club root of cruciferous veggies

bok choy
broccoli
Brussels sprouts
cabbage
cauliflower
kale
kohlrabi
napa cabbage
radish
rutabaga
turn

Figure 1. Clubroot galls on kale roots.
NCSU PDIC

Figure 2. Clubroot on turnip.
NCSU PDIC

Figure 3. Clubroot on greens.
NCSU PDIC

Figure 4. Root knot nematode on tomato roots.
NCSU PDIC

Root knot nematodes look similar, but usually don't affect brassicas.

- Soil borne pathogen
- Infected plants exhibit daytime wilting and nighttime recovery due to reduced water and nutrient uptake.
- Slow growth and stunted development are common in infected plants.
- Infected plants often have fewer and smaller leaves.
- The foliage of infected plants may appear blue-green in color.

Legumes

Question:

I was thinning my green beans and noticed what looks like pinkish nodules tangled in the roots. Is this something to worry about?

- Legumes takes nitrogen from the air and puts it into the soil
- How? symbiotic nitrogen fixation.
- Legume plant and microorganisms that live in very small nodules attached to the plant's roots.
- Microorganisms obtain food and energy from the root of the plant while converting, or fixing, atmospheric nitrogen to a form the plant can use
- When legumes die, their residue is easily broken down by microorganisms that release nitrogen back into the soil

Innoculant, usually a powder, is a bacteria that's added to the soil by applying it to pea or bean seeds before planting.
In a nutshell, he rhizobium bacteria stimulates the legume roots to grow the nodules that "fix" nitrogen.

Mountain Valley Seed Legume Inoculant
Verdesian Guard-N Seed Inoculant for Peas and Beans
Nature's Aid Garden Soil Inoculant

Spindly/weak

Not enough light

Overwatering

Overcrowding

Too much nitrogen

https://www.growbetterveggies.com/files/designing-the-perfect-vegetable-garden-5.pdf

Solutions

Relocate garden next season. Plant garden rows N to S so plants don't shade each other.

Are your taller plants shading your smaller ones? This CAN work to your advantage.

https://www.gardenersmag.com/vegetable-garden-design-plant-veggies/

Stunted growth

(Leaves pale green to yellow)

Not enough light

Temps too cold

Too much water, poor drainage

Soil nutrition problem

Soil pH too low--common here

Insects or disease (more on that later)

Under unfavorable conditions, plants will not develop sufficient foliage or produce satisfactory yields. Moreover, if plant growth is significantly hindered at any stage, be it from seedling to fruit maturation, low yields and unsatisfactory eating quality can be anticipated.

Solutions

- Drought, consistent winds, excessively wet soil, low-quality seedlings, extreme temperatures, and dense or compacted clay soils can all lead to the stunted growth of young seedlings or transplants.
- Reduce water and add organic matter to the soil, used a raised bed.
- In the absence of soil test results, add a balanced fertilizer, compost.
- Thin plants to reduce competition for nutrients.
- Add lime in fall to raise soil pH.

Leaf spots/holes

Fungal diseases

Viral diseases

Chemical burn

Homemade “insecticides”

Herbicide damage

Deck cleaner solution

Insect damage

Fungal diseases

Viral diseases

Solutions

Avoid overhead watering, adequate airflow (spacing, pruning, thinning).

Plant resistant varieties.

Always ALWAYS read the instructions on the label. More damage by homemade concoctions--phytotoxic.

More on specific insect and disease problems.

Trim lower tomato leaves so they are not touching the ground.

Spray drift--droplet or vapor (increases as temp).

Leaf Curling

- Aphids
- Physiological damage (Esp. tomatoes) Stress response to significant fluctuations in soil moisture, over fertilizing (N), over-enthusiastic pruning.
- Herbicide Damage

Solutions

–Tomato Leaf Roll Problems

https://spokanecountyextension.files.wordpress.com/2013/06/http___cru-cahe-wsu.jpg

Physiologic leaf roll

Caption: Curly top virus symptoms on tomato
Photo by: R.S. Byther

Curly top virus

Herbicide Damage

Herbicide drift damage to squash

Solutions

1. Adjust the applicator spray so it's droplets, not a fine mist. Drops are heavier, more likely to fall to the ground, and less likely to vaporize.. Use a low-pressure setting when spraying.
2. Don't spray when it's breezy. It's okay to spray with a gentle breeze between 2-10 mph, but be sensitive to the wind direction! Surprisingly, very calm conditions can increase the risk of drift, even without strong wind. Typically, when there are clear skies and no wind at night, an inversion occurs the next morning.
3. Don't spray when the temperature is above 74° or in low humidity conditions. There is a greater chance of the herbicide vaporizing into the air.

No fruit

Temps too cold

Temps too hot

Too much nitrogen

Incomplete or absent pollination

Cool overcast days

Plants aren't mature enough

Poor fruit yield/poor flavor

- Inconsistent soil moisture
- Poor soil nutrition
- Poor flavor

Solutions

KNOW WHAT YOUR PLANT NEEDS--can vary!

Temps below 57° delay growth-protect plant.

Over 85°, pollination doesn't occur--will resume when temp.

⇩

Stop fertilizing.

Attract pollinators--flowers, avoid overuse of pesticides. Hand pollinate squash, melons, if necessary.

Patience!

Water deeply, test soil at 3 inches.

Increase soil fertility in fall and at planting by adding good compost to support growth.

Plant at right time of year, and know when to harvest.

