

# Sustainable Vegetable Gardening

## Class 4: Warm Season Vegetables

### Key ideas

- *Encourage beneficial insects by providing food, water, and shelter, and not using broad spectrum insecticides.*
- *Warm season vegetables need warm soil and air temperatures to grow well. Don't plant too early!*
- *By giving seedlings the right care (spacing, watering, supporting, harvesting), you'll get the most from them.*

### 1. Encouraging beneficial insects

Provide food for beneficial insects.

- Plant flowers to produce nectar and pollen.
- Plan for bloom spring through fall.
- Many small flowers, flat surface (many beneficials are very small).
  - Coriander, fennel, dill, Queen Anne's lace
  - Yarrow, daisy, sunflower, cosmos
  - Alyssum, mustard, broccoli flowers
  - Mints, rosemary, thyme, lavender, oregano
  - Native and exotic shrubs: elderberry, ceanothus, coffeeberry, grevillea, cotoneaster, lantana, buckwheat

Allow prey to survive

- Don't wipe out every bug!
- Watch for parasitized aphids, caterpillars

Provide water and salts from evaporated water

- Bird baths, small shallow containers
- Temporary puddles
- Rocks or sticks for perching at water's edge

Provide habitat

- Annual and perennial plants
- Tall and short plants
- Shady and sunny areas
- Litter and mulch
- Areas that are not tilled or disturbed

### 2. Warm season vegetables

Tomatoes

- Types
  - **Classic** – Generally round & smooth, ranging from medium-small to medium-large in size. Sometimes called main crop or slicing tomatoes
  - **Cherry** – Small, bite-size tomatoes

- **Beefsteak** – Generally large to very large, usually somewhat irregular in shape, often later to mature
- **Paste** – Generally elongated shapes and often meatier with less seed gel, hence good for processing as sauce & paste. Also good for salsa and salads.
- Heirloom: many varieties. Always open pollinated, never hybrids. Usually passed on from generation to generation, but some 'new heirlooms' also exist.
- Determinate vs indeterminate
  - Determinates are short, about 2-4 feet high. Standard tomato cages will work.
  - Indeterminates will continue growing until frost kills them, easily 6 feet or more, need tall cages
  - Semi-determinate: indeterminates that don't get very tall, 4-5 feet
- Growing
  - Start seeds in pots about 6-8 weeks in advance, Feb - May
  - Pot up into larger containers as needed
  - Stems can be buried, both when potting up and when planting in the ground. Roots will develop where the leaves were attached.
  - Plant out Apr - June, when soil has warmed up, 2-3 feet apart
  - Don't use a high nitrogen fertilizer. It encourages too much leafy growth
  - Support vines with cages to keep fruit off the ground
  - Don't overwater tomatoes once they're established. They'll develop better flavor with less water.
  - Harvest when fully ripe and starting to soften
- Some favorite tomatoes – many more than these!
  - Beefsteaks
    - Reds/pinks: Aker's West Virginia, Cuostralee, Brandywine from Croatia, Ed's Millenium, Stump of the World
    - Bi-color: Big Rainbow, Hillbilly
    - Orange: Kelloggs breakfast
    - Green: Aunt Ruby's German Green, Green Giant
  - Classics:
    - Reds/pinks: Early Girl, Stupice, Dona
    - Other colors: Green Zebra, Black from Tula
  - Cherries
    - Reds/pinks: Supersweet 100, Gardener's Delight
    - Other colors: Sungold, Sun Sugar, Black Cherry
  - Pastes:
    - Reds/pinks: Amish Paste, Opalka
    - Other colors: Amish Gold, Speckled Roman
- Diseases
  - Early and late blights (fungal)
    - Look for discolored spots on leaves
    - Plant only after weather warms up
    - Keep leaves dry
    - Destroy infected plant material
  - Vascular wilts (fungal): fusarium and verticillium
    - Look for leaves yellowing, wilting, browning in spite of correct water
    - Plant resistant varieties (V, F on label)

