Home Vegetable Gardening

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UCCE Stanislaus County
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UC CE University of California Agriculture and Natural Resources Cooperative Extension

Special thanks to Dr. Richard Molinar, Fresno, & the Sacramento Master Gardeners for use of some slides & photos

Zheng Wang

2007 MS 2009 2011 PhD 2015 Post-doc 2017

Bowling Green, KY

Lexington, KY

Wooster, OH

Zheng Wang

- UCCE Vegetable and Irrigation Farm Advisor since March 2018
- Optimizing regional and statewide vegetable production

In the next few hours…

I try not to make you feel dizzy!

Topics, discussions, questions, breaks = interaction

Picture, picture, picture…

Stop me anytime for any questions!

In the next few hours…

- Basics about vegetable crops: common and unique.
- Planning: using the knowledge you learn from the basics to plan your garden.
- Planting and caring for crops: a good foundation is the precursor of a productive harvest.
- Major vegetable production: tomato, lettuce, and melons.
- Troubleshooting: how to start effectively when solving questions for your customer.

Purpose

- To equip everyone with basic knowledge on vegetable crops and their gardening “tactics”.
- To train everyone briefly on how to effectively help your future customers when they have questions.
- To increase likelihood of success with your own vegetable production.
- To provide useful resources when you need help.

Basics about Vegetables

Commonality with other agricultural commodities?

They require optimal temperature, light, water, air, and fertility to proceed from one growth stage to the next until the final harvest and seed production.



Plant phototropism

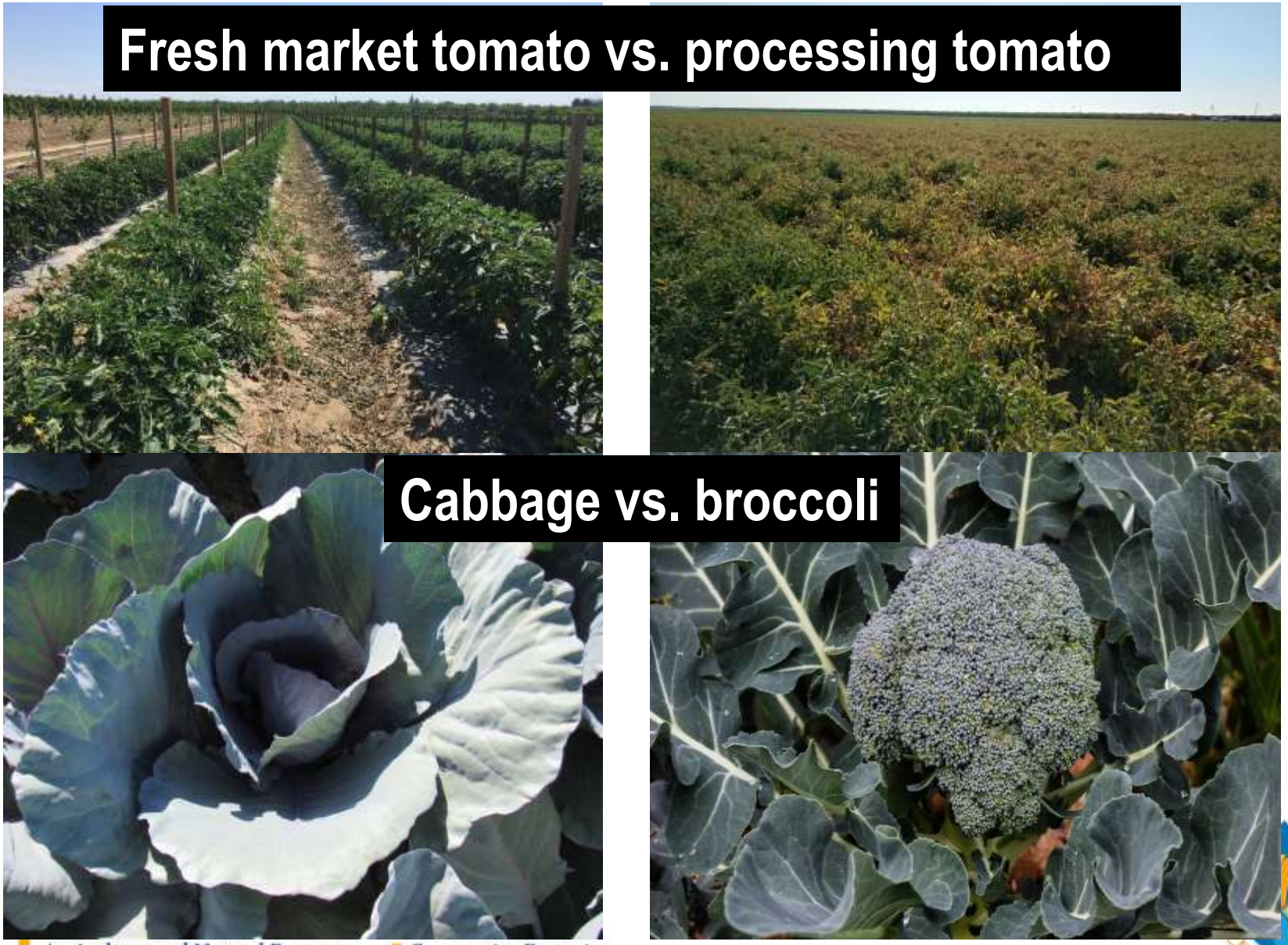
Seed germination under low light

Seed germination under normal light

Why vegetable crops are unique?

- Crop – crop among and within families are highly variable in terms of morphology, life cycle, growth habit, production practice, consuming portion, etc.

Within family difference…



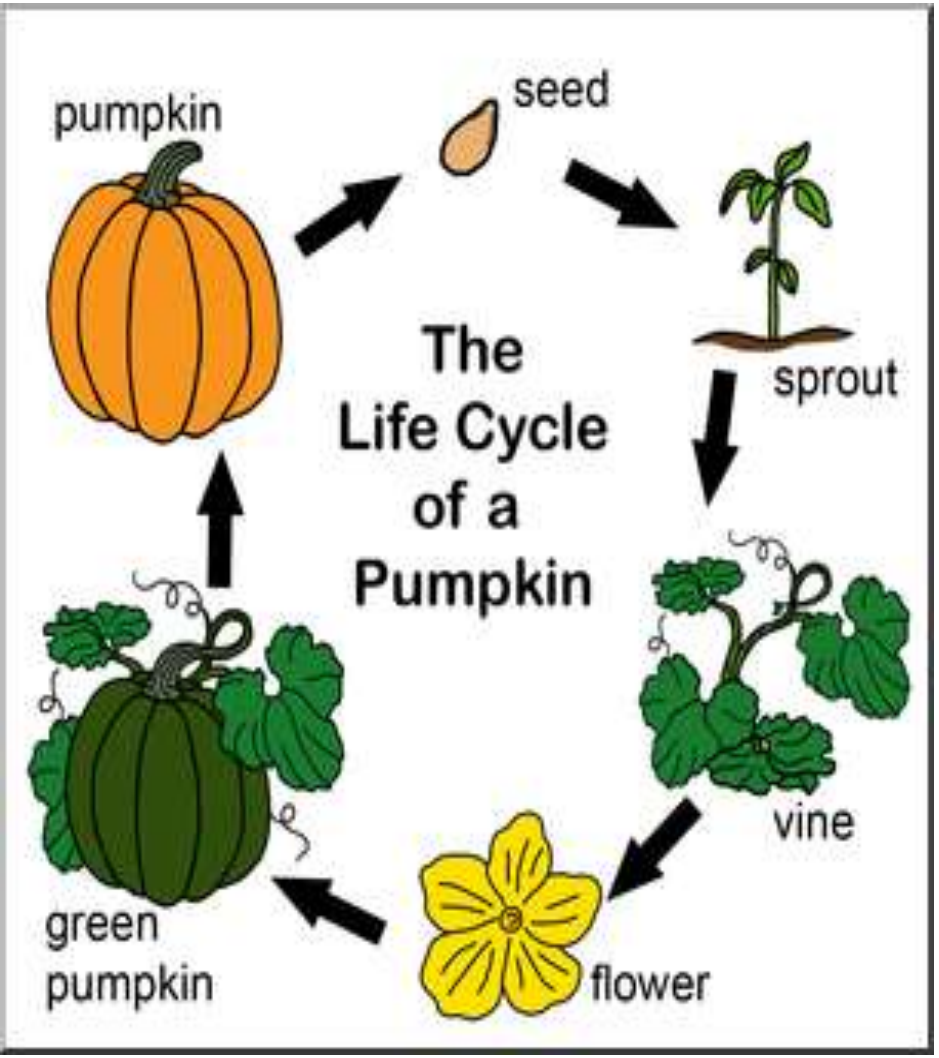
Vegetable Classification

Orthodox classification by family: 11 families

Family name	Example vegetables
Amaryllidaceae	garlic, onion, leek
Amaranthaceae	spinach, beets
Apiaceae	carrot, celery
Asparagaceae	asparagus
Asteraceae	lettuce, artichoke
Brassicaceae	broccoli, cauliflower
Convolvulaceae	sweet potato
Cucurbitaceae	cucumber, melon, squash
Fabaceae	snap beans, peas
Poaceae	sweet corn
Solanaceae	tomato, potato, pepper

Welbaum, G.E. (2015): Vegetable Production and Practices

Classification by life cycle: annual, biennial, perennial



Life cycle: completion of a whole, integral process from seed to seed.

Annual: pumpkin, tomato, lettuce, peas, cucumber (completes its life cycle in one year.

Biennial: carrots, parsley, brussels sprouts, cabbage, cauliflower, parsnip, celery, chard (completes its life cycle in two years.

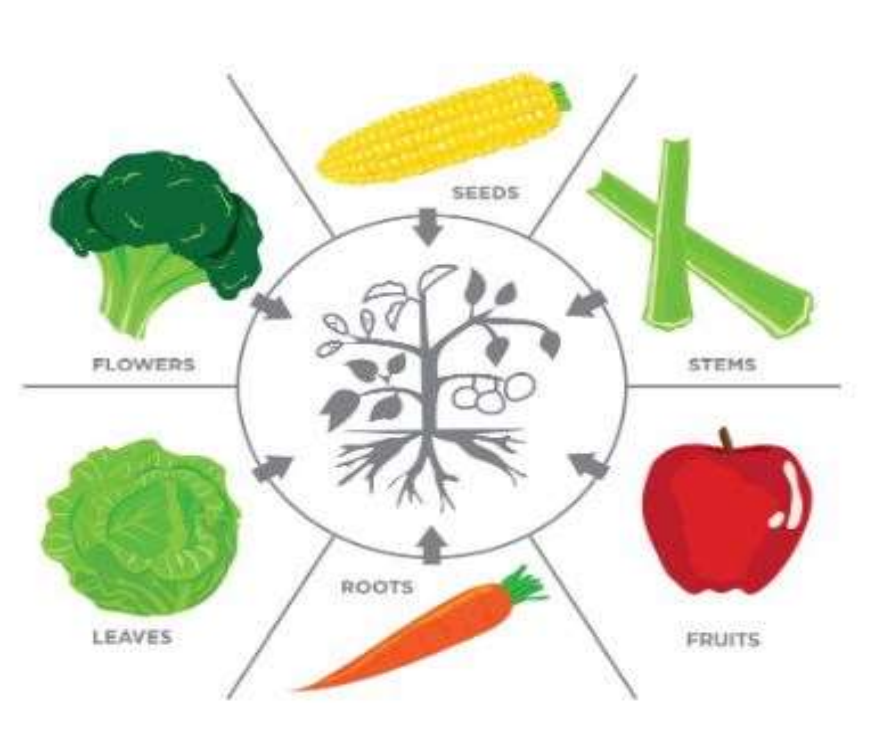
Perennial : artichokes and asparagus (lives from year-to year).