Leaf yellowing

- Environmental stress:Extreme temps, wide temp swings, compacted, cold, waterlogged soil, drought, high winds, poor quality seeds/transplants
- Nutrient deficiency
  - Early in the season,, there may be a scarcity of nitrogen, especially. This can cause the leaves of vegetables like lettuce, cabbage, and spinach to have a generally pale green or yellowish appearance.
  - Purple leaves--early spring--cold soils, immature roots can't take up nutrients
- Sucking insects--spider mites, white flies

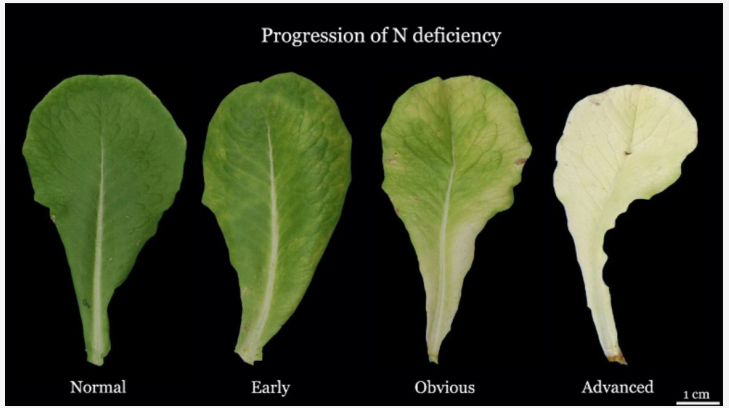
Solutions

Ensure optimum growing conditions!!!

Fertilize spring seedlings and transplants with a soluble fertilizer mixed with water, then switch to a granular vegetable fertilizer as the plants grow.

Apply a balanced soluble fertilizer to the root zone (around the base of each plant) early morning.

Know the nutrient needs of your plants



https://www.cdfa.ca.gov/is/ffldrs/frep/FertilizationGuidelines/Lettuce.html

Yellowing leaves

Whitened leaves

White, tan, or brown spots and splotches of seedlings and transplants

- environmental stressors
  - temperature extremes
  - wide temperature swings
  - cold, cloddy, compacted or waterlogged soil
  - drought
  - high winds
  - poor quality seeds or transplants.
- Should recover--check new growth

Sunscald on leaf.

Photo: Daren Mueller, Iowa State University, Bugwood.org

Sunscald on a bell pepper.

Photo: University of Georgia Plant Pathology , University of Georgia, Bugwood.org

Bleached area on fruit surface is caused by sunburn.

Photo: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

Recently transplanted pepper is sunburned at the lower stem, girdling plants.

Photo: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

https://extension.oregonstate.edu/gardening/flowers-shrubs-trees/heat-wave-garden-how-identify-prevent-heat-stress-plants

Whitened leaves

Solutions

- Protect plants from wind and cold with row cover material, a cold frame, or a cloche (e.g. an empty 1-gallon plastic milk jug with the bottom removed) over each individual plant.

⇩

Bolting

Biennials usually bolt to flower and seed after going through winter. They need consistent cool temps for a specified amount of time to develop fruit. Temps above a specified temperature will interrupt this cycle and cause bolting.

The most common triggers are

- cold temperatures after coming out of a greenhouse
- moisture stress (too much in the soil or too little), and/or
- low fertility, especially nitrogen.
- E.g., bolting short cycle of warm days, followed by very cold days, then warm to hot week

Solutions

- plants should be no more than 4 weeks old when they are transplanted.
- Place under row covers if possible to keep them warmer until outdoor temperatures improve.
- Plant bolt-resistant varieties

No heads forming cabbage/lettuce

Lettuce

- Cool season crop that will bolt or fail to fix heads when daytime temperatures are higher than 70 degrees

Cabbage

- If the central growing point of a small plant gets damaged, it may fail to form a head. The existing leaves will become tough and thick, and no new leaves will emerge.
- Cold temperatures, rough handling, and insect feeding can all harm young plants
- Avoid planting them outdoors until the weather has stabilized, and regularly inspect for insect infestations.
  https://apps.extension.umn.edu/garden/diagnose/plant/vegetable/cabbage/headnone.html

Brassicas (cabbage family)

Hollow stems and poor heads

-

Clubroot of crucifers

Caption: clubroot symptoms on cabbage
Photo by: L.J. du Toit

Carrots

- Forked or split roots can occur due to rocky, heavy, or compacted soil, as well as drought conditions.

- Limited root growth with healthy green tops often indicates overcrowding of plants.

- Excessive nitrogen fertilization can lead to excessive leaf growth while hindering root growth.

- When the tops of root crops like carrots are exposed to sunlight, they may turn green. In such cases, simply remove the green portion.