- Do not replant tomatoes for 3-4 years in same spot
    - Remove and destroy infected plants
  - Tobacco mosaic virus
    - Look for mottled and/or distorted or puckered leaves
    - No smoking in the garden!
    - Plant resistant varieties (T on label)
    - Remove and destroy infected plants
- Pests
  - Russet mite
    - Look for brown, drying leaves starting at bottom; bronze discoloration on stem
    - Spray with wettable sulfur
  - Hornworm
    - Look for large frass, eaten leaves, large but well-camouflaged green caterpillar
    - Hand pick
    - Encourage parasites by allowing parasitized caterpillars to live
- Physiological conditions
  - Blossom end rot
    - Look for dark, hardened area at blossom end
    - Maintain even watering schedule
  - Sunscald
    - Look for bleached, leathery areas on fruit
    - Maintain healthy foliage to protect fruit
  - Catfacing
    - Lots of seams on bottom side of tomato. Beefsteaks are particularly susceptible.
    - Cosmetic only, just cut away
    - Caused by cool, cloudy conditions at blooming time
    - Consider planting later for warmer weather conditions

## Peppers

- Seedlings
  - Start seeds in pots 6-12 weeks in advance, Jan - Apr
  - Pot up into larger pots if necessary
  - Don't plant outside until soil is at least 55 degrees and night temperatures are regularly 50 degrees or more (May)
- Planting out
  - Plant 12-15 inches apart
  - For sweet peppers, pick off first blossoms and fruits to encourage more leaf and root growth, for at least 2 weeks and up to 6 weeks. Can double overall production.
  - Small 'tomato' cages or stakes are a good idea for large fruited peppers
- Sweet peppers
  - Need good, regular watering to make thick, juicy peppers.
  - Pick at desired color (green, red, yellow, etc.). Use a hand pruner.
  - Many great varieties. Some favorites: Karma, Orange Sun, Corno di Toro, Nardello
- Hot chiles

- Pick at desired color. Often snap off easily.
- Scoville ratings: 0 (sweet) to 600,000+ (some habanero and Indian peppers)
- Some favorites: Serrano (10,000 - 23,000), Fish (45,000-75,000), Rocoto (100,000 - 200,000)
- Diseases: Vascular wilts – see tomatoes for descriptions. Rare for peppers here.
- Pests: corn earworm
  - Look for small hole in pepper, worm inside (color varies)
  - Pick and destroy wormy produce (okay to salvage what you can)
  - Encourage natural enemies
- Physiological conditions: sunscald, blossom end rot – see tomatoes for descriptions
  - Large, sweet peppers particularly susceptible to sunscald
  - Encourage foliage cover. Pick before the scalded area opens.

### Eggplant

- Seedlings
  - Start seeds 8-12 weeks before planting; pot up as needed.
  - Plant when nights are warm (June 1), ?-? inches apart
  - Short tomato cages work well as supports.
- Harvesting
  - Harvest when fruit is still very glossy and has stopped enlarging. Baby eggplants are delicious, but over mature ones can be bitter and seedy.
  - Use pruners to clip off fruits, and watch out for thorns on the stem cap.
  - Some favorite varieties: Black Chu Chu (baby eggplants), Rosa Bianca, Neon
- Diseases: vascular wilts – see tomatoes for descriptions
- Pests: flea beetles
  - Look for tiny holes in leaves and tiny, shiny black/brown beetles that jump when disturbed
  - Cover small plants or set out transplants only when large enough to tolerate damage
  - Clean up debris at end of season; adults overwinter

