



Increasing Tomato Production

UNDERSTANDING TOMATO CHARACTERISTICS

❖ Heirloom vs Hybrid

- Heirloom tomatoes are open pollinated varieties that have been passed down from generation to generation. Modern Heirloom crosses are stabilized by at least 8 generations of planting, some more.
- Hybrid plants are crosses that are pollinated by hand. Seeds from these plants are not stable. They will not reproduce the plant and fruit you harvested.

❖ Indeterminate and Determinate

- Indeterminate or Vining tomatoes
 - Pruning encourages growth and production.
 - Grows a continuous crop that ripens throughout the season.
 - Needs to be caged or staked to prevent disease/breaking.
- Determinate or Bush tomatoes
 - No pruning needed.
 - Grows only one crop of tomatoes which all tend to ripen at the same time.
 - Best for canning.
 - Usually stop growing at 4 ft.

❖ Days to harvest – the time from transplant to first fruit. (planted by memorial day)

- Early - less than 70 days to harvest (3rd week of July)
- Mid-Season between 70 and 80 days to harvest (2nd week of August)
- Late Season more than 80 days to harvest (Last week of August)

“Tomato” is thought to originate in Peru meaning “plump thing with a navel”

❖ There’s no such thing as “low acid” tomato

- All tomatoes are between 4.14 and 4.8 on the pH scale.
- Some might point out that there is a slight difference in the pH but as you can see below, even a commercially produced product can have a range of pH and those are made with precise measurements.
- Foods with similar acidity to ALL tomatoes:
 - Philadelphia cream cheese (4.1-4.79)
 - Beer
 - Peanuts
 - Buttermilk (4.41)
 - Bananas
 - Chocolate
- Foods that are more acidic than ALL tomatoes:
 - Apricots, Apples, Blueberries, Cherries, ALL CITRUS FRUIT, Cranberry, Grapes, Peaches, Pears, Pineapple, Plums, Pomegranate, Raspberries, Rhubarb, Strawberries,
 - All Jelly/Jam
 - Honey (3.7-4.20)
 - Vinegar /Cider (2.4-3.4)
 - Sauerkraut (3.3-3.6)
 - Sherbet (3.69)
 - Most Sauces, bbq, ketchup, etc.
- Tomatoes described as “low acid” simply taste less acidic because sugars mask the acidic flavor.

❖ Cracking /Splitting /Scarring

- Crack resistant usually means their skins are thicker.
- Thin skinned tomatoes tend to split after sudden rains if they have begun to ripen.
- Some tomatoes have a great ability to scar after splitting. This makes them able to continue to ripen on the vine, even after cracks have formed.
- Tomatoes that have high sugar content are more likely to split as sugar draws water to the fruit quicker than the skin can accommodate.

PICKING THE BEST PLANTS – UNDERSTANDING A PLANTS PURPOSE

A plant's sole purpose in life is to make offspring. If a plant feels its environment is not ideal it will force fruit production. It does this to make sure its next generation can be created before it dies. If a plant has gone into survival mode it will already be stressed and a poor candidate for fruit production.

- ❖ Selecting a healthy plant is the basis of your growing season and production volumes. Here are things to look for when purchasing a plant:
 - **YOUNG PLANTS**
 - Young plants are focused on root growth.
 - Plants that have shifted focus to foliage growth will grow shallow root systems, not develop the deep root system required for dry, hot summers.
 - **NO FLOWERS / NOT ROOT BOUND**
 - Flowers tend to develop in potted plants when they feel their roots are constrained and have reached their environmental limit.
 - Plants that have shifted focus to flowering will never revert to the root growth stage which will lead to disease susceptibility.
 - **HARDENED OFF PLANTS**
 - Plants grown in nurseries will not be conditioned to the fluctuating temperature, winds or watering changes and will become stressed when transplanted.
 - Harden off your plants prior to planting them by leaving them in their pots and putting them on your patio or porch in an area that allows them to adjust to their new environment without stressing them out.

PLANTING METHODS

ALL PLANTS PURCHASED FROM REDEFINE THE VINE AFTER MAY 13TH ARE HARDENED OFF AND READY TO PLANT!