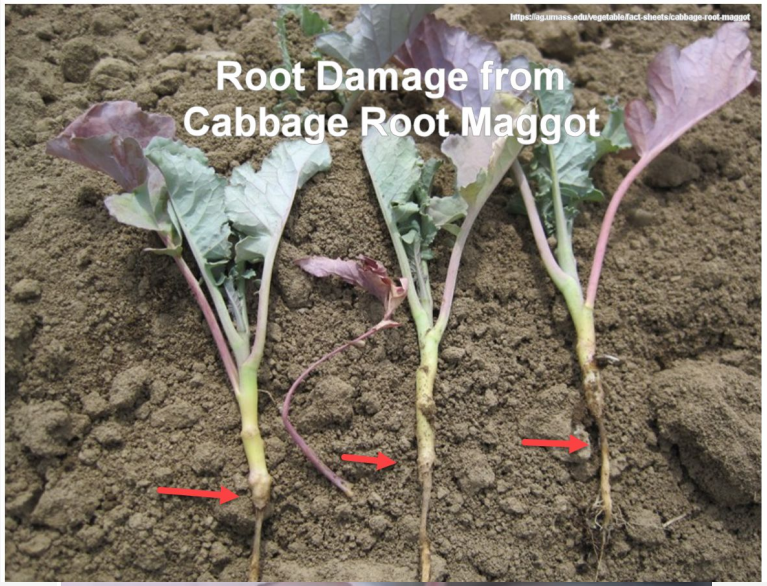
Normal and stubby carrots *UMN.edu*

Carrots--Abiotic problems

- Split Roots

Root attacking insects

Carrot Rust Fly

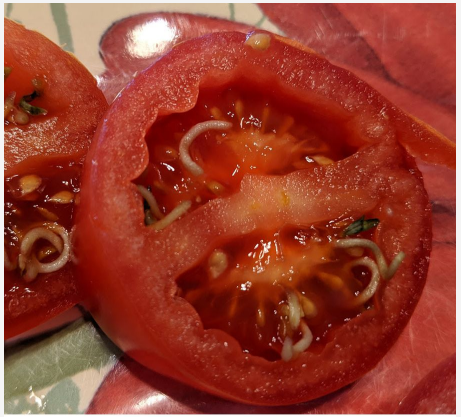


Common Abiotic Tomato Problems

https://ucanr.edu/sites/sacmg/files/261550.jpg

Sunscald

Blossom End Rot



Vivipary

Catfacing

Managing your Tomatoes in Extreme Heat

Problem	Explanation	Solution
Leaves burnt, tomatoes sunburned	The sun can heat up the surface of the leaves and fruit, causing damage.	Use shade cloth to keep sun of plants during hottest part of the day. Make sure not to wrap the plant--it needs good air flow or it will cook! Keep fruit shaded by leaves--don't over-prune!
Fruit cracking/splitting	Sudden changes in soil moisture levels, leading to rapid expansion of the fruit that exceeds the growth of the tomato skin.	Keep your soil consistently moist. Don't let it dry out completely. Appropriately regulated drip irrigation systems are the easiest way to control consistent soil moisture
Blossom end rot	inconsistent soil moisture--calcium is unavailable to the plant	See above.

Managing your Tomatoes in Extreme Heat

Problem	Explanation	Solution
Flowers dry up and fall off; no new tomatoes for a couple of weeks	Temps in 90--pollination can't happen. Not as much insect activity, either.	Help pollinate the flowers by buzzing the blunt end of your electric toothbrush on the flower or stem
Tomatoes showing signs of needing nitrogen despite fertilizing properly (lower leaves yellowing)	Frequent watering because of the heat can leach nutrients, especially nitrogen, from the soil.	You may need another application of your usual nitrogen fertilizer if you notice this.
Tomatoes wilting mid-day, but soil is still damp	The plant closes up its cells to prevent moisture loss through the leaves. When a leaf is wilted, it reduces the surface area exposed to sunlight, thus slowing down water loss.	If the soil is moist, the plant will perk up by late evening or in the morning. Resist the urge to water it. Check soil moisture in the morning.
Spots appearing on the lower leaves of the plant after watering overhead	The lowest leaves and those in the back of the plant are most likely to first show signs of fungal disease from wet leaves.	Water at the base of the plant, keeping leaves dry. Prune off affected branches as soon as you see them. Don't compost. Prune lower leaves so th th plant so f

Potatoes

Greening

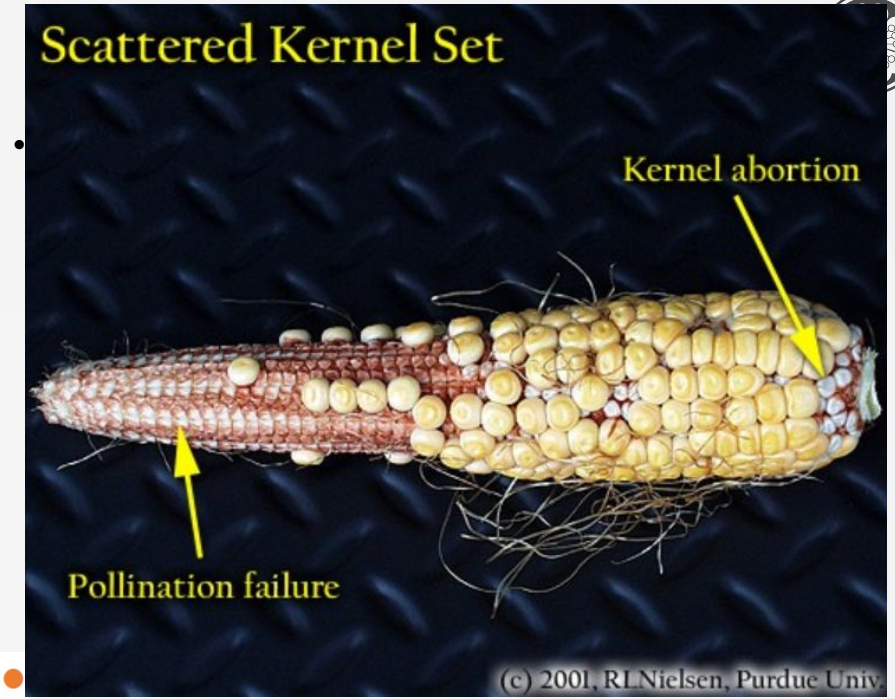
SCAB

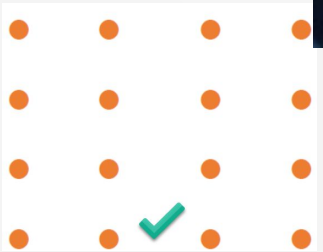
Bacterial ring rot

Potato: Hollow heart. Calcium deficiency

Rhizoctonia blight aka "scurf"


https://crops.extension.iastate.edu/files/article/nutrientdeficiency.pdf


Scattered Kernel Set
Kernel abortion
Pollination failure
(c) 2001, R.L.Nielsen, Purdue Univ.



Sweet Corn

– Corn and critter damage

Filament (strapping) tape

Install electric fencing. Use two or more wires, the first about five inches above the ground and the second four inches above the first (or nine inches above ground). Raccoons must not be able to crawl under, go between or go over the wires without being shocked.

Wrapping filament tape around ripening ears of corn or placing plastic bags over the ears

A well-designed electric fence can preclude raccoons, deer, and other nuisance animals from gardens and small farms.
https://naturalresources.extension.iastate.edu/

Onions and Garlic

- Frequent offender--**Fusarium Basal Plate Rot**
- pinkish color on root end
- Seed borne
- worse in wet springs
- Gets worse if you re-plant
- sanitation and rotation
- Better chance in raised beds

- WORST offender: White Rot
- Long soil life (10+ years)
- Moves on plants and/or cloves
- No treatments
- Remove all infected plants and the adjacent healthy plants.
- Remove soil around infected plants when practical. Destroy or discard (do not compost) diseased materials.

Cucurbits--Cukes, squash, melons

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https://s3.eu-west-2.amazonaws.c
male-and-female-flowers-2x.jpg

Slugs (non-insect pest)

- Hand-pick and kill slugs when noticed
- Slug killer, but if you do, **use one with the active organic ingredient Iron Phosphate**. AVOID METALDEHYDE products—they are very toxic to pets and birds

- Set traps with beer in a shallow pan or place a board where you usually find them, then check under it in the morning and destroy them.
- Encourage predators

Mating in Oct./Nov.