### Green beans

- Bush and pole types
- Seedlings
  - Start in pots 3-4 weeks in advance (Mar - May) or direct seed (May - July)
  - Needs warm soil to germinate
  - Plant seeds deeply, 1-2 inches
  - Bush beans 3-4 inches apart
  - Pole beans 2-3 inches apart
- Harvesting
  - Pick when large and firm but before seeds inside become obvious
  - Pick frequently, every 2-4 days
- Some favorite varieties:
  - Blue Lake, pole & bush (green), Kwintus, pole (green, long), Beurre de Roquencourt, bush (yellow), Marvel of Venice, pole (flat yellow)
- Pests: stink bugs
  - Look for pinprick wounds on fruit, blotchy leaves, and/or shield-shaped green, brown or brightly colored insects
  - Hand pick insects

- Encourage natural enemies
- Pests: mites
  - Look for fine stippling on leaves, causing a bleached appearance
  - Keep leaves free of dust by spraying with water
  - Encourage natural enemies

### Cucumbers

- Cucumbers and squashes are all members of the cucurbit family. Pests and diseases are listed with the vegetable most commonly affected, but can affect any of them.
- Seedlings
  - Direct seed in May- June or start in pots 3-4 weeks in advance, Apr - May
  - Transplant or seed when weather is warm, May - June. They do not like cold weather!
  - Plant 4 inches apart on trellis or in hills of 4-5 seeds
  - 4-8 vines or 1-2 hills probably enough
- Support
  - Vining plants need room to ramble or climb. Even short (3') tomato cages can help
  - Trellising gives straighter, cleaner cukes with little insect damage, space efficient
  - Cukes need some help climbing; weave through trellis or tie up
- Harvesting
  - Pick at any size, but before they get fat and seedy, especially before they turn yellow
  - Old cukes on vine will slow/stop production. Check carefully – they hide!
- Pests: cucumber beetles
  - Look for colorful, spotted or striped, ¼" long beetles
  - Cover young plants if beetles have been a problem in past
  - Hand pick (tough to do)
  - Encourage natural enemies

### Summer squash

- Many types: zucchini, crookneck, pattypan
- Seedlings
  - Direct seed in May-June or start in pots 3-4 weeks in advance, Apr - May
  - Does best in warm weather, but you can try putting out transplants in April
  - Space 3-4 feet apart
- Flowers
  - First flowers are male
  - Female flowers have tiny, embryonic squash
  - Unpollinated squashes will turn yellow and drop off
  - Can hand pollinate if necessary
  - Flowers are edible and tasty
- Harvesting
  - Harvest when desired size, usually young and tender
  - They get big fast! Check every 2-3 days
  - Watch out for hidden ones
  - 2-4 plants are probably enough
- Diseases
  - Powdery mildew (late in season when nights grow cool)
    - Look for white powdery spore growth on both sides of leaves, flowers, stems

- Ensure good air circulation, spray with water early in day
  - Keep in check for some time with water sprays
- Mosaic virus, especially on summer squash – see tomatoes for description
- Physiological conditions: lack of pollination
  - Look for small fruits failing to enlarge, rotting at blossom end
  - Hand pollinate

#### Winter squash

- Types
  - *Cucurbita pepo*, *c. maxima*, *c. moschata*
  - Butternut, acorn, kabocha, pumpkins
- Seedlings
  - Direct seed or start in pots 2-3 weeks in advance, May-June
  - Needs warm soil
  - 3-5 seeds per pot or hill, then thin to strongest 3
  - Space bush varieties 3-6 feet apart
  - Vining varieties need room to ramble
- Harvesting
  - First flowers are male
  - Not as productive as summer squash, often only 1 or 2 per vine for the big ones
  - Harvest when rind is fully colored and hard, stem is brown, usually Sept - Nov
  - Store at 50-60 degrees
  - Some favorites: Potimarron, Red Kuri, Tahitian, Green Olive (Olive Vert)
- Pests: squash bugs
  - Look for dark adults, ¾", orange outline; light gray nymphs with black legs; shiny red-brown oval eggs laid in arrays on stem.
  - Hand pick insects. Crush eggs.
  - Trap under boards and vacuum up every day
  - Clean up debris at end of season (adults overwinter)
  - Encourage natural enemies (tachinid flies)
- Physiological conditions: leaf wilt
  - Look for leaves wilting dramatically in hot afternoon sun
  - Check next morning to see if leaves recover. If so, no action necessary. If not, water.