Warm Season Vegetables

- Grow best between 65°- 95°F
- Intolerant of prolonged low temperature
  - Tomatoes, eggplants, peppers
  - Cantaloupe, watermelon
  - Winter squash (butternut, spaghetti, acorn)
  - Summer squash (zucchini)
  - Sweet potatoes

Cool Season Vegetables

- Grow best between 55°-75°F.
- Can tolerate slight frost when mature.
- Can tolerate prolonged low temperature with cover protection.
- Some are subject to bolting. This is when cool weather crops such as lettuce, broccoli, onions start to sprout before you are ready to harvest.



Consumption parts (marketable portion)

- Roots: radishes, turnip, beets, carrots, parsnips
- Leaves: lettuce, kale, chard, spinach
- Tuber: potato and sweet potato
- Immature flowers: broccoli, cauliflower
- Fruit: tomatoes, eggplants, peppers, melons
- Seeds: sweet corn

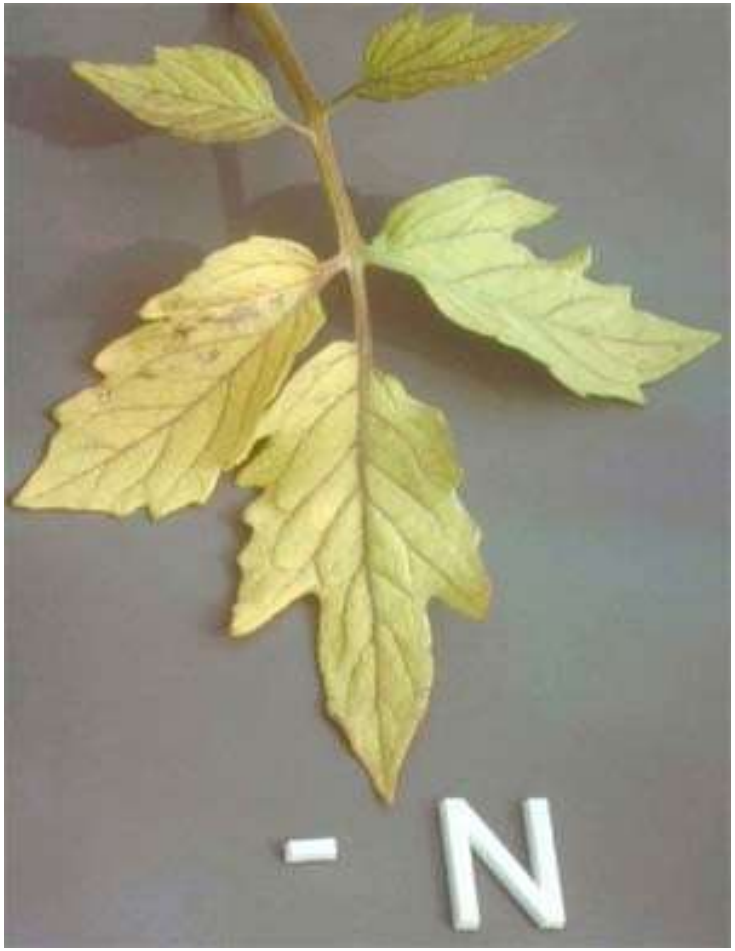
Other classifications:

By growth length: long-season and short-season vegetables such as butternut squash vs. lettuce (80 – 100+ days vs. 28 – 50 days).

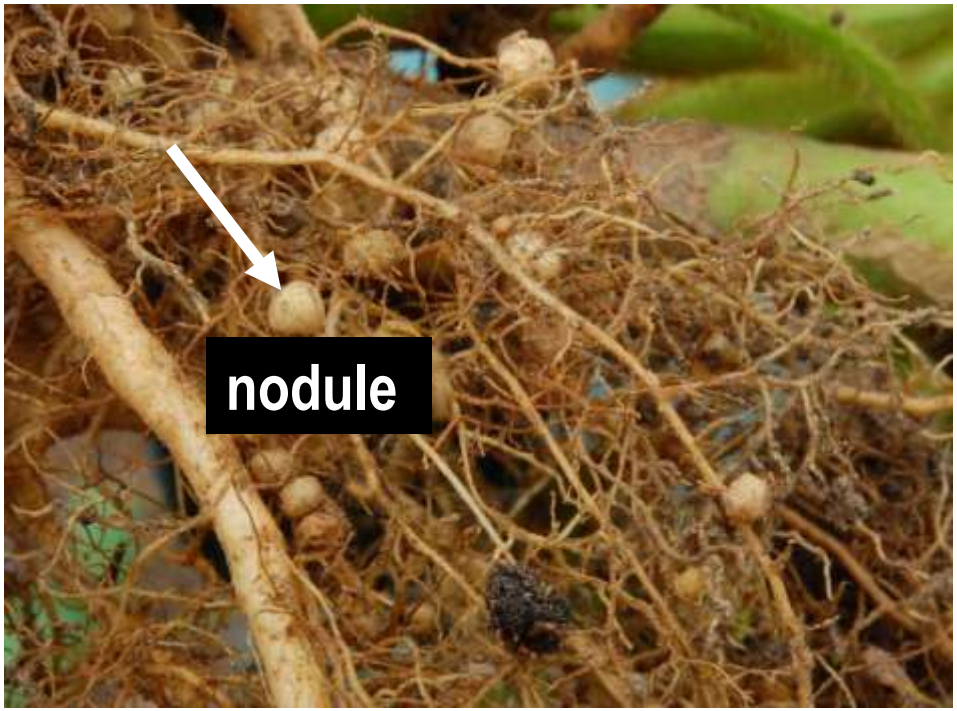
By plant morphology: upright growth vs. flat growth (sweet corn vs. melons).

By nutrient requirement: heavy consumer vs. nutrient fixer (tomato vs. beans).

Tomato requires 150 – 350 lbs. of nitrogen/acre.



Beans can fix 25 – 100 lbs. of nitrogen/acre per season into the soil.



Knowing vegetable classifications

- Can help you determine what species to grow.
- Can guide you to specific management.
- Can help you better prepare for next season.
- Can manage your time more effectively.
- Can provide corresponding disease and pest control tactics.

Why Home Vegetable Gardening?

- Nothing more satisfying than growing vegetables.
- Interesting, healthful, rewarding, and remunerating.
- Supply family diet and additional income.
- Fresh produce superior in quality.
- Kids/grandkids engagement

Planning Your Garden

The first step before cultivating a piece of new land?

Planning a Garden: Location

Not as simple as the word!

- **Exposure**
  - North
  - South

  → Maturity
- **Soil**
  - Well-drained, fertile, silty loam
  - Heavy, super sandy soil, sterile

  → Fertilization
- **Distance to irrigation**
  - Close by
  - Very far

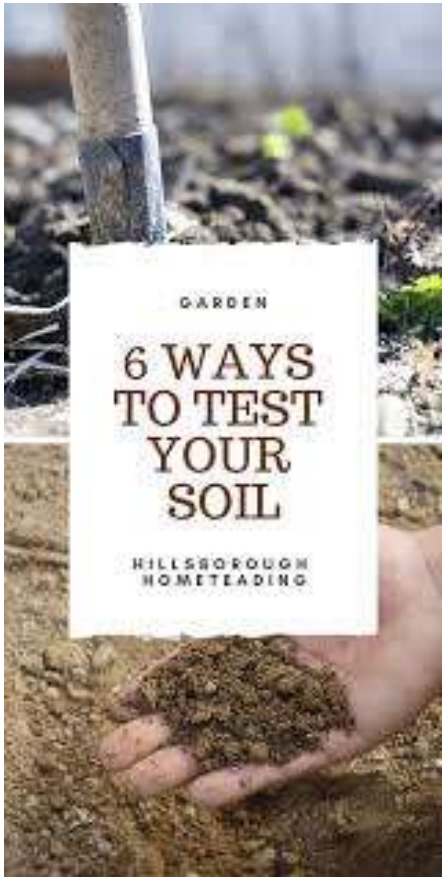
  → Irrigation installation and crop selection
- **Slope**
  - Flat field
  - Hilly land

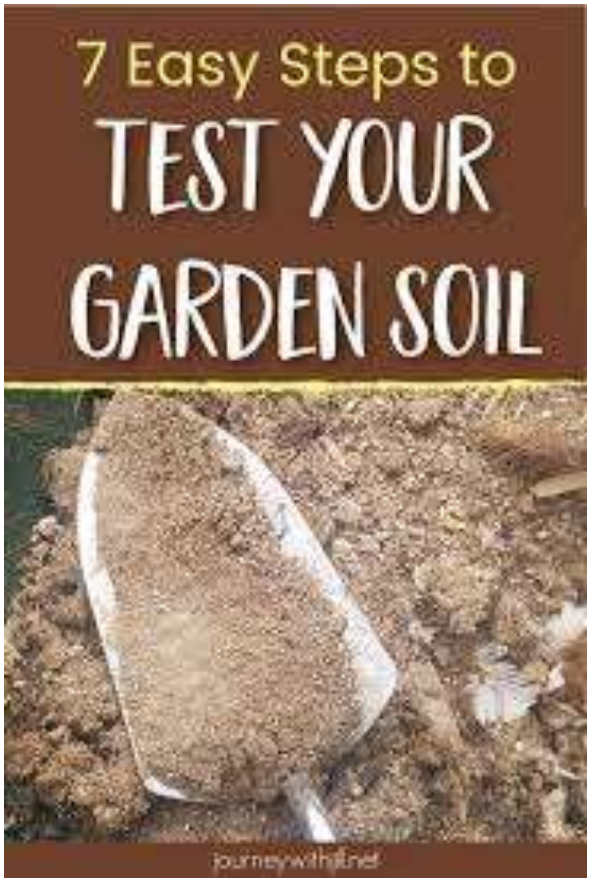
  → Water accumulation, disease, and frost injury

Planning a Garden: Know your Field

Initial state of your land matters how you start.
Keeping a good record helps!

Planning a Garden: Know your Soil





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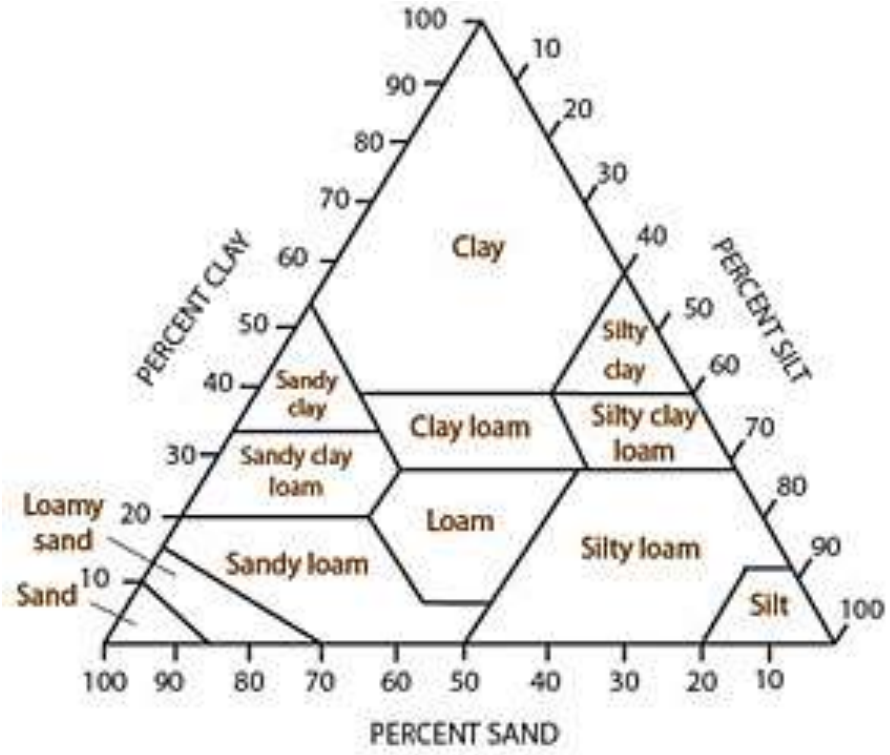
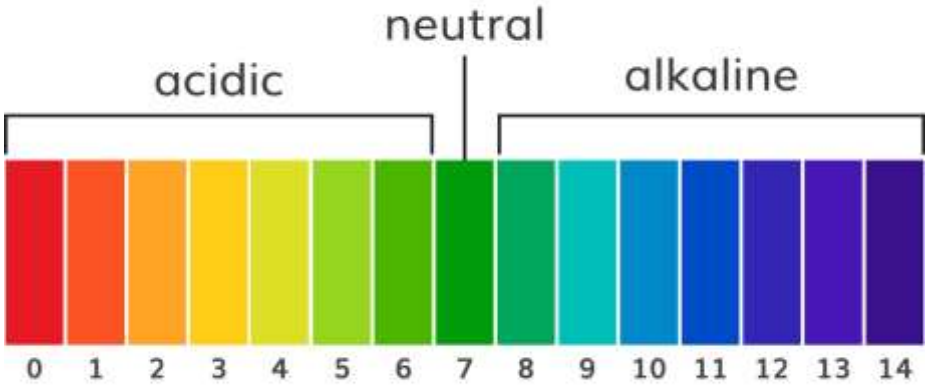
pH: optimal pH for most vegetable crops range from 6.0 – 7.0.