Most common insect problems

Holes, “window panes”

CHEWING	PIERCING-SUCKING
Beetles	"Shield" bugs
Grasshoppers	Aphids
*Moths	Leafhoppers
*Butterflies	Whiteflies
*Flies	Thrips
*Sawfly	Spider mites
	Azalea Lace Bugs
*Larvae have chewing mouthparts	Scale

Suck leaf tissue-pale discoloration, twisted leaves

Photo 3. Twospotted spider mite injury on soybean. Photo

Aphids

- Prune heavily infested leaves, destroy heavily infested plants.
- Squish ‘em, wipe off leaves.
- Hose ‘em down.
- Don’t over-fertilize.

Plant a trap crop like Nasturtiums to encourage beneficial insects.

Chemical-Examples

- Safer Brand BioNEEM Multi-Purpose Insecticide & Repellent
- Safer Brand Insect Killing Soap

Wingless adults and nymphs of the potato aphid

Spider mites

- Keep plants healthy--take care in hot, dry conditions!
- Monitor plants for leaf stippling.
- Use magnifying glass to look under leaves.
- Shake leaves onto white paper to see spider mites.
- Hose with water.

Beneficial insects help with control--avoid use of "broad spectrum" pesticides.

Use slow release, lower N fertilizer.

Chemical control-Examples

Bonide Mite X RTU

RID-BUGS

Safer Brand Insect Killing Soap

Safer Brand BioNEEM Multi-Purpose Insecticide & Repellent

Image courtesy of Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

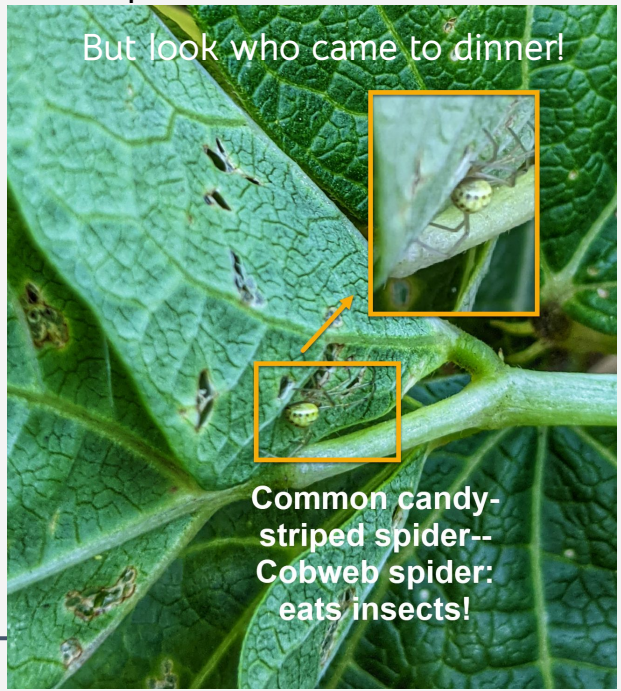
Flea Beetles

- Feed on tomatoes squash, beans, corn, sunflowers, lettuce, potatoes and many weeds. beets, kale, collards, radish, and many weeds.
- Leaf damage can kill seedlings.
- Plant "trap Crops (radish) away from main crops. Chemical management:

Chemical management:

- Bonide Captain Jack's Deadbug Brew (O)
- Bug Buster-(O) (pyrethrins)
- Safer Brand BioNEEM Multi-Purpose Insecticide & Repellent (O)

Crucifer flea beetle damage on turnips



Caterpillars

Whitney Cranshaw, Colorado State University, Bugwood.org

- Eat holes, skeletonize leaves.
- Squish caterpillars.
- Row covers are very effective
- Predators such as, paper wasps, and parasitic flies and wasps, such as the parasitic wasp, Cotesia glomerata, are natural enemies.
- Treat caterpillars is while they are still small and before they cause too much feeding damage. Pesticides are less effective in killing larger caterpillars.

Chemical management:

- Bonide Captain Jack's Deadbug Brew [O](spinosad)
- Bonide Thuricide BT
- Bug Buster-O [O] (pyrethrins)
- ferti-lome Dipel Dust (Bt)
- Safer Brand Caterpillar Killer for Trees, Shrubs & Vegetables [Bt] [O]


Cabbage looper


Cabbage looper moth

Caption: Imported cabbage worm and damage
Photo by: A.L. Antonelli


Cabbage looper larva


Caption: Imported cabbage worm adult
Photo by: A.L. Antonelli

Caterpillars

Climbing cutworms

- Squish caterpillars when seen--they're nocturnal, and hide just under the soil.
- Use collar around base of plant
- Biological controls beneficial nematodes
- Avoid pesticides like broad spectrum pesticides include permethrin, beta-cyfluthrin, and lambda-cyhalothrin.
- Treat caterpillars is while they are still small and before they cause too much feeding damage. Pesticides are less effective in killing larger caterpillars.

Chemical management:

- Bonide Captain Jack's Deadbug Brew [O](spinosad)
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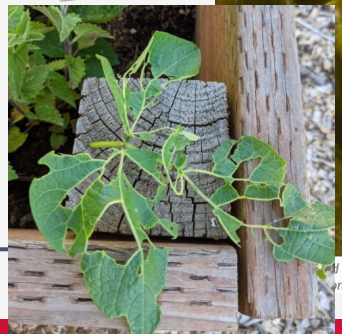

Caption: Celery looper pupa
Photo by: A.L. Antonelli

l cutworm larvae
nelli

Leafminers

- Control weeds in and around the garden.
- Rotate crops. Do not replant where crops were infested the previous year.
- Pinch leaves to kill larvae inside.
- Pick out infested leaves when noticed. Discard leaves in garbage.
- Screen plants with a floating row cover prior to emergence of flies in spring (April-May). **Do not put row covers over soil previously infested with this pests**

Chemical management:

- None recommended

–Cucumber Beetles

Squish 'em.

Use trap crops-- plant some cucurbits early, away from main garden, and kill them with a pesticide when they congregate.