- ❖ **GARDEN PLANTING**
 - Planting early doesn't equal earlier fruit.
 - Tomato roots grow best in soil 70° -77°. If your soil has not reached these temperatures you will not gain any more growth vs waiting to transplant.
 - Depth of planting - Deeper isn't better
 - Roots grow best in warmer soil temps, planting deep places the root ball in cooler soil and stunts growth.
 - A week prior to transplant lay your plant pot sideways to allow plant to grow at a 90° angle. This allows for extra surface root to grow along the stem but keeps the root ball in warmer soil encouraging deep root growth.
 - Hilling is a better alternative to DEEP PLANTING or raised beds.
- ❖ **CONTAINER/RAISED BEDS/ SQUARE FOOT GARDENING**
 - EARLY, Dwarf or Determinate plants are suggested for container or square foot gardening.
 - Only use potting mixes for containers, it is formulated to efficiently drain excess water. Field dirt does not promote drainage.
 - Raised bed soil temperatures fluctuate more than traditional gardens because of a lack of insulation. Use a thick layer of mulch to prevent evaporation and heat loss in cool evenings.
 - Slow release fertilizers are best for containers/
 - NOTE: studies have proven that putting rocks in the bottom of your pots only adds rocks to the bottom of your pot.... It does not aid drainage.
 - Soil physics- water will not move from fine particles of soil until it is completely saturated
 - Rocks move saturated soil closer to the plants roots.
 - If you are still skeptical you can experiment with this by using clear containers one with rocks, one with only soil. (or you can watch a few videos about it by searching rocks for drainage debunked)



Container gardening requires a dedicated feeding and watering schedule. If you do not have the commitment to provide the plant with food don't expect it to return the favor!

❖ **NO Till Gardening** – Protecting your microbiome

- Leaving your soil undug means bacteria, earthworms, ground beetles and fungi can thrive undisturbed.
- Soil that has naturally compacted has water channels and aeration made by earthworms.
- Compost can still be used with no till gardening in the form of a tea.
- No till gardening is not suggested for soil that has not been previously tested and amended.
- Once you have your soil at the proper loam it should only take one winter to get a perfect environment for no till gardening.

❖ **Dry Farming Schedule**-Enjoy a more flavorful tomato.

- NOTE: I NEVER WATER MY GARDEN TOMATOES... (Unless it hasn't rained in 2 weeks)
- Constant watering leads to more foliage growth and less flavorful fruit.
- Watering heavily every 2-3 days after transplanting and letting soil dry out encourages the plants roots to search out ground water.
- Tomatoes thrive in moist, not wet, soil. Tomatoes LOVE well aerated soil.

❖ **Mulching** –it's not just for flower beds!

- Keeps soil temperature higher and prevents moisture evaporation.
- Use 4" of mulch to insulate the soil temperatures at night and prevent moisture evaporation in the day.
- The ideal material for mulching gardens is wood chips. It breaks down after the years providing organic material. Grass clippings can also be used if they are very thick.
- Using heavy landscape fabric or black plastic mulch is an excellent way to control weeds.
- Straw can be used alone or with landscape fabric.
 - Be careful to shake out seed or you will just be planting straw!

❖ **Supporting your plant**

- Cages
 - Best for Determinate or Bush Plants.
 - I notice that plants can perceive their growing space and restrict their foliage growth of when surrounded by wire cage. This can be beneficial if you want to control vigorous vining plants.
 - You can hang Red bulbs on cages early in the season to confuse birds so they leave them alone.
- Stakes
 - Tie loosely and with a soft material to avoid damaging the stem.
 - Wooden stakes harbor disease and should not be used season to season.
 - Metal and plastic coated metal stakes should be sanitized between each season.
- Rope Trellis
 - Best for indeterminate, Vining plants
 - Use clips or a soft rope to tie every foot of growth.
 - I LOVE CLIPS. I have used many different types and have not found one I don't like yet!
 - There is also a tool made especially for tying plants. It's really cool, I haven't tried it yet but it has great reviews and is highly recommended in the grape industry.
 - There are also clips made to support the branches producing heavy fruit.