Soil texture: varies by crop (melon and sweet potato: sandy soil; others: silt/sandy loam).





Now, test your soil pH and feel soil texture.

Planning a Garden: Initial Space

- Capability
  - Time to take care of plants
  - Possible conflict to other activities (family travel)
- Helpers you have
  - Gardening is the source of happiness not suffering.
- Tools you have
  - Manual or mechanical
- Your initial budget
  - Return on investment

Field Preps – Soil Work

Soil Preps – Digging or Tilling

- **Why digging or tilling?**
  - Good air exchange
  - Soften soil for crop rooting
  - Requires a hand-pushed rototiller or a shovel
  - Tiller gives a deeper depth (sometimes > 6”)
  - Fuel cost, soil disturbance, possible compaction
  - Activate weed seeds
  - Dust

Soil Preps – Digging or Tilling

- **Reduced or zero-tillage**
  - Till small portion of the field and/or shallowly
  - Only till the area where plants are grown
  - Prepare seed beds while protect soil structure
  - Ground cover with mulch or other debris needed
  - Save or eliminate fuel cost
  - Prevent early weed problem
  - Cleaner fruit

Preparing the Soil Outdoors

- All soil textures benefit from addition of organic material.
  - Compost, sawdust, composted manure, leaves, lawn clippings
  - Composting pre-season and incorporate with soil
- Never till soil when wet. Why?
  - Hard to handle any tool.
  - Soil will be compacted.

Field Preps – Soil Fertilization

- Know how much nutrient you applied before planting
- Provide newly planted vegetables a quick startup
- Know how to read a fertilizer label

GUARANTEED ANALYSIS
16-16-16

Total Nitrogen (N)	16.00%
4.0% Ammoniacal Nitrogen	
2.0% Nitrate Nitrogen	
10.0% Water Soluble Organic Nitrogen	
Available Phosphate (P_2O_5)	16.00%
Soluble Potash (K_2O)	16.00%

Percent phosphorous in P_2O_5 = 43.7%
Percent potassium in K_2O = 83%

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Available Phosphate (P_2O_5)	16.00%
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Q: In a 100-lb bag of fertilizer, what are the weights of N, P, and K?

N: 100 lbs. x 16% N = 16 lbs.

P: 100 lbs. x 16% P_2O_5 x 43.7% = 7 lbs.

K: 100 lbs. x 16% K_2O x 83% = 13.3 lbs.

Fertilize potential plants not weeds

Banding/Side dressing vs. Broadcast

More concentrated and prevent triggering weed growth

Planting and Caring for Plants

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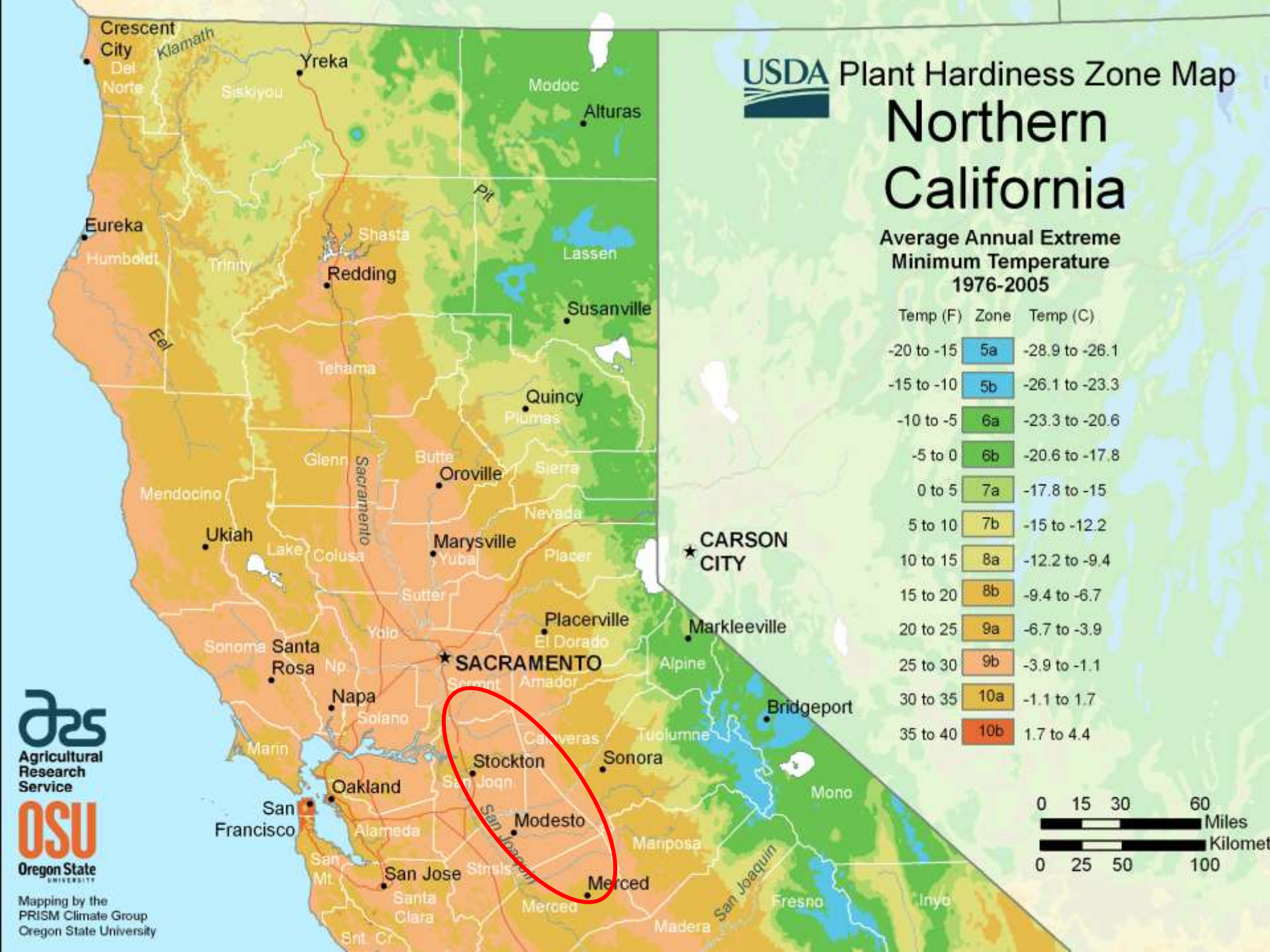
Timing is everything!

Where are you?

Direct seeding or transplant?

When to harvest?

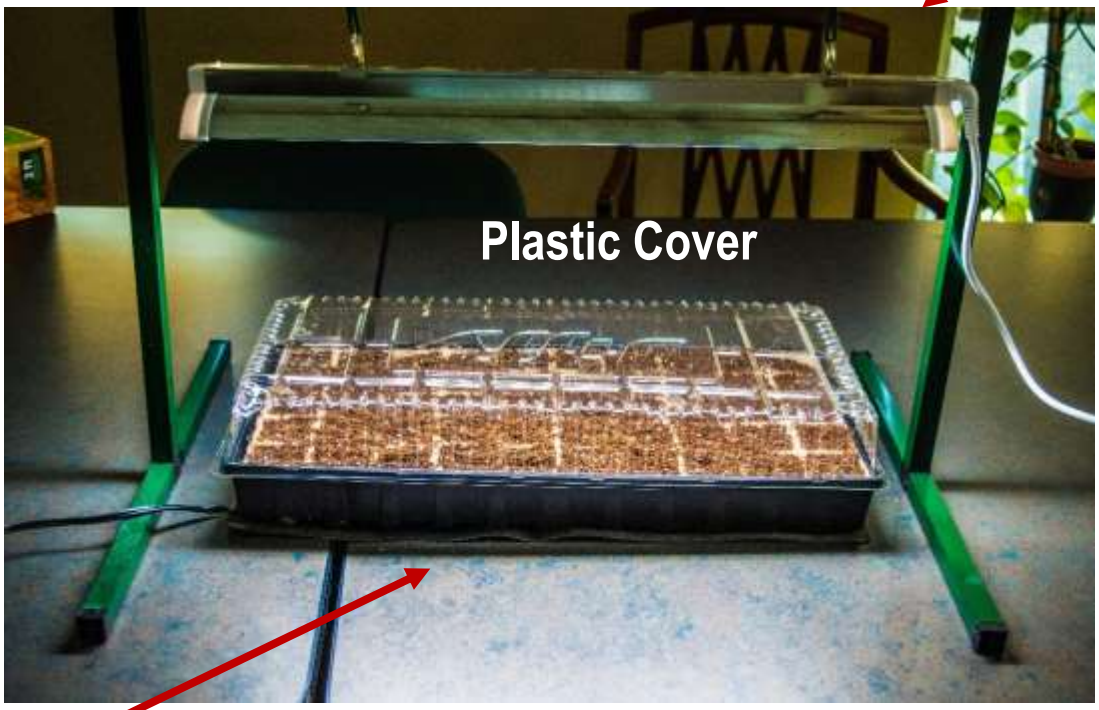
Sunlight requirement?


USDA Plant Hardiness Zone Map
Northern California
Average Annual Extreme Minimum Temperature 1976-2005
Temp (F) Zone Temp (C)
-20 to -15 5a -28.9 to -26.1
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
-5 to 0 6b -20.6 to -17.8
0 to 5 7a -17.8 to -15
5 to 10 7b -15 to -12.2
10 to 15 8a -12.2 to -9.4
15 to 20 8b -9.4 to -6.7
20 to 25 9a -6.7 to -3.9
25 to 30 9b -3.9 to -1.1
30 to 35 10a -1.1 to 1.7
35 to 40 10b 1.7 to 4.4
0 15 30 60 Miles
0 25 50 100 Kilometers
Crescent City
Klamath
Del Norte
Siskiyou
Yreka
Modoc
Alturas
Eureka
Humboldt
Trinity
Shasta
Redding
Pit
Lassen
Susanville
Eel
Tehama
Quincy
Plumas
Glenn
Butte
Sacramento
Oroville
Sierra
Mendocino
Nevada
Ukiah
Lake
Colusa
Marysville
Yuba
Placer
CARSON CITY
Sutter
Placerville
El Dorado
Markleeville
Yolo
Sonoma
Santa Rosa
Np
SACRAMENTO
Alpine
Sermt
Amador
Napa
Solano
Bridgeport
Marin
Calaveras
Tuolumne
Stockton
Sonora
San Joqn
Oakland
Mono
San Francisco
Alameda
Modesto
San Joaquin
Mariposa
San Mt
Strisls
San Jose
Merced
Santa Clara
Merced
Fresno
Inyo
San Joaquin
Madera
Snt. Cr
Agricultural Research Service
OSU Oregon State University
Mapping by the PRISM Climate Group Oregon State University

Starting Vegetable Plants Indoors

- Plant seeds indoors in winter/early spring to get a "jump" on the gardening season
  - Start seeds in soilless mix 6-8 weeks before transplanting outside
  - Use grow lights and/or a heating mat
  - Keep growing medium moist
  - Two weeks after seeds sprout, fertilize with ½ strength fertilizer
  - "Harden" seedlings off before planting

Artificial Grow Light



Plug the light into a timer to make sure the seedlings get enough light.