Use a rowcover in June, but remove it when they start to flower--or hand pollinate!

If you find 25% of a plant defoliated, apply pesticides

Chemical management:

- Bug Buster-O [Organic] (pyrethrins)
- Safer Brand BioNEEM Multi-Purpose Insecticide & Repellent Conc [O]

Feeding damage caused by striped cucumber beetle

Adult striped cucumber beetle

Adult spotted cucumber beetle

https://extension.umn.edu/yard-and-garden-insects/cucumber-beetles

–Wireworms

Crop rotation may help reduce damage by wireworms. Or grow in a container.

Grow in in well-drained soil.

More common in gardens that were previously in grass or sod.

Plant resistant varieties of potatoes, and harvest them early—by late July.

*Planting brassica family vegetables *may* also cut down the population

Cut away damaged portions of tubers before use.

Dry out the solid and dig clumps to expose them. Birds (and chickens!) will eat them

Biological management:

- Some research indicates that beneficial nematodes may help.

Art Cushman, USDA Systematics Entomology Laboratory, Bugwood.org
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Brown Marmorated Stinkbug

- Significant damage to apples, beans, eggplants, grapes, peppers, sweet corn, swiss chard and tomatoes, blueberries, strawberries, raspberries.
- Biological control of BMSB-beneficial natural enemy--tiny Samurai wasp lays its own eggs in BMSB eggs.
- Exclude BMSB with fine netting BEFORE you expect the BMSBs..
- Scout for egg masses and nymphs--squish 'em.
- Prevent them from entering homes-seal all the openings with caulking or other material.
- When in the house, vacuuming them is the best way to capture and remove BMS

But

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David R. Lance, USDA APHIS PPQ, Bugwood.org
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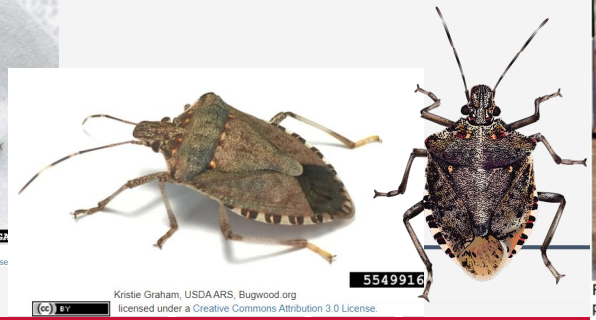

Kristie Graham, USDA ARS, Bugwood.org
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Figure 2. BMSB nymph feeding injury on bell pepper. (Photo by A. Morehead)

Corn earworms

- Plant resistant varieties with tight husks if you've had problems: (such as 'Country Gentleman', 'Golden Security', 'Silvergent', and 'Staygold')
- Place a clothespin at the point where the silk enters the ear can prevent earworm access when the first silk is seen.
- Plow or dig up corn plots in the fall to kill overwintering pupae and prevent emergence of adults in the spring.
- Peppers, tomatoes, beans, and many other plants are also attacked.

Chemical management:

- Safer Brand BioNEEM Multi-Purpose Insecticide & Repellent Conc [O]
- Bonide Captain Jack's Deadbug Brew [O](spinosad)

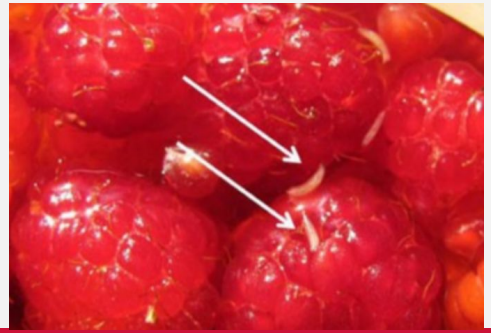
Apply first application when silks first appear. Follow label instructions on reapplication intervals. Direct insecticide application to silk.

Spotted Wing Drosophila

- Damage ripe fruit such as cherries, plums, raspberries, strawberries, and blackberries.
- The best way to control them is to monitor for their presence with traps,
- Pick ripe fruit immediately
- Don’t allow fallen fruit to remain on the ground.
- Fine netting may help protect the fruit

Chemical management:

- Apply only during late evening, night, or early morning
- Organic, spinosad
- Bonide Captain Jack's Deadbug Brew R-T-U
- Monterey Garden Insect Spray
- Pyrethrins, piperonyl butoxide:
- GardenTech WorryFree Brand
- Garden Safe Houseplant and Garden Insect Killer

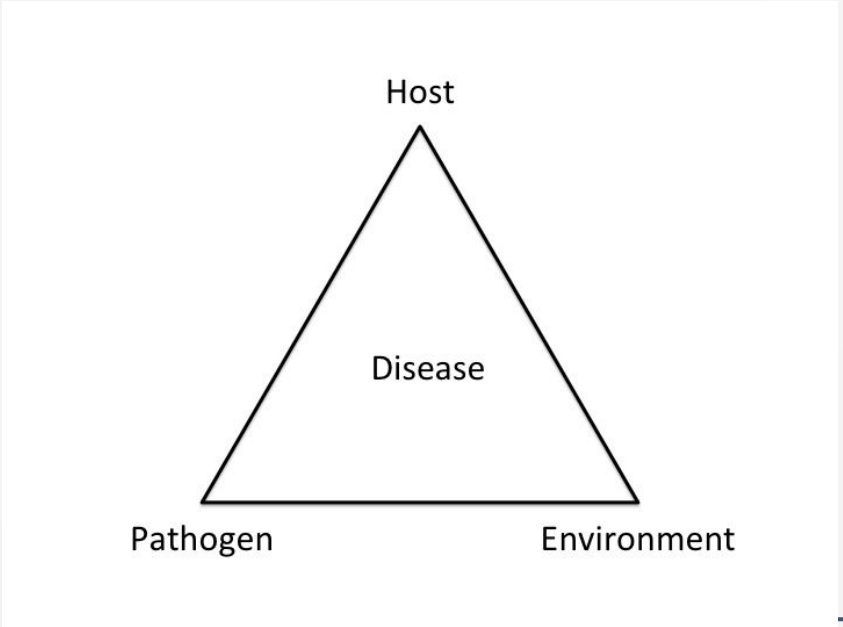


Important:

- Chemical applications are effective against ADULTS ONLY and will not control SWD eggs, larvae, or pupae in fruits.
- RASPBERRY must be listed on the pesticide label.
- Monitoring for SWD to know when they are present, then apply protective pesticide.
- Good spray coverage of the foliage and ripening fruit is essential to prevent oviposition by the females.