❖ **PESTS**

- BIRDS!- hanging shiny, reflective, objects that move and frighten birds. Hanging red ornaments on cages early, before fruit even sets, will confuse birds and they will ignore fruit when its ripe thinking it isn't food.
- Hornworm- Spraying your plants with organic Bt (THURICIDE) kills all caterpillars. Use on all your garden plants that are eaten by worms. Borage deters hornworm.
- Stinkbugs- suck moisture from fruit
- Other uncommon infestations: aphids, cutworm, spider mites, flea beetles, whiteflies

GROWTH STAGES, WATERING and FERTILIZERS

This chart shows the stage, typical duration of each stage, ideal soil temperatures, suggested fertilizer ratios and a beginner's Dry farming watering schedule. Many people who are conditioned to water their gardens daily will find it hard to allow the plant to fend for itself, this guide will ease you into neglecting your plants. (Length of growth phase is determined by days to harvest)

GROWTH PHASE	APPROX PHASE DURATION	IDEAL SOIL TEMPERATURE	SUGGESTED FERTILIZER*	DRY FARMING WATERING SCHEDULE FOR BEGINNERS**
Rooting	1 week after transplanting	70° -77°	EVEN N=P=K 10-10-10	Water heavily the first day, then every 2-3 days for the first week
Foliage	1-3 weeks	86°	N > P > K 15-10-5	heavily water every 3-5 days
Budding	1 week	<90°	N < P > K 15-30-15	Reduce to 4-6 days
Flowering	1-2 weeks	Extreme temps signal plants to produce	N < P = K 5-10-10	reduce watering to every 6-10 days
Fruiting	1-2 weeks	70° -75° <80°	N =P < K 10-10-20	minimum
Ripening	end of season	cool evenings signal ripening	NONE	

*Fertilizer ratios are not exact requirements. Before you apply any fertilizer to your crops it is important to get a soil test. This will determine the needs of your garden and whether you need to apply fertilizer at all.

Refresher: the pointed end of the > < signs means the number it is pointing to should be lower than the other number. N- Nitrogen, P- Phosphorous, K-Potassium (Potash)

** Any heavy rain is considered a watering. If it rains skip a watering. You may be able to go the entire summer without watering your plants in an average Ohio summer. If there isn't any rain follow the guide or use your best judgement.

- ❖ **Soil additives** – you don't HAVE to add anything to your soil. (if you are planting in the garden)
 - For tomatoes, most fertilizers are wasted money and only contribute to soil and ground water contamination.
 - Before you add any fertilizers to your soil a soil test is your best investment.
 - If your soil is deficient in N-P-K I suggest adding a slow release fertilizer.
 - It is highly unlikely that you have a calcium deficiency in your soil but it can happen. No Tums Needed.
 - Things I do suggest adding to your soil are sand and organic materials (leaves, compost, etc.)
 - Adding sand helps to promote drainage and improves aeration.
 - Organic material helps to increase the vermiculture (worms) in your soil.
- ❖ **Foliar Spray Fertilizers**
 - I prefer to use foliar spray applications for fertilizing my plants.
 - Foliar sprays are absorbed more quickly by the plant
 - They can be mixed with MOST, but not all, Fungicides to combine tasks.
 - Foliar sprays reduce over use of fertilizer.
- ❖ **STOP USING EPSOM SALT-** one week it's a fertilizer the next it kills them??
 - Just because it's in your newsfeed everyday on Facebook does not mean it is good advice. The only reason to add Epsom salt to your garden is if it's deficient in magnesium. Even if you have a magnesium deficiency (which like calcium is HIGHLY UNLIKELY) there are better ways of adding it.
 - Epsom Salt is not recommended, is unnecessary, and potentially damaging
 - Too much magnesium in the soil will inhibit a plants uptake of calcium and iron.
- ❖ **Natural Fertilizers**
 - COMPOST / COMPOST TEA
 - Fish emulsion... It stinks but boy does it work.
 - If you don't have the time, energy or gumption to make compost tea then fish emulsion is by far superior to fertilizer salts. I would even rank it higher than kelp.
 - Manure is always a good fertilizer but it also carries the risk of contaminating your produce with bacteria. Manure should be well composted before using in food gardens.
 - Chicken Manure is not suggested for Tomato production. Chicken Manure is specifically high in nitrogen and makes plants rigorously produce foliage but not much fruit.
- ❖ **Homemade Herbicide Recipe**
 - DON'T
 - MIX
 - YOUR OWN HERBICIDE
 - Either pull the weeds or use glyphosate -It is never a good idea to concoct pesticides of any kind from household chemicals. The products made for these purposes have been heavily researched and I encourage you to be proactive and look into them with an open mind. The toxicity and carcinogenic effects of generic glyphosate are lower than a career as a hair dresser, or working night shifts with unusual sleep patterns.