Raise or lower the grow light to keep it close to the seedlings as they develop.

Seedling Heat Pad

Early Transplanting Outdoors

- Protect plants with hot caps, row covers, low tunnels.
- Some people want the FIRST tomato of the season
- Open sides for air ventilation
- Still a 10% chance of frost after March 21*

*National Weather Service

Direct-Seeding

- Seeds can be planted directly outdoors
  - Follow seed packet instructions, don't bury too deeply!
  - Use a tweezer
  - Thinning seedlings to ensure a proper spacing
  - Thinning seedlings to reduce plant-plant competition

Read the seed package before thinning!

The tallest may not be the best!

Which one to keep, and which ones will be gone.

busygardening.com

No uprooting, will hurt the good seedling.

Keep the best! Leaves fully open, stem is strong, color is the best.

Transplanting

- Transplants
  - Correct way to plant
  - Make planting hole large enough so roots aren't crowded
  - Root ball-soil contact! Don't let it dry out.
  - Firm, don't pack around roots
  - Water well to shorten transplant shock

Keep the roots wrapped around the root ball.

Cover the root ball with soil and water well.

New roots protrude from root ball and attach to soil.

Preferred planting methods for common vegetable crops

Species	Transplanting	Direct seeding
Tomato	√	
Lettuce	√	√
Pepper	√	
Cabbage	√	
Broccoli	√	
Spinach		√
Carrot		√
Melon	√	√
Pumpkin	√	√

Vegetables in Containers

- Many vegetables can be grown in containers
- Moveable
- Vertical garden, saving space
- Water holding

Vegetables in Plant Boxes/Raised Beds

Away from ground – On the ground
100% soilless mix vs. "cocktail"
Well-drainage is necessary
Row cover needed for season extension

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All vegetables need irrigation in the Central Valley

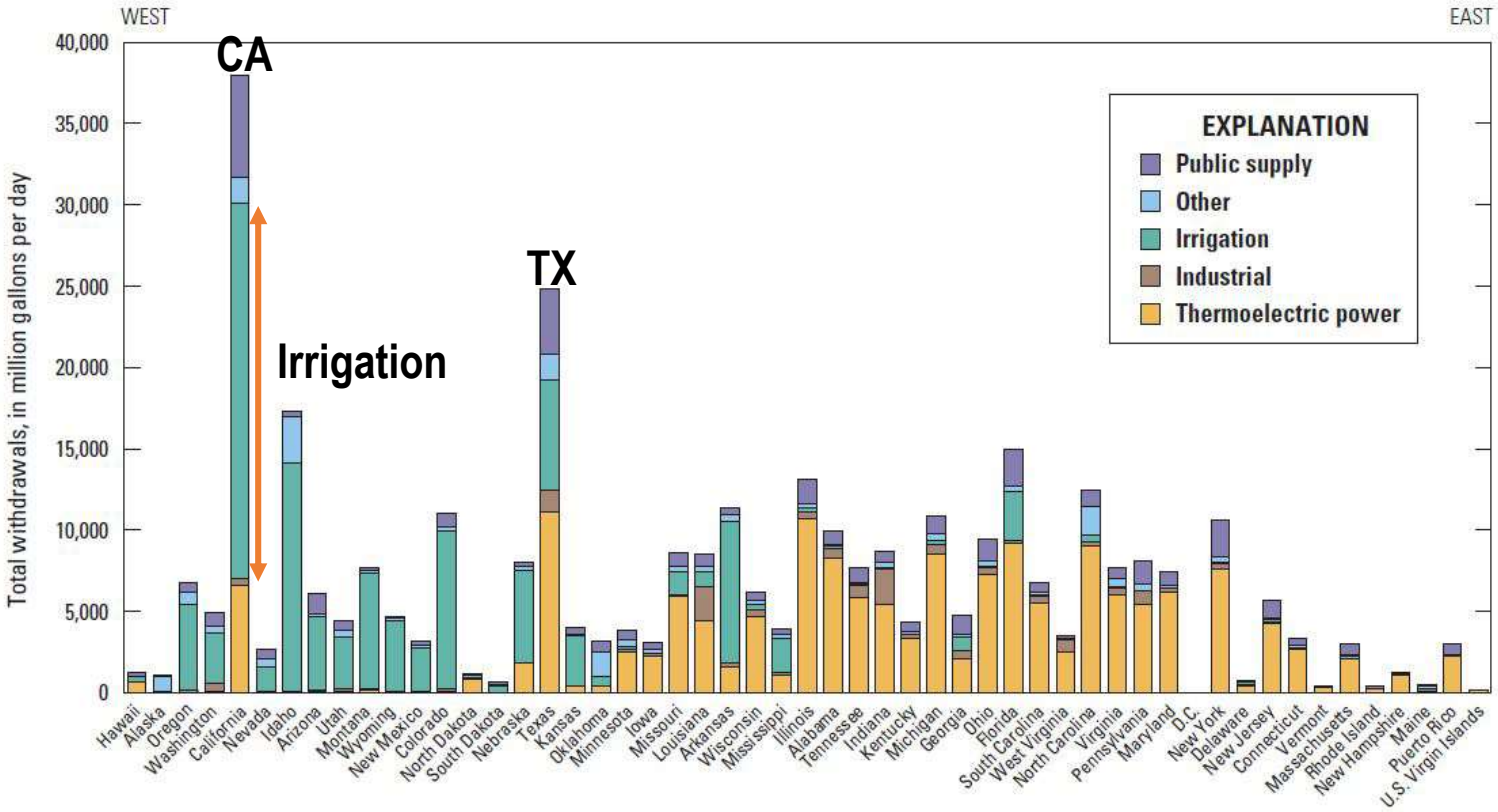
Average Rainfall by Month: Modesto, CA (1888-2017, source: MID)	
January	2.38"
February	2.05"
March	1.91"
April	0.97"
May	0.48"
June	0.10"
July	0.02"
August	0.03"
September	0.20"
October	0.63"
November	1.33"
December	2.10"

Typical Mediterranean climate lies most of rainfall during winter. Summer months are hot and dry.

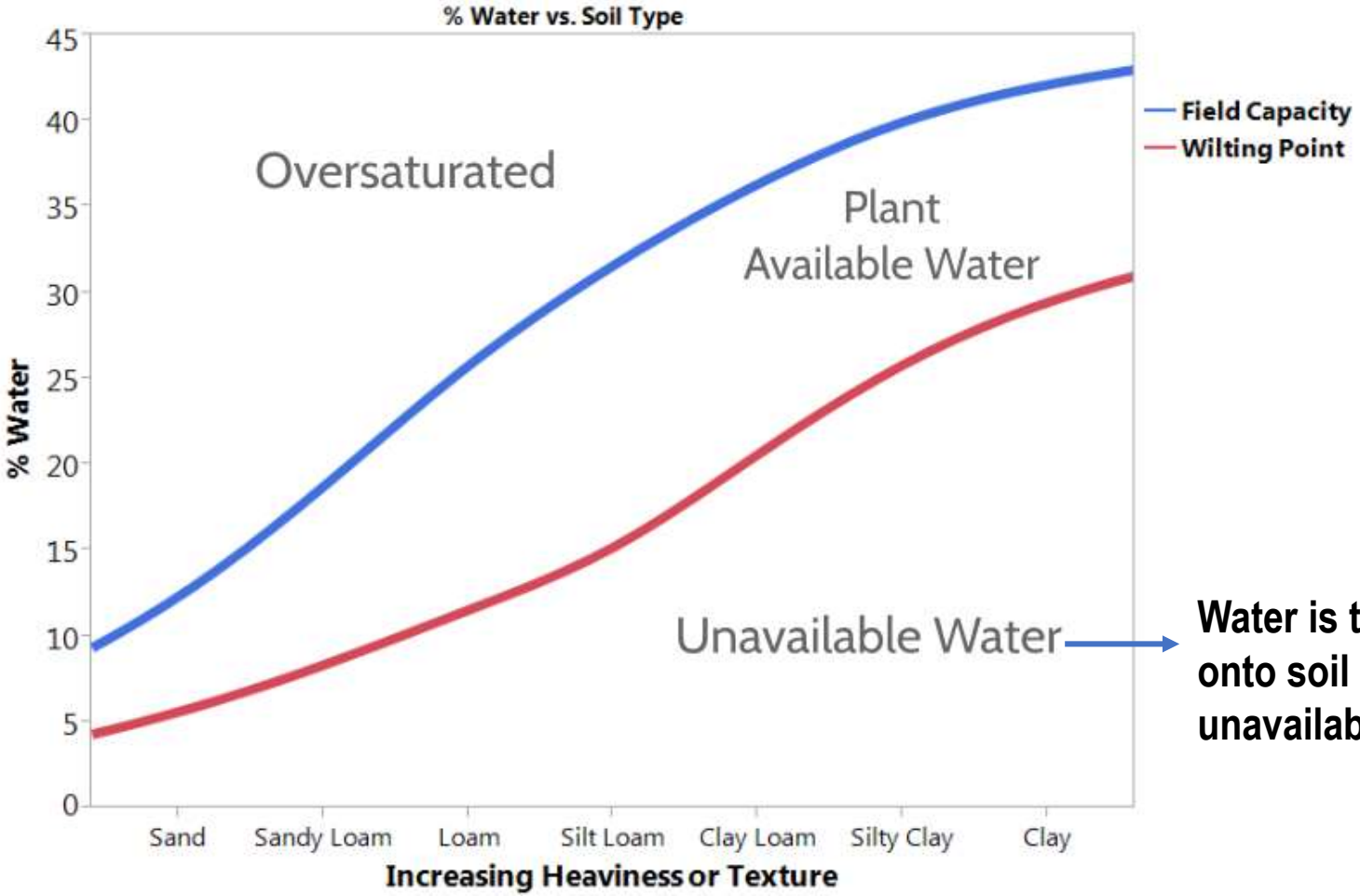
Monthly Average Reference Evapotranspiration by ETo Zone (inches/month)

Zone	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.93	1.40	2.48	3.30	4.03	4.50	4.65	4.03	3.30	2.48	1.20	0.62	32.9
2	1.24	1.68	3.10	3.90	4.65	5.10	4.96	4.65	3.90	2.79	1.80	1.24	39.0
3	1.86	2.24	3.72	4.80	5.27	5.70	5.58	5.27	4.20	3.41	2.40	1.86	46.3
4	1.86	2.24	3.41	4.50	5.27	5.70	5.89	5.58	4.50	3.41	2.40	1.86	46.6
5	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93	43.9
6	1.86	2.24	3.41	4.80	5.58	6.30	6.51	6.20	4.80	3.72	2.40	1.86	49.7
7	0.62	1.40	2.48	3.90	5.27	6.30	7.44	6.51	4.80	2.79	1.20	0.62	43.3
8	1.24	1.68	3.41	4.80	6.20	6.90	7.44	6.51	5.10	3.41	1.80	0.93	49.4
9	2.17	2.80	4.03	5.10	5.89	6.60	7.44	6.82	5.70	4.03	2.70	1.86	55.1
10	0.93	1.68	3.10	4.50	5.89	7.20	8.06	7.13	5.10	3.10	1.50	0.93	49.1
11	1.55	2.24	3.10	4.50	5.89	7.20	8.06	7.44	5.70	3.72	2.10	1.55	53.1
12	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40	3.72	1.80	0.93	53.4
13	1.24	1.96	3.10	4.80	6.51	7.80	8.99	7.75	5.70	3.72	1.80	0.93	54.3
14	1.55	2.24	3.72	5.10	6.82	7.80	8.68	7.75	5.70	4.03	2.10	1.55	57.0
15	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9
16	1.55	2.52	4.03	5.70	7.75	8.70	9.30	8.37	6.30	4.34	2.40	1.55	62.5
17	1.86	2.80	4.65	6.00	8.06	9.00	9.92	8.68	6.60	4.34	2.70	1.86	66.5
18	2.48	3.36	5.27	6.90	8.68	9.60	9.61	8.68	6.90	4.96	3.00	2.17	71.6