–Vegetable diseases and disorders

Diseases--caused by a pathogen



Disorders--caused by environmental conditions

- Too much/little water
- Too much/little light
- Too cold/hot
- Poor soil conditions
- Poor soil nutrition
- Poor Pollination

Powdery mildew

- Infects all cucurbits, including muskmelons, squash, cucumbers, gourds, watermelons and pumpkins
- The first sign of powdery mildew is pale yellow leaf spots.
- White powdery spots can form on both upper and lower leaf surfaces, and quickly expand into large blotches
- Space and stake plants to minimize humidity
- Don't over-apply nitrogen
- Plant resistant varieties next year!
- If a severe infection ruined your plants last year, apply fungicide this summer when you first see the pale yellow leaf spots.

Chemical management:

- Bayer Advanced Natria Neem Oil Conc [Organic]
- Bi-Carb Old-Fashioned Fungicide [Organic] (potassium bicarbonate)
- Active ingredient: potassium bicarbonate | EPA reg no: 54705-10
- Monterey Horticultural Oil [Organic]
- Safer Brand Garden Defense Multi-Purpose Spray Conc [Organic] Neem oil

Tomatoes/potato-Late blight

- Good air circulation a must
- A couple of drizzly days in summer can set the stage for Late blight.
- If rain is forecasted, spray plants with a copper fungicide

Chemical management:

- Bonide Copper Fungicide Spray or Dust RTU [O] (copper sulfate)
- Bonide Fung-onil Multi-Purpose Fungicide (chlorothalonil)
- Apply BEFORE the cool humid conditions develop. Repeat application according to label directions

Leaf infections are large brown blotches with a green gray edge

Verticillium Wilt

- Soil borne-attacks roots and moves upward
- Infected plants wilt, are stunted, and have yellow leaves which tend to roll inward.
- Older and lower leaves are the most affected- Leaves dry out, turn brown, and die.
- Stem tissues have brown discoloration
- Usually doesn't kills tomato plants but reduces their vigor and yield.
- Not much can be done

- Rotate crops if you have a large garden, don't plant tomato family plants in the soil. Try celery, lettuce, peas, beans, and asparagus instead.
- Plant resistant seeds.
- Clean up plant debris and destroy.

Common sense approach to plant problems

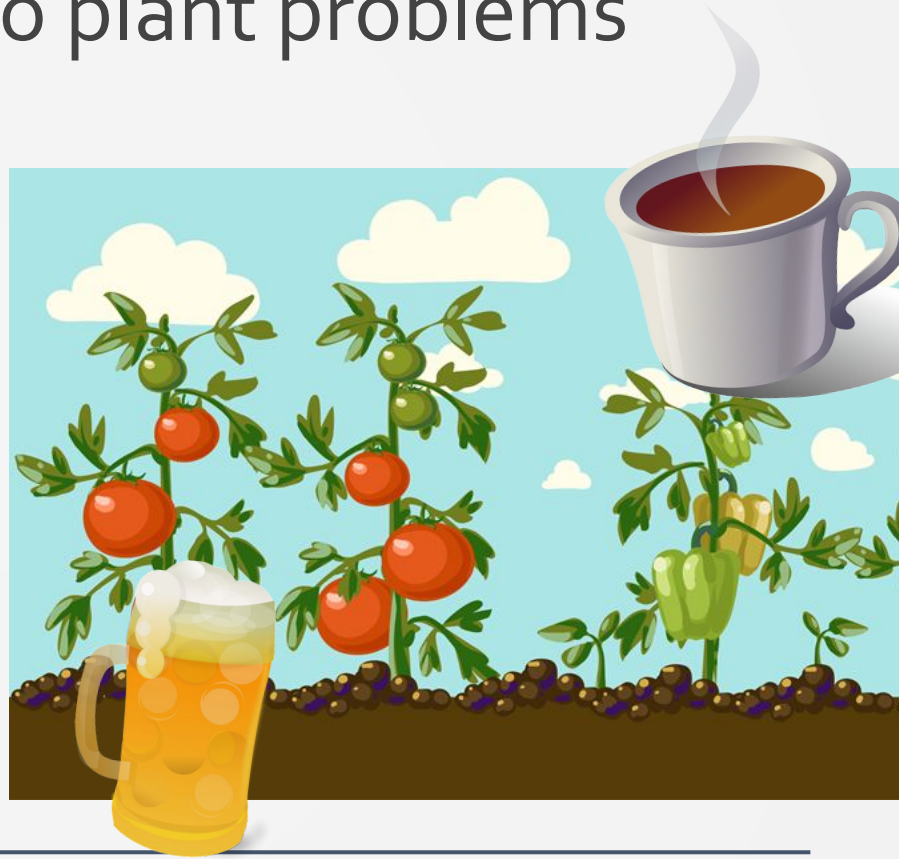
1. **Monitor** the pest's activity and adjusting methods over time. This means going out into your garden every day. It's easier to stop small problems than to correct large ones.

2. Use a **variety of common-sense methods** to control problems in the garden, not just using pesticides!

3. **Tolerate** harmless pests.

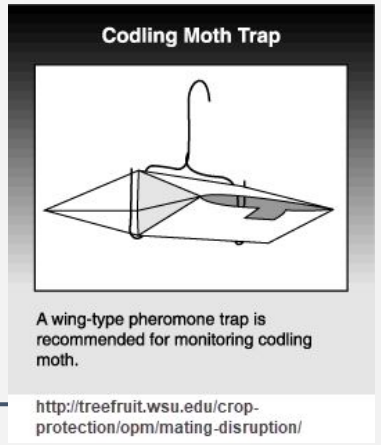
4. **Set** a threshold to decide when it's time to act. Not every problem needs to be "treated."

5. **REPEAT** steps 1-5 all growing season long!