DISEASE & RESISTANCE

❖ Disease Resistance

- No tomato is resistant to ALL diseases. Most “disease resistant” varieties are only resistant to 1 or 2 diseases. Very few disease resistant varieties are resistant to Early Blight, Late Blight, or Septoria Leaf Spot.
- Heirloom tomatoes are too numerous and genetically varied to scientifically test for disease resistance like commercial hybrids. Knowledge of disease resistance in heirlooms is generally information supplied from individual grower’s observations.
- Disease resistant tomatoes have genetics that fight common fungal, bacterial and viral diseases

Codes for disease resistance of **HYBRID** tomatoes.

- | | | |
|--------------------------------|----------------------------------|--|
| ▪ V -Verticillium Wilt | ▪ TMV -Tobacco Mosaic Virus | ▪ A or EB -Alternaria Stem Canker (EARLY BLIGHT) |
| ▪ F, FF, or FFF -Fusarium wilt | ▪ N –Nematodes | ▪ St -Gray Leaf Spot |
| ▪ (Fusarium Races 1, 2, and 3) | ▪ TSW -Tomato Spotted Wilt Virus | ▪ Ph, PHR, or LB –Late Blight |

❖ SEPTORIA - it’s in your soil.

- Septoria and Blight look identical, appear at the same times and are both fungal.
- Do not save seeds from plants that have septoria, it cannot be killed by fermenting and will infect the soil you plant them in.
- Septoria can only be killed by greenhousing your soil. To greenhouse your soil you will need to cover your entire plot with thick clear plastic and let it bake the earth for the entire summer.

❖ BLIGHT - it’s probably not blight.....

- Most people believe that late season death of their tomato crop is caused by late blight. While entirely possible, in most cases it is actually Septoria Leaf spot.
- Potato Leaf varieties are much more susceptible to blight
- If you want to get confirmation take a plant sample to an extension office for testing.

❖ NATURAL DISEASE PROTECTION- Your best protection from diseases be it fungal, bacterial or insects is a healthy plant! Encourage this by providing an ideal environment.

- Air flow, air flow, air flow!
 - Wide plant spacing - 3’ apart and 4’ rows to allow air circulation.
- Water from below the plant, this prevents fungi spores being splashed onto the leaves.
- Prune the lower leaves to prevent soil splashed onto the roots
- Remove any diseased plant quickly and place it in the garbage in a plastic bag.
- DO NO COMPOST DISEASED PLANTS
- Keep your garden free of weeds.
 - Weeds harbor insects and diseases, keeping them out of your garden keeps your plant healthy.

❖ FUNGICIDE- even the best cared for plant could use some assistance when it comes to fungal disease.

Apply to the top and underside of leaves. Using an ionizing sprayer is ideal.

- APPLY FUNGICIDE JUST PRIOR TO RAIN! Many people apply fungicide after rains thinking rain will wash the protection away but advances in conventional fungicides take 2” of rainfall to deplete the protection by 50%. As long as the spray has enough time to dry your plant will be protected. (last year the most rainfall we had in one storm was 1 ½”)
- If you do not apply based on the schedule of forecast apply once every 7-10 days.
- It is important to rotate fungicides so they do not develop a resistance to them.
- **COPPER SULFATE**- a toxic organic.
 - I do not suggest copper fungicide, it is extremely toxic to humans, insects, birds and the microbes that live in your soil. It will also burn tender plants.
 - Copper doesn’t just go away, it is a mineral and over time it builds up in your soil. Copper buildup in the soil is toxic to plants it reduces root growth so your plant may look healthy but when a disease or threat arises it doesn’t have a healthy root system providing nutrients to combat it naturally.
- **SERENADE**
 - Organic disease control- uses a bacterial protectant.
- **DACONIL**
 - Apply every 7-10 days or extremely heavy rains
 - While it is not organic this product requires 0 days from application to harvest making it extremely safe. This product stays after Moderate rainfall.
- **MANCOZEB**
 - Requires a 5 day waiting period after spraying before harvest. I only use this in early season before fruiting and if it is extremely rainy or prime fungal conditions.