Source: State of California Department of Water Resources



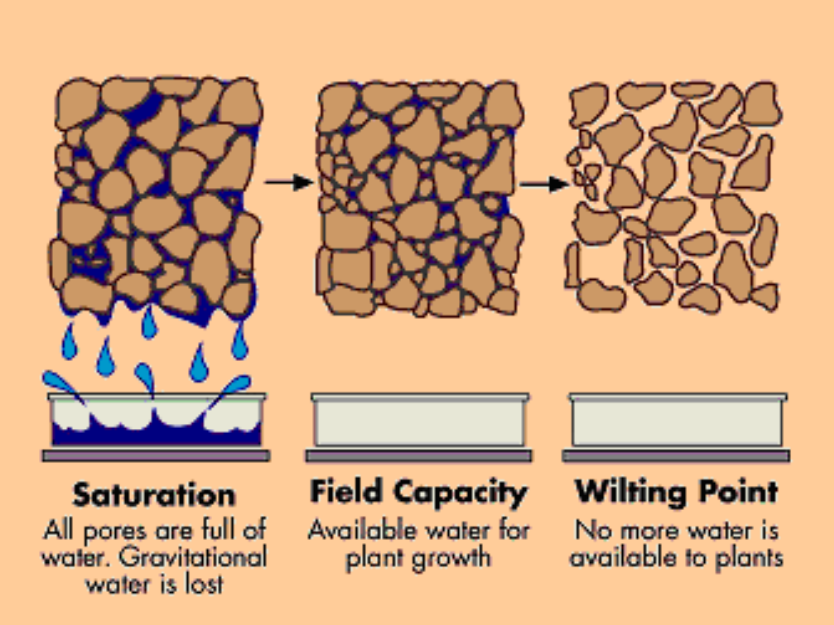
Total Daily Water Use by State in 2010 (Source: USGS)

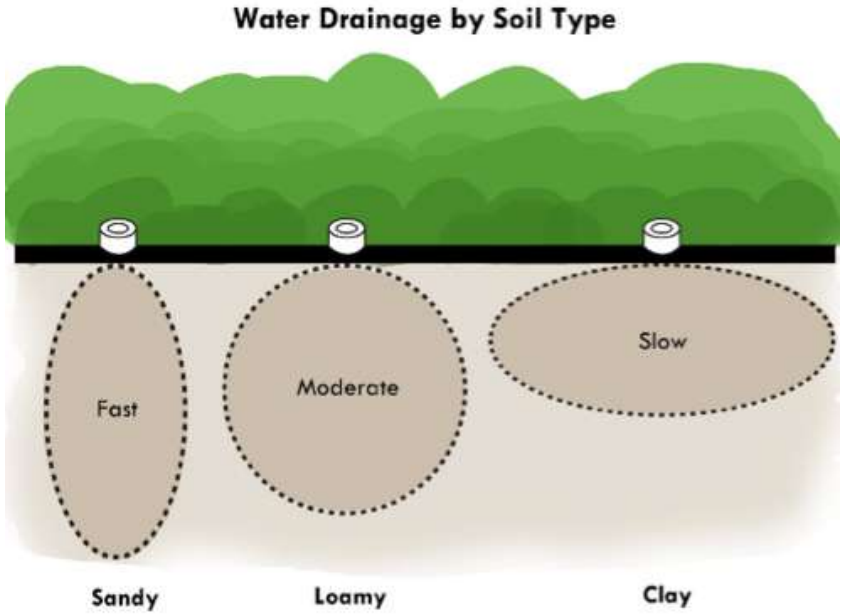


Water is tightly attached onto soil particle and unavailable for crop use.

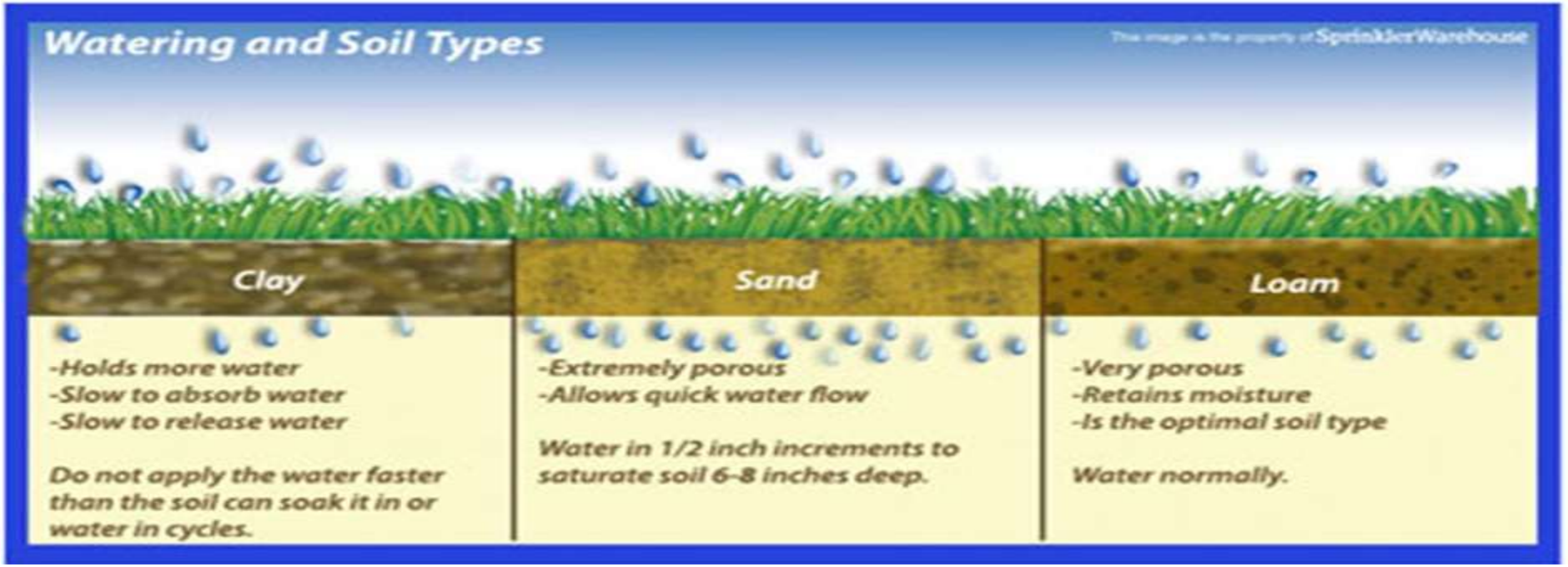
Source: Spruce Irrigation

Irrigation is to maintain the soil moisture level between the blue and red lines.


Saturation
All pores are full of water. Gravitational water is lost
Field Capacity
Available water for plant growth
Wilting Point
No more water is available to plants


Water Drainage by Soil Type
Fast
Moderate
Slow
Sandy
Loamy
Clay

- Watering depends on soil type
- Watering depends on time of year
  - 1-3 irrigations/week in summer
  - 1-2 or less/week during other seasons
- Watering depends on crop growth stage
  - Seedling stage, transition stage
  - Over-irrigating: fruit cracks, flavor diluted



Irrigation Methods

- Drip irrigation
  - Delivers water where slowly when needed, saves water
- Furrow irrigation
  - Flooded and root absorption
  - Applies more water than needed
- Sprinkler irrigation (Overhead)
  - May hit foliage and increase foliar diseases
  - Splash muds (soil disease)
  - For transplant establishment
  - Trigger weed emergence

Weeding

- Weed control starts pre-season, and prevention is more important and effective than eradication.
- Weeds compete for space, water, and nutrients.
- Weeds serve as host crops for pests.

Weeding - Solarization

Weeding - Mulching

Residues from last crop

Polyethylene plastic cover

Added mulch (straw, decayed leaves, paper, etc.)

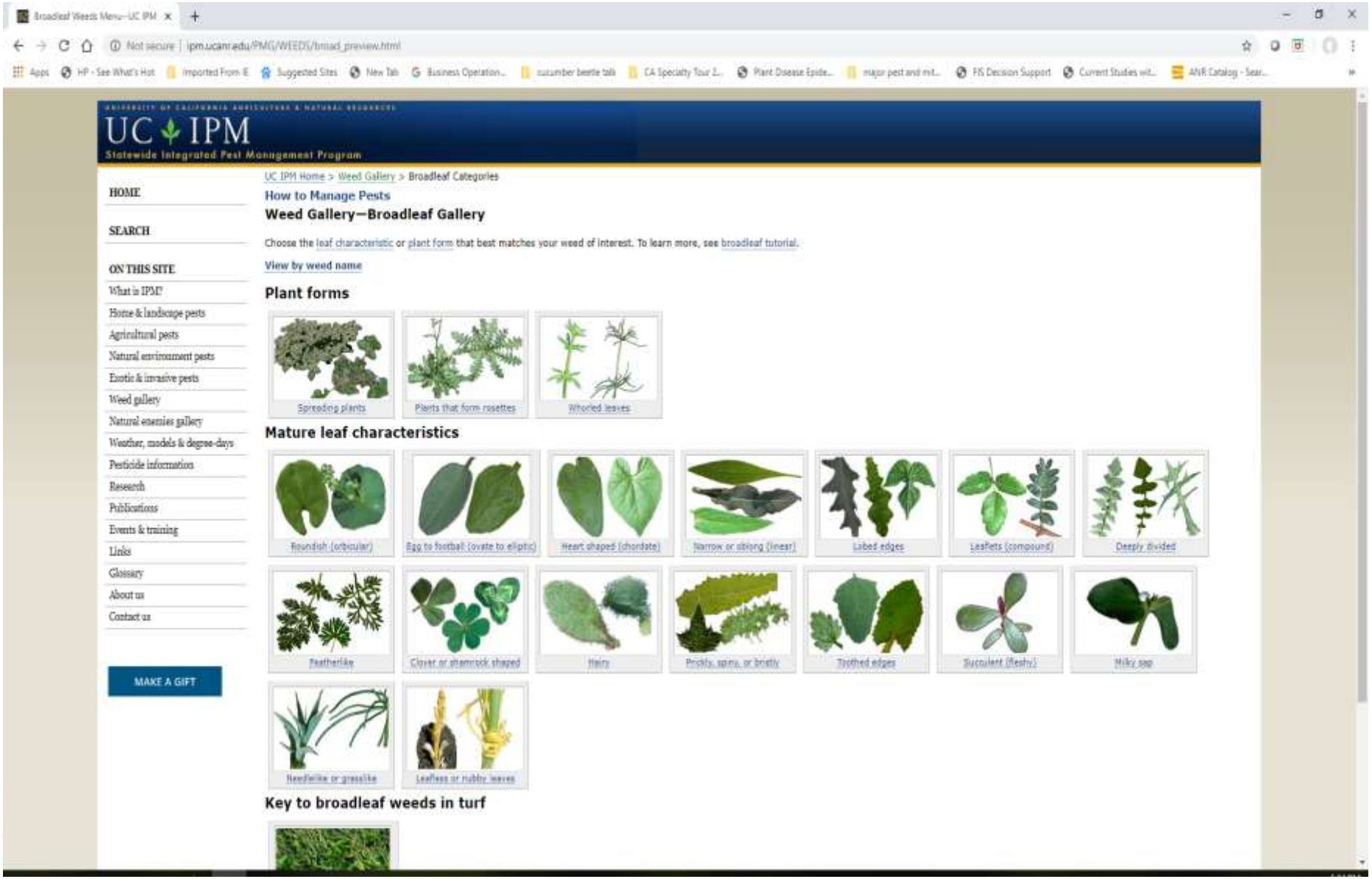
Mulch (2-4" thick), weed fabric
Effects can last a few weeks to months.