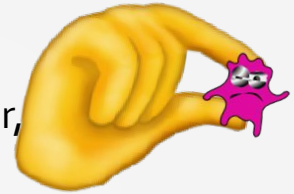
Common-sense methods to control problems in the garden

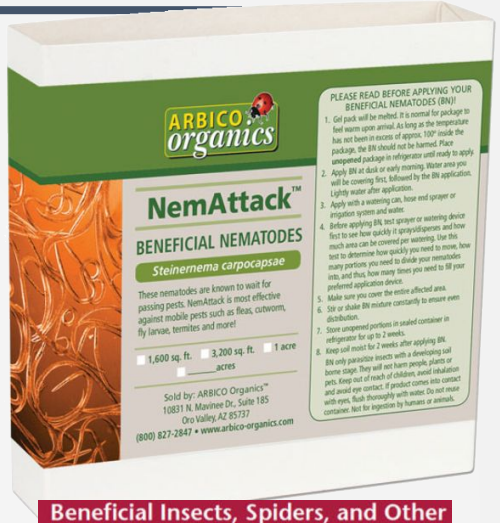
1. **Have a healthy garden**
   a. Good airflow, fertilize, and water properly.
   b. Keep a very close watch for problems.
2. **Control access to your plants**
   a. Row cover
   b. Crop rotation
   c. Mulch
   d. Weed control
   e. Stem collars
   f. Trap crops
3. **Repellant**
   a. Diatomaceous earth (crawling insects)
   b. Pheromone lures
      i. insect specific
      ii. Monitoring,
      iii. Mating disruption

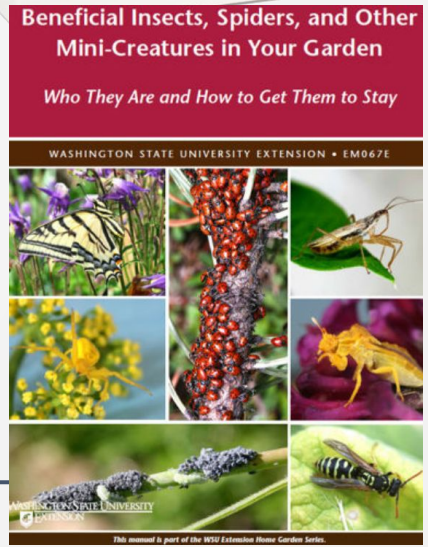


_ Common-sense methods to control problems in the garden

- FIRST: **VISUALLY IDENTIFYING INSECT PEST** (Plant and Insect Clinic)
- Use the **LEAST TOXIC** methods first
  - Best control: Your thumb and index finger, despite the "YUK factor"!
  - Strong spray of water.
- Biological controls.
- **LAST RESORT—PESTICIDE.** Pesticides—*least toxic* (spot treat!! The affected plant and shield others
- READ THE LABEL!

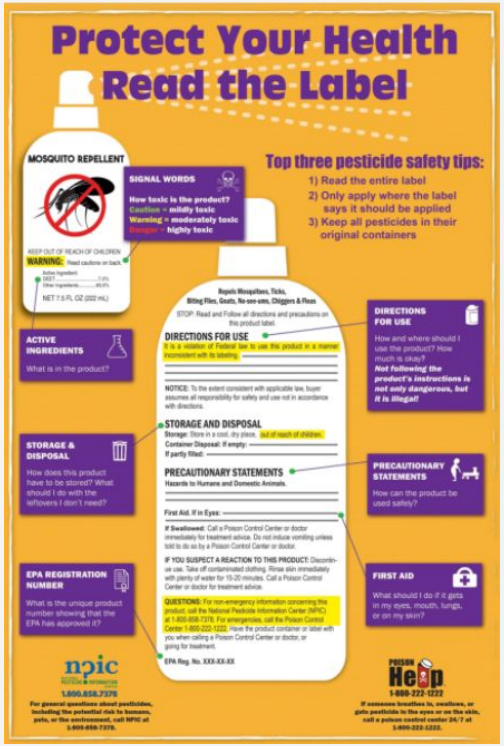






Common-sense methods to control problems in the garden

- Again—ID the insect--READ THE LABEL
- Find the product that solves the problem. The insect will be listed on the label if it's effective for that problem.
- Buy the right amount—label tells how much you'll need, and some won't remain effective if stored.
- FOLLOW DIRECTIONS- when and how to apply, how long before picking fruits/veggies.
- More is not better—you can harm plants, birds, lawn, water supply, and fish!
- Dispose properly.



Label example

HOW TO MIX

Add the required amount of this product to the specified amount of water, mix thoroughly, and apply uniformly to both upper and lower surfaces of plant foliage. Mix only as much spray as needed for a single treatment. In vegetable gardens, for best results, do not use more than 3 gallons of spray for 1000 sq ft of area. Do not use kitchen utensils for measuring. Keep measuring utensils with product and away from children.

	Amount of this product to Use per Pint, Quart or Gallon of Spray		
Unit of Measure[1]	Per Pint (16 fl oz) of Spray	Per Quart (32 fl oz) of Spray	Per Gallon (128 fl oz) of Spray
Fluid Ounces (fl oz)	0.25 fl oz	0.5 fl oz	2 fl oz
Tablespoons (Tbs)	½ Tbs	1Tbs	4 Tbs

[1]Conversion factors: 2 tablespoons (Tbs) = 6 teaspoons (tsp)

HOW TO APPLY

Shake Well Before Use

This product may be applied with trigger sprayer, hand-held, backpack, or hose-end sprayers. Use a hose-end sprayer that can be adjusted to provide a dilution ratio of about 2 fl oz of this product (4 Tbs) per gallon of spray.

WHEN TO APPLY

Apply when listed pests are present. Repeat applications may be made as indicated in the Home Gardens section. See your state extension service recommendations for treatment guidelines in your area.