❖ BLOSSOM END ROT -BER

- Blossom end rot is not CAUSED by a calcium deficiency; rather THE DISEASE CAUSES the plant's inability to take up calcium.
 - Most common causes of BER are water stress, High nitrogen levels, and soil with too much salinity (are you using well water?)
 - Using 4" of mulch to control moisture evaporation will greatly reduce BER
 - Choose a different type of tomato. BER is most common in long tomatoes and those with pointed ends.
 - IF your soil is low in calcium and/or you feel a need to add it to your soil may I suggest OYSTERSHELL-this chicken product is an absorbable form of calcium that can be placed in your hole prior to planting.

❖ COMPANION PLANTING

♥ BORAGE

- protects against Tomato Horn Worms.
- Edible; cucumber taste.

♥ NASTURTIUM

- repels squash bug, beetles, aphids, spider mites, white flies
- controls fungal disease.
- Edible; radish, spicy taste.

♥ MARIGOLDS

- repels numerous garden pests.
- Roots release a chemical that deters root-knot nematodes.

♥ BASIL

- Repels thrips, flies and mosquitos

♥ CHRYSANTHEMUM

- Because it produces Pyrethrum, most bugs hate chrysanthemum and since you don't need bees to pollinate tomatoes they make great companions!

♥ CATMINT

- Repels flea beetles, Japanese beetles and squash bugs.

♥ CALENDULA, GARLIC, SAGE

❖ DO NOT PLANT TOMATOES NEAR THE FOLLOWING PLANTS!

Whether they attract pests, encourage disease, or secrete plant killing toxins these plants should never be near your tomatoes!

- ☠ **POTATOES**- highly susceptible to blight and can cross contaminate you tomatoes
- ☠ **DILL**- attracts hornworms. Plant this as a trap crop FAR from tomatoes to draw hornworms away from the garden!
- ☠ **ALLELOPATHIC PLANTS:**
 - ☠ **SUNFLOWERS,**
 - ☠ **PEAS**
 - ☠ **ARTEMISIA,**
 - ☠ **BLACK WALNUT**

INCREASING PRODUCTION

❖ Quantity

- Shake that plant. This will hasten and improve pollination, yep I'm serious, look it up!
- Stressing your plant to encourage fruit production is a relatively new practice.
- Stressing your plant should only be done in the flowering stage or after.
- Water Stress
 - Only for plants that have been continuously irrigated (NOT DRY FARMED)
 - Deprive water until it is wilted then drench the soil this makes the plant switch growth stages by threat.
- Imitate environmental threats that would force a plant to speed up production of its offspring.

- Stress Pruning- mimics threat of insect infestation.

- Cut Largest Sugar Leaf in half



- Hitting with a stick-mimics threat of hostile environment.

- During Flowering stage (helps pollination)

❖ Quality

- Pruning Suckers helps to concentrate the needed nutrients into the areas it should be instead of wasted energy.
- Support trusses with heavy fruit to prevent constricted vascular structures that carry nutrients to the fruit.
- DO NOT OVERWATER

❖ FORCING FRUIT TO RIPEN

- At a certain point in time, be it the end of the season or plants looking unhealthy you might want your fruit to ripen faster on the vine. Use these tips to hasten them from blush to vibrant.
 - Harvesting frequently –makes the plant think fruit is being eaten by animals.
 - Remove flower clusters, lower leaves, and small excess or diseased fruit- if it isn't going to make it to the end of the season it's just wasting the plants resources.