#### Basil

- Seedlings
  - Start in pots 8-10 weeks in advance
  - Transplant when weather is warm, May - June
  - Basil needs rich garden soil and regular water
  - Plant 8-12 inches apart
- Harvesting
  - Harvest sprays of leaves frequently to keep tender new growth coming and to prevent flowering
  - Or plant enough to allow some to flower. Bees love basil blossoms.
  - Italian or Genovese best for pesto

- Other varieties: lemon, lime, cinnamon, lettuce leaf, small leaves, etc. African Blue basil has great reputation as a beneficial attractor.
- Diseases: fusarium wilt (see tomatoes)
- Pests
  - Snails, slugs
    - Night patrol, especially first few weeks
    - Check hiding places: cool, damp, shaded. Set out boards, bricks, flowerpots.
    - Earwigs eat snail eggs, as do other insects
    - Use copper foil as a barrier
    - Use iron phosphate (Sluggo): do not overuse
  - Earwigs
    - Night patrol, especially early in season
    - Look for chewed, partly skeletonized leaves
    - If damage cannot be tolerated, trap in damp rolls of newspaper or cans of cooking oil baited with fish oil or soy sauce (see pest table)

## Corn

- Seedlings
  - Generally direct seeded May - July, but some people start in pots and transplant earlier, April - May
  - Space 8-12" apart in a block 4' x 4'
  - Tassels male, corn silks female
  - Wind pollinated. Can shake stalks when pollen appears to assist in pollination
- Harvesting
  - Harvest when ear is full and silks are brown.
  - Pay close attention! Overripe corn gets starchy, isn't sweet.
  - Usually 2 ears per stalk
- Pests:
  - Corn earworm
    - Look for worm frass at top of ear
    - Plant earlier varieties, which are less affected by this pest.
    - After harvest, cut off damaged portion (usually only first few inches).
    - Apply 20 drops mineral oil to silks just inside the ear, 3-7 days after silks first appear
  - Raccoons, squirrels
    - Look for missing ears of corn!
    - Never intentionally feed wildlife. To discourage raccoons, keep garbage tightly covered, and do not leave pet food out at night.
    - See [www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74116.html](http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74116.html) and [www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74122.html](http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74122.html) for complete information on dealing with raccoons and tree squirrels, respectively.

## Summary

### Common Pests and Diseases of Some Warm Season Vegetables in Home Gardens (Napa County)

Vegetable	Diseases	Pests	Physiological Conditions
Basil	Fusarium wilt	Snails, slugs Earwigs	
Beans		Stink bugs Spider mites	
Corn		Corn earworm Raccoons, squirrels	
Eggplant	Verticillium wilt	Flea beetles	
Pepper	Vascular wilts	Corn earworm	Sunscald Blossom end rot
Summer squash, cucumber	Powdery mildew Mosaic virus	Squash bugs Cucumber beetle	Lack of pollination Leaf wilt (squash)
Tomato	Early and late blights (fungal) Vascular wilts (verticillium and fusarium) Tobacco mosaic virus	Russet mite Hornworms Stinkbugs	Blossom end rot Cat-facing Sunscald
Winter squash	Powdery mildew	Squash bugs Cucumber beetle	Leaf wilt (squash)

### Resources and references

*Golden Gate Gardening*, Pam Peirce

[www.ipm.ucd.edu](http://www.ipm.ucd.edu) – UC Davis Integrated Pest Management website

*Pests of the Garden and Small Farm*, Flint, UC Press

*Natural Enemies Handbook*, Flint and Dreistadt

Master Gardener Hotline: 408-282-3105.

*Garden Insects of North America*, Whitney Cranshaw, Princeton University Press.

Mac's Field Guide: CA Garden Bugs. Available at [Mountaineerbooks.com](http://Mountaineerbooks.com) and local bookstores