Crops	Pests Controlled	Maximum Number of Applications per Season	Minimum Days to Wait Before Reapplying	Minimum Days to Wait from Last Application to Harvest
cole crops (Brassica vegetables), including, but not limited to: broccoli, broccoli raab, brussels sprouts, cauliflower, cavalo, Chinese broccoli, cabbage, Chinese cabbage (bok choy), Chinese cabbage (napa), Chinese mustard cabbage (gai choy), collards, kale, kohlrabi, mizuna, mustard greens, mustard spinach and rape greens	cabbage looper diamondback moth imported cabbage worm leafminers worms	6	4	1
cucurbits, including, but not limited to: cucumber, edible gourds, muskmelons (cantaloupe, honeydew, etc.), pumpkin, summer and winter squash, and watermelon	leafminers thrips worms (caterpillars)	6	5	all except cucumber, 3 cucumber, 1
fruiting vegetables, including, but not limited to: eggplant, ground cherry, okra, pepino, pepper, tomatillo, and tomato	Colorado potato beetle leafminers thrips worms (caterpillars)	6	4	1

ENVIRONMENTAL HAZARDS

This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. This product is toxic to aquatic invertebrates. To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies or drainage systems.

And for those we didn't cover

WSU's list of common offenders

Asparagus *Guide
Lettuce
Bean
Onions, Garlic
Beet, Chard
Pea
Broccoli, Cole crops
Pepper, Eggplant
Cantaloupe, Melons
Potato
Carrot
Radish *Problem solving
Corn
Spinach
Cucumber, Pumpkin, Squash
Tomato
Turnip, Rutabaga

Hortsense
http://hortsense.cahnrs.wsu.edu
Search by crop

Pestsense

Always choose the
LEAST TOXIC OPTIONS!

SIMPLE, HOLISTIC, COMMON SENSE METHOD OF MANGING GARDEN PESTS & DISEASES

Cheat Sheet: Choose the Least Toxic Pesticide

Organic-
Least to most toxic to beneficials

- **Bt -**caterpillars--little or no toxicity to any other organism
- **Diotomaceous Earth**
- **Neem oil** - azadirachtin
- **Insecticidal Soap** - Potassium salts of fatty acids
- **Spinosad** - E.g., Entrust, Success, Regard, Bonide Captain Jack's Deadbug Brew R-T-U; apply at night
- **Boric Acid** - ants
- **Pyrethrin** - highly toxic--apply at night

Synthetic Pesticides-
ALL highly toxic to bees

- Acetamiprid
- Acephate
- Bifenthrin
- Carbaryl (E.g., Sevin)
- Cyfluthrin
- Esfenvalerate
- Cyhalothrins
- Malathion
- Permethrin

READ THE LABELS

- How to use
- Target use and insects
- How to dispose
- Protect yourself, the environment, and pollinators

Problems:
If you plant, they will happen!

- Growing problems
- Common sense approach to problem solving
- Insect Problems
- Plant disease and disorders

Questions?

Alice Slusher

WSU Extension Cowlitz Co. Master Gardener Volunteer

Contact info: 360-577-3014 ext 1

cowlitzmastergardener@gmail.com

Website: Cowlitzcomg.com

For information about **becoming a WSU Extension Master Gardener in Cowlitz Co.**, contact Gary Fredricks, garyf@wsu.edu, 360-577-3014 ext. 3

WASHINGTON STATE UNIVERSITY

http://mastergardener.wsu.edu/

Resources

Know what your crop needs--check individual growing requirements!! Best resources I've found:

- https://extension.umn.edu/find-plants/vegetables#vegetables-a-z-2396210
- https://extension.umd.edu/resources#!/category/3/subcategory/828

Hortsense-common problems in our area http://hortsense.cahnrs.wsu.edu/

All you need to know about gardening in containers: https://extension.umd.edu/resource/growing-vegetables-containers

Fertilizing vegetables in the home garden (excellent): https://extension.umd.edu/resource/fertilizing-vegetables

Fertilizing your Garden https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec1503.pdf

Growing Your Own OSU https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9027.pdf

WSU: Garden Vegetables--individual growing guides http://gardening.wsu.edu/vegetable-gardens/
OSU Vegetable Gardening Resources: https://extension.oregonstate.edu/topic/gardening/vegetables/resources

Territorial Seed Growing Guides https://territorialseed.com/blogs/spring-growing-guides
Natural enemy of Brown Marmorated Stink Bug--Samurai Wasp
https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9164_0.pdf

Growing Sweet Corn in Home Gardens https://extension.tennessee.edu/publications/documents/SP291-E.pdf

Good look at problems affecting sweet corn in our area
https://www.skagitmg.org/wp-content/uploads/Public-Pages/Food%20Gardening/Food%20Gardening%20Library/WSU%20Bulletin%20FS104E%20Sweet%20Corn.pdf

Resources

Tips and tricks for growing vegetables in our area and on the coast https://extension.oregonstate.edu/gardening/vegetables/growing-vegetables-pacific-northwest-coastal-region

Interesting read about the causes of deformed carrots https://gardenerspath.com/plants/vegetables/causes-deformed-carrots/

Great resource for ALL your gardening and landscape needs--choosed topic from column on left. http://gardening.wsu.edu/

Nutrient deficiencies in crop vegetables https://crops.extension.iastate.edu/files/article/nutrientdeficiency.pdf

Photo Gallery of Vegetable Diseases https://mtvernon.wsu.edu/path_team/diseasegallery.htm

National Pesticide Information Center http://npic.orst.edu/

Why read labels? https://www.epa.gov/sites/production/files/2014-04/documents/why_read_labels.pdf

– Resources

Inviting Beneficial Insects to your garden - Here are a free great little free publications you can download that will help you to get to know who lives in your garden! Search Google for the following:

1.) OSU: What to plant! Encouraging Beneficial Insects in your Garden PNW550
https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw550.pdf

2.) OSU: Excellent identification guide Common Natural Enemies of Crop and Garden Pests in the PNW EC

1613-E https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec1613.pdf

3.) WSU: Beneficial Insects,Spiders, and Other Mini-creatures in your Garden--how to get them to STAY! EM067E
http://pubs.cahnrs.wsu.edu/publications/wp-content/uploads/sites/2/publications/em067e.pdf

Where to get Separate seed packs

"Beneficial Insectary Mix"-www.outsidepride.com

"Beneficial Insect Attractant Mix" - www.johnnyseeds.com