Both plastic and ground covers

Weeding - Cultivation

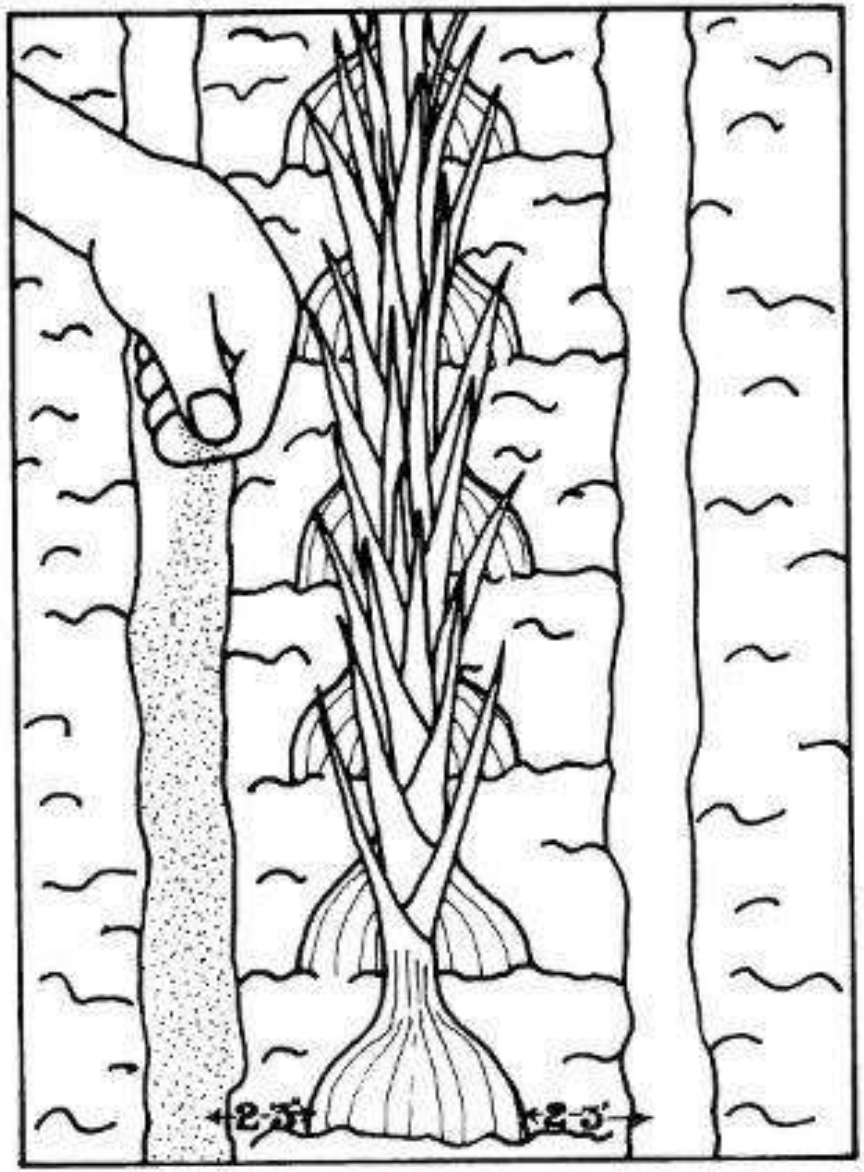
- As early as possible
- Roots entangle - hurt vegetable crop root when weeding
- Cultivator used in the furrow and around plants while hand tools close to plants

UC IPM Weed Photo Gallery



In-season Fertilization

1. Highly varied by crops
2. Multiple times and comply with growth stage
3. Banding near root zone (side dressing) or through drip irrigation
4. Fast release, soluble, and nitrogen-containing
5. Apply while irrigating to prevent high salinity and better absorption



Side dressing

Granular and soluble

Make a small ditch along the row

Distance between plant and ditch varies by crops.

Cover and water

Harvest

- Harvest carefully to extend fruit production. Avoid pulling or twisting; use pruners.
- Some vegetables can be picked “immature”
  - Squash, salad greens, cucumbers, beans, peas, okra, sweet corn, eggplant, peppers, tomatoes
- Some vegetables are best picked when mature
  - Cantaloupe, watermelon, pumpkin, winter squash

Yes, and best flavor

Yes, but will become starchy

Yes, both are good

Extension

Immature fruit will become mature after picking?

NO!

NO!

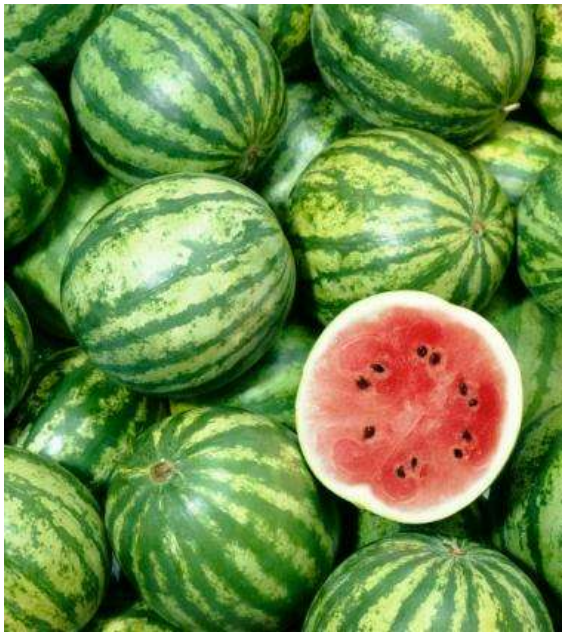
NO!

For melons and watermelon, harvesting at the right time is very important.


Webs attach to
stem end

Storage

- Review the 4 storage groups on Handbook pages 351-353 for best storage tips
- Be aware that the refrigerator is not always the best place to store vegetables such as tomatoes, peppers, eggplants, potatoes, and sweet potatoes.



Representative Vegetables

Tomato

Classifications

Cherries – Plants range from dwarf size to 7-footers. Generally abundant producers.

Container varieties – Midget, patio, or dwarf varieties have very compact vines.

Paste/Processing tomato – Best for cooking and canning.

Standard/Fresh market – All of the rest, including beefsteak and slicers.

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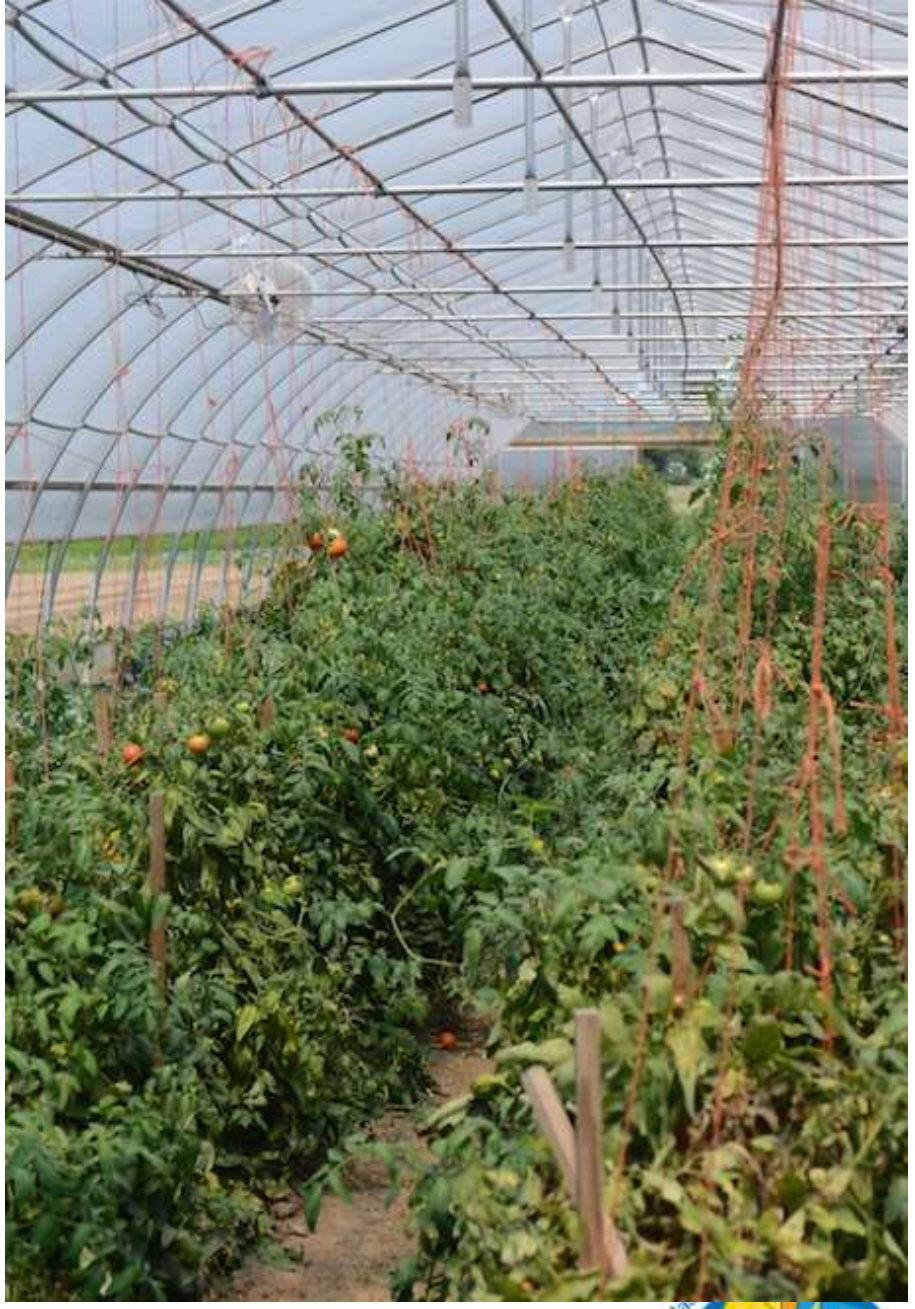

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By seed type: Hybrid vs. Heirloom

Plant breeders intentionally cross-pollinate two different varieties of a plant, aiming to produce an offspring, or hybrid, that contains the best traits of each of the parents.

Hybrids offer some combination of favorable traits: uniformity, less required care, early maturity, higher yield, improved flavor, specific plant size, and/or better disease resistance. Hybrid vegetables typically look like the veggies you'd find at a supermarket.

The process of developing a hybrid typically requires many years. Hybrid seeds are more expensive.

Most heirlooms come from seed that has been handed down for generations (over 40+ years) in a particular region or area, hand-selected by gardeners for a special trait.

Heirloom varieties are open-pollinated, meaning they are pollinated by insects or wind without human intervention.

Heirlooms may produce a "mixed bag" harvest. The harvest may be less predictable, and fruit size can vary greatly even on the same plant.

Save seeds for the next year.

You can plant both for a flavorful harvest!

