

2/23	Noon		Spring Roses Care
2/24	6pm		Fruit Growing for the Beginner
3/2	Noon		Blueberries
3/3	6 pm		Soils and Fertilizers
3/9	Noon		Raspberries
3/10	6 pm		Rain Barrels
3/16	Noon		Strawberries
3/17	6 pm		Right Plant, Right Place
3/23	Noon		Who Gets Grandma's Yellow Plate
3/24	6pm		Choosing Fruit Varieties for Western WA
3/30	Noon		Composting
3/31	6pm		Worm Composting
4/6	Noon		April Garden Tasks
4/7	6 pm		Advanced Composting
4/13	Noon		Beneficial Insects
4/14	6 pm		Lawns
4/20	Noon		Preparing and Sharpening Tools for Summer
4/21	6 pm		Weed Management

Save the Date!

Master Gardener Foundation of Cowlitz County

PLANT SALE
&
TOMATOPALOOZA

Order Online May 10-13
Pick-up May 15



Master Gardener
Program

WASHINGTON STATE UNIVERSITY
EXTENSION

How to start seeds

Alice Slusher