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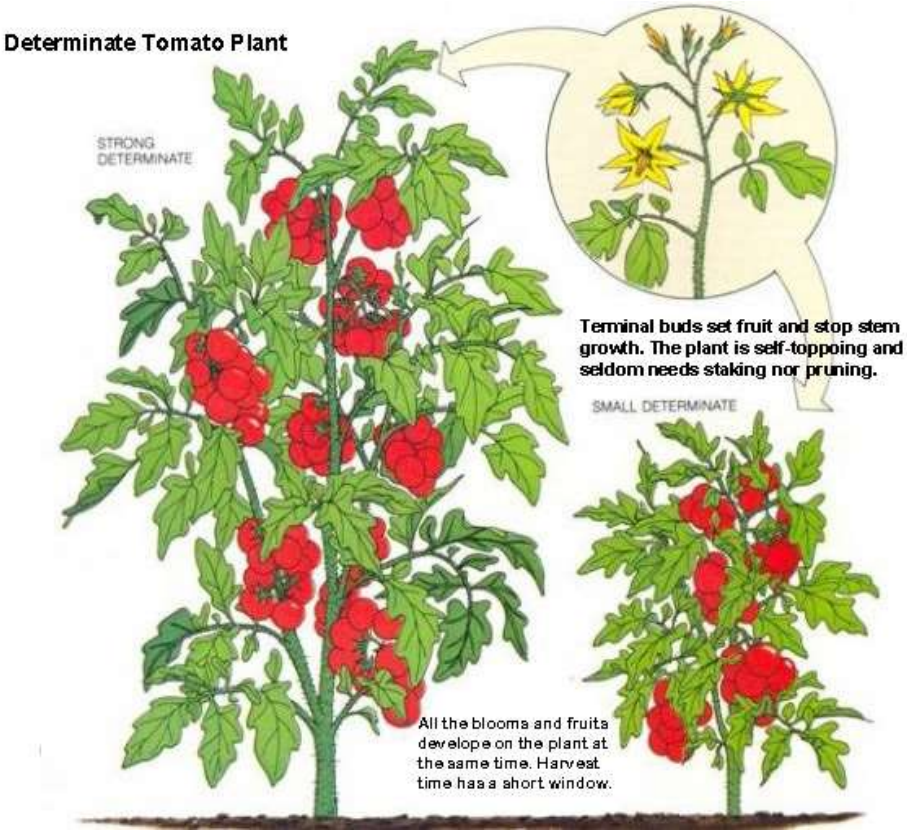
Growth Habit

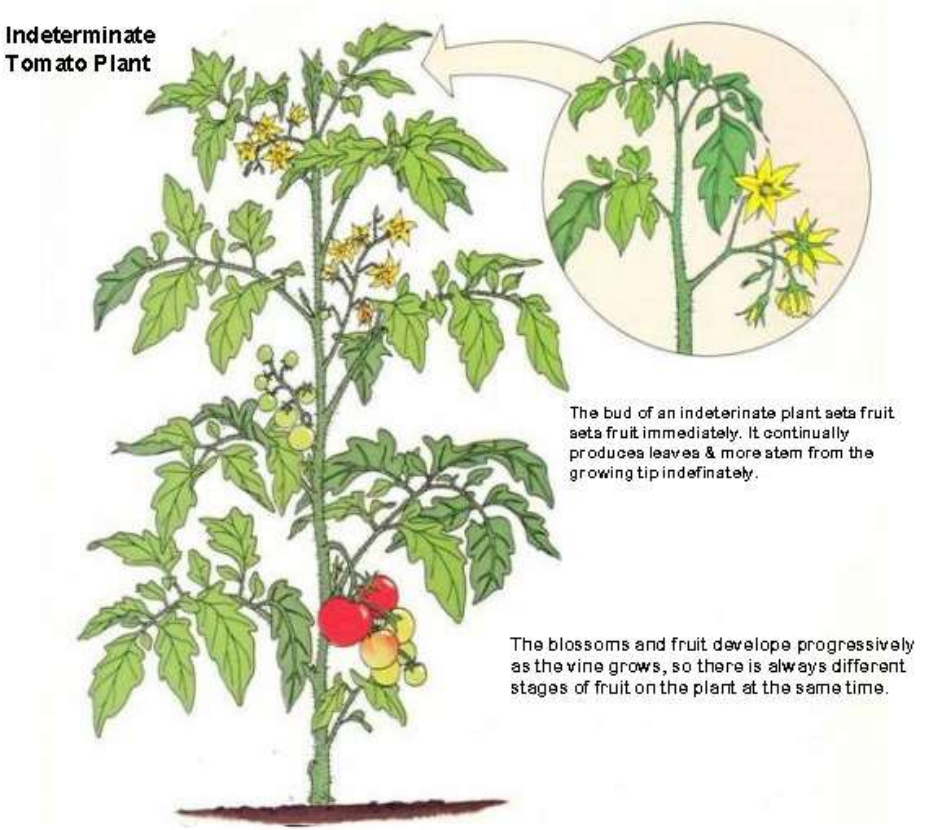
Indeterminate

- Grows and sets fruit until killed by frost or disease.
- Support structure is needed (sometimes over 6’ tall).
- Produces more fruit over a longer period of time.

Determinate

- Grows like a bush to a certain height (3-4’), then sets fruit, and gradually declines.
- The fruit usually ripens in a short, concentrated harvest.
- Good for container planting.





Shelley Stone-Schmidt from UC ANR

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Culture

- Start seeds 6-8 weeks prior to transplant.
- Purchased plants – no flowers or fruit.
- Cover the root ball.
- Prune anything that touches the ground.
- Staking and wiring as needed.
- Fertilize mid-season (multiple times).

Common Problems: abiotic and biotic

Leaf twist or curling

- **Environmental disorder (Abiotic)**
  - High wind
  - Low humidity
  - Hot and Drought
- **Herbicide misuse (Abiotic)**
  - Herbicide drift
  - Herbicide residue
- **Pest (Biotic)**
  - e.g., Broad mites
- **Virus (Biotic)**
  - Beet curly top virus
  - Various mosaic virus

Tomato herbicide drift

Unhealthily curling vs. normal curling

Common Problems: abiotic and biotic

Fruit disorder

- **Nutrient deficiency/disorder (Abiotic)**
  - Low calcium
  - Low potassium
- **Weather/irrigation factors (Abiotic)**
  - Fruit cracking
- **Worm/insect damage (Biotic)**
  - e.g., Stink bug
- **Bacterial, fungal, and virus diseases (Biotic)**
  - Bacterial canker
  - Fruit black mold rot
  - Tomato spotted wilt virus

Tomato yellow shoulder

K^+ disorder and adverse weather

Blossom end rot

Lack of Ca^{2+} and adverse environment

Fruit splitting and cracking with heavy rainfall/over-irrigation after dry weather

Stink bugs make cosmetic damage on tomato fruit.

Bacterial canker – look at the “bird eyes”

Tomato spotted wilt virus – look at the necrotic rings

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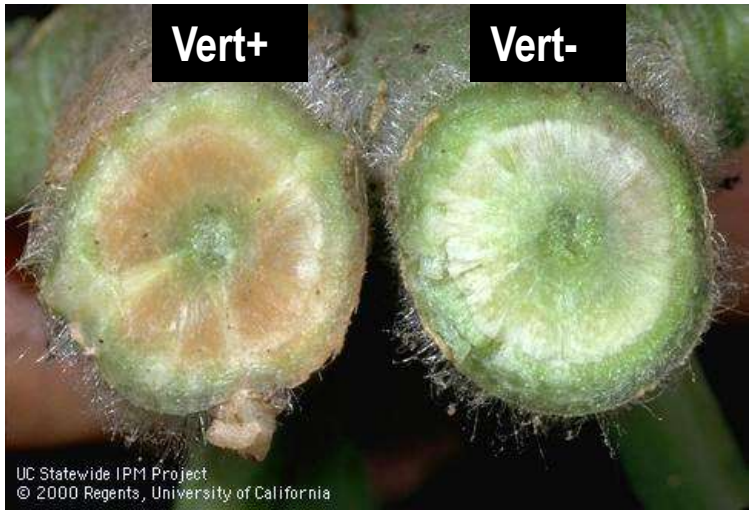
Common Problems: abiotic and biotic

Root and stem fungal diseases

Verticillium Wilt



"V" shape lesion on leaves, cooler season disease, outside stem looks good but brown vascular discoloration inside.

Fusarium Wilt

Bilateral leaf chlorosis

Inside stem with brown vascular discoloration

There are still many more diseases and pests threatening tomato growth.

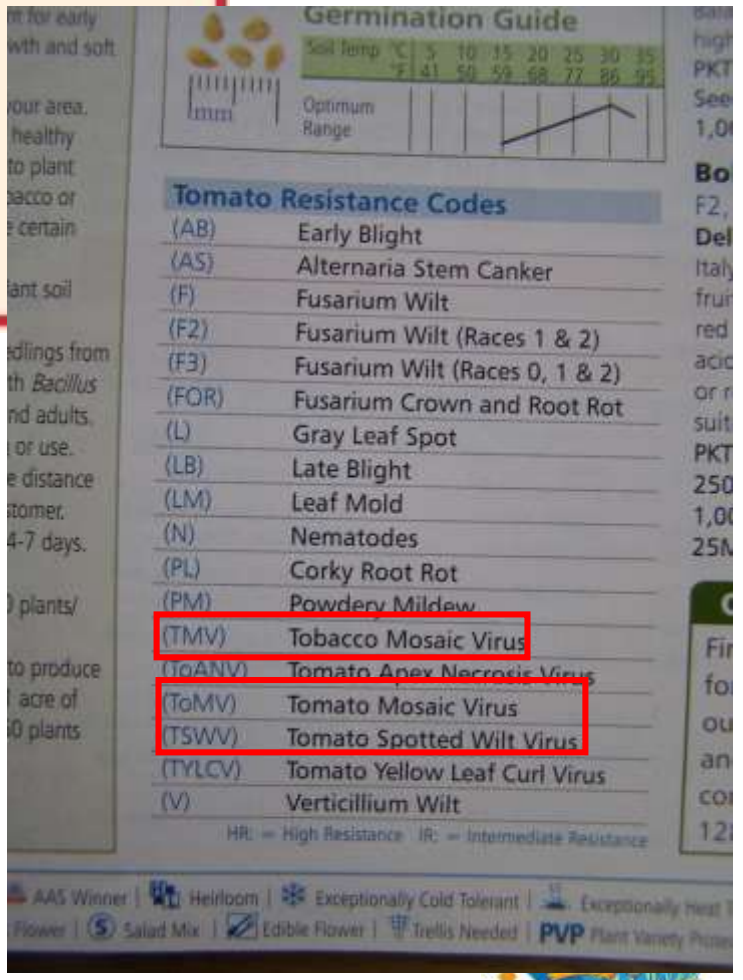
- Always get tomato seeds and transplants from a reputable nursery or garden center, or a good gardener friend.
- Look at the seed label for desired disease resistance/tolerance.
- Avoid growing tomato year after year on the same field unless you have very limited space or ways to sanitize your grounds. Use a different type or variety. For gardeners, using different crops from different families are strongly recommended.

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

Disease abbreviations can be varied, read the full names!

TMV vs. ToMV vs. TSWV



Lettuce

Lettuce Types

Bibb: clean light color leaves, butterhead.

Crisphead: iceberg lettuce.

Romaine: : tall head, sturdy leaves

Lettuce

- Cool season crop
- Loose leaf
  - Easiest to grow
- Head lettuces
  - Needs long cool season, may “bolt”
- Sensitive to warm temperatures, may become bitter

Culture

- Direct-seeding for leaf harvest.
- Grow transplants for head harvest.
- Plant under cover to start early in the winter.
- Thinning is needed.
- Stagger seeding for continuous harvest.

Grow lettuce in summer?

- Field with morning sun and afternoon shade
- Covering with a shade cloth (microclimate)
- Choose heat tolerant/bolting resistant varieties
  - Varieties available for each type

Vegetable bolting

Bolting is a physiological term applied to vegetable crops when <u>they prematurely develop to seed stage</u>, usually making them inedible. It can affect a wide range of vegetables including lettuce, spinach, basil, and broccoli.

Hot weather, insufficient water, and fluctuation in day length trigger bolting.

Bolting is induced by plant hormones like gibberellins.

Avoid bolting

Grow bolting resistant varieties.

Time of sowing: follow seed package instruction, stager seeding.

Cool down leafy vegetables: shade and irrigation help cool down leaf temperature.

Watch the weather/be flexible: hot days will shorten growth length, so harvesting accordingly to avoid bolting.

Avoid plants from stress: water and fertilize timely.

Common Problems: Damping off

Common Problems: Damping off

Caused by a fungus or mold under cool, wet conditions.

***Rhizoctonia* spp., *Fusarium* spp., and *Pythium spp*. are the most common pathogens.**

Common at young seedlings.

Stem or root has mold, brown patches.

Plants can be killed and affect other plants quickly.

Don't over irrigate and keep soil well drained and air circulated.

Common Problems: Powder mildew

Common Problems: Powder mildew

White patches found on both upper and lower sides of leaves.

Symptoms favored by warm and dry conditions.

Commonly present on mature leaves.

Transmitted by wind currents.

Common Problems: Downy mildew

Common Problems: Downy mildew

Light green, yellow angular spots on upper leaf surface.

Leaves will then turn brown and dry up.

Young seedlings and severely infected plants can die.

Symptoms favored by moist, damp, cool conditions.

Spores are transmitted by wind currents.

Use resistant varieties.

Melon and Watermelon

Fruit or Vegetable

- The eating part is fruit, but cultural practices are within vegetable domain.
- Most varieties are long-season, requiring at least 70 days for mature.
- Melons are warm season vegetables requiring full sun.
- They can be directly seeded or use transplants. But there are exceptions.
- Fruit must be picked when mature.
- Sandy soil is the most suitable for melon growth.

- Sandy loam, well-drained soil with pH 6-7.
- Using ground cover (mulch or plastic) will protect fruit from being rotten.

Should you plant melon or watermelon?

- Space: they are vine vegetables, taking large space. The usual space per plant is 3-4 feet apart. If you grow more than one row, the row spacing could be as big as 6 feet.
- They require multiple harvest. For cantaloupes, they can be harvested over ten times.
- Large vines require enough water to sustain, so keeping plants away from thirsty is vital.
- Melons are sensitive to cold temperature, so planting too early has the danger of cold stress.

CANTALOUPE HALE'S BEST

aka MUSKMELON | NON-GMO HEIRLOOM

Cucumis melo

HISTORY: Non-GMO American Heirloom, first introduced in California in the early 1900's.
INFO: Drought/heat tolerant & powdery mildew resistant. Melons average 3-4 lbs each.
TRAITS: Round-oval shaped, slightly ribbed & heavily netted with salmon-orange flesh.
GROWTH: Vine heights up to 14" tall x 5' spread. Heavy yielder, up to 20+ lbs per vine.
USES: Tender, sweet flesh is delicious in ice cream, juices, salads, smoothies and more.
NUTRITION: Tasty source of Calcium, Fiber, Folate, Potassium, Vitamins B6, C & K.
SPRING: Start indoors 4 weeks before or directly outdoors 4 weeks after last frost.

FROM SEED TO TABLE IN 75 DAYS	900 MG	$1.99
APPROX. 25 SEEDS	EST. YIELD: 150+ LBS	

Plant seeds or transplants?

- For melons, planting seeds into the soil saves money.
- For seeded watermelon, planting seeds is common.
- For seedless watermelon, transplanting is the standard practice.
- Seeded watermelon (like ‘Sugar Baby’) is the choice for most gardeners.

Seeded and seedless watermelon

Seeded and seedless watermelon

- The biggest difference is pollination.
- Seeded watermelon are self-pollinated, and the pollen is fertile.
- Seedless watermelon pollen is mostly sterile. Pollens from another seeded plant or a specialty plant (called pollenizer) are needed to be transferred by bees.

Seedless fruit and pollenizer

Common Problems:
Pests – Cucumber beetle

Cucumber Beetles

Cucumber beetles in general:

Stripped cucumber beetle
Spotted cucumber beetle
Banded cucumber beetle

Cucumber Beetles: Damage

Cucumber beetles have a wide range of host plants.

Feeding damage is more severe on Cucurbits than other families.

Adult feeding is more serious than larvae.

Melons are the most susceptible to cucumber beetle damage.

Cucumber beetles can transmit leaf diseases.

Cucumber Beetles: Disease Transmission

Bacterial wilt (*Erwinia tracheiphila*) is known to be the top one detrimental disease for cucurbits especially in the mid- to eastern U.S. This may also impact melon growth in California, especially northern area.

- Both striped and spotted species are vectors.
- Spreading through feeding wounds.
- Individual leaf wilting appears within 7 days after feeding.
- Damaging plant vascular systems (xylem), blocking water transport.
- Colonies can overwinter in beetle's gut.

Cucumber Beetles: Disease Transmission

All symptoms spread very quickly. Once a plant is infected, there is nothing we can stop.

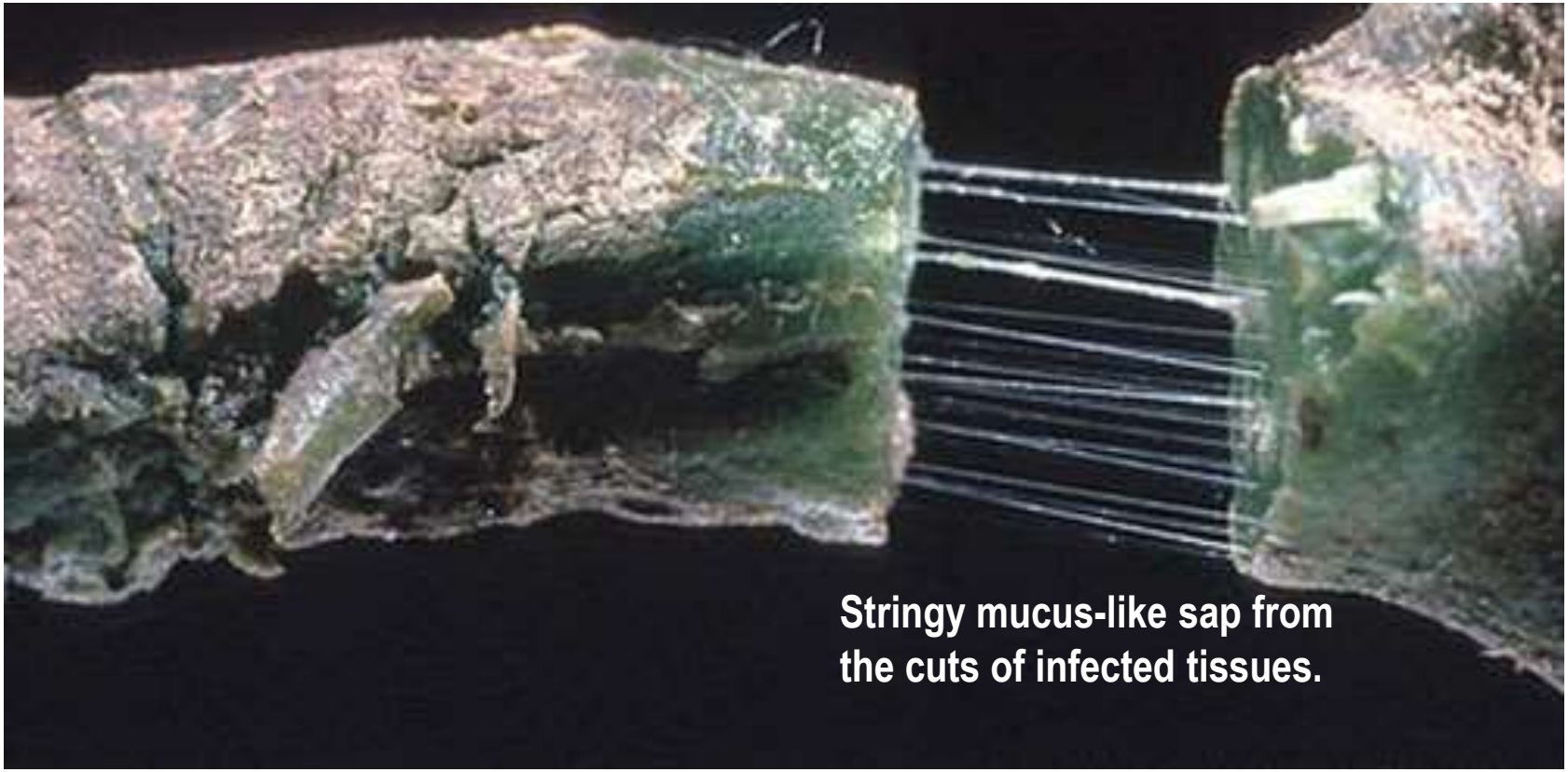


Photo by M.P. Hoffmann, Cornell Univ.

Cucumber Beetles: Prevent and Control (Traps and Lures)

Specify the species!

Mount above canopy

Check following scouting schedule

Cannot replace garden scouting

Cucumber Beetles: Prevent and Control (Row Covers)

Use it early to prevent beetles from landing on young plants.

Pay attention to irrigation to avoid over-moist for fungal disease.

Open sides for air ventilation.

More common for small scale growers and home vegetable gardens.

Remove before flower opening for pollination.

Common Problems:
Fungal disease – Powder and Downy mildew

Like lettuce, symptoms are favored by moist, damp, cool conditions.

Usually happened at late season.

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Trouble Shooting & Problem Solving

To extend research-based knowledge and information on home horticulture, pest management, and sustainable landscape practices to the residents of California and be guided by our core values and strategic initiatives.

From the aspect of vegetable gardening…

Listening: Information in, be patient

Sieving: Extract useful information

Recording: Write down useful detail

Asking: Self-clarification, any missing info

- Be with them as if it were your question.
- People express in different ways.
- People may be very talkative.
- Listen till the end, try not to stop them.
- While listening, be prepared for extracting useful info.

From the aspect of vegetable gardening…

Listening: Information in, be patient

Sieving: Extract useful information

Recording: Write down useful detail

Asking: Self-clarification, any missing info

Example: *I grew about 100 tomato plants in my backyard garden. You know, it is about a quarter acre. The house was built by my grandpa, and my husband and I love living here… We love our garden and our tomatoes…… Oh, here are my tomato samples. I picked from one plant, and as you see, the leaves are blackening and curling. One day, my daughter went to pick some tomatoes and she found them. I was just astonishing to see this. These plants were just transplanted about a month ago. I don't quite understand what's going on.*

Example: *I grew about 100 tomato plants in my backyard garden.* ~~*You know,*~~ *it is about a quarter acre*~~*. The house was built by my grandpa, and my husband and I love living here… We love our garden and our tomatoes…… Oh, here are my tomato samples.*~~ *I picked from one plant, and as you see, the leaves are blackening and curling. One day,* ~~*my daughter went to*~~ *pick some tomatoes and she found them*~~*. I was just astonishing to see this.*~~ *These plants were just transplanted about a month ago.* ~~*I don't quite understand what's going on*~~.

100 tomatoes in ¼ ac, leaves disorder, maybe already happened many days ago, 100 plants are planted at different times?

From the aspect of vegetable gardening…

Listening: Information in, be patient

Sieving: Extract useful information

Recording: Write down useful detail

Asking: Self-clarification, any missing info

Besides asking questions on the consultation form, double check/clarify some key points. They may miss the most critical information.

100 tomatoes in ¼ ac, leaves disorder, maybe already happened many days ago, 100 plants are planted at different times?

After confirming: the lady grew about 100 tomato plants all using transplants. She also grew other crops on her ¼ acre garden. She transplanted about 50 plants in early April and started to pick on late June. She then transplanted another 50 plants mid June. Now her second batch of tomato plants are about one-month from transplanting. But about a week ago, she was told that a few tomato leaves got curled, and leaf tip got blackening. She did not use any pesticides, fertilized normally, and did not detect insects. BUT since June, the temperature was a few degrees higher than the average, and some days high temp reached over 100 F when she transplanted.

Possible reason: environmental and climatic issues. Plants were stressed when transplanted into dry and hot soil.

Possible solution: irrigate at night or early morning to avoid evaporation and heat injury. Provide plants canopy cover if possible. Plants may grow out of it when getting more established and condition improves.

Role Play

Q: A customer took pictures of his tomatoes and asked what was wrong with these tomato leaf curling.

How are you going to start helping the customer?

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- **Environmental disorder (Abiotic)**
  - High wind
  - Low humidity
  - Hot and Drought
- **Herbicide misuse (Abiotic)**
  - Herbicide drift
  - Herbicide residue
- **Pest (Biotic)**
  - e.g., Broad mites
- **Virus (Biotic)**
  - Beet curly top virus
  - Various mosaic virus

Remember this slide of causes of leaf curling

When, where, distribution (all plants or certain spots), fertilization, irrigation, weather, herbicide, pests?

True reason: herbicide was used by him to spray his fence weed on a windy day. The herbicide was drifted to all his 200 tomato plants.

- **The last part and maybe the most important part is giving your <u>opinion/option if you can</u>.**

Be authentic if you are not sure and don't force yourself to say something. But you can guide them to other resources of help. e.g., I can send your sample to our IPM advisor. I will follow up with further result.

The actual reason sometimes can be complex and attributed to multiple factors. The knowledge we learned here is to help find out all reasonable possibilities. Customers will be given options to take to maybe avoid things from happening again.

"It depends" is one of the effective tools though we should not spoil ourselves using it too often. For example, should I grow heirloom or hybrid tomatoes? Should I grow seeded or seedless watermelons? You may need to give pros and cons statement as this statement usually comes after "it depends".

Thank you!
Good luck!

Ready for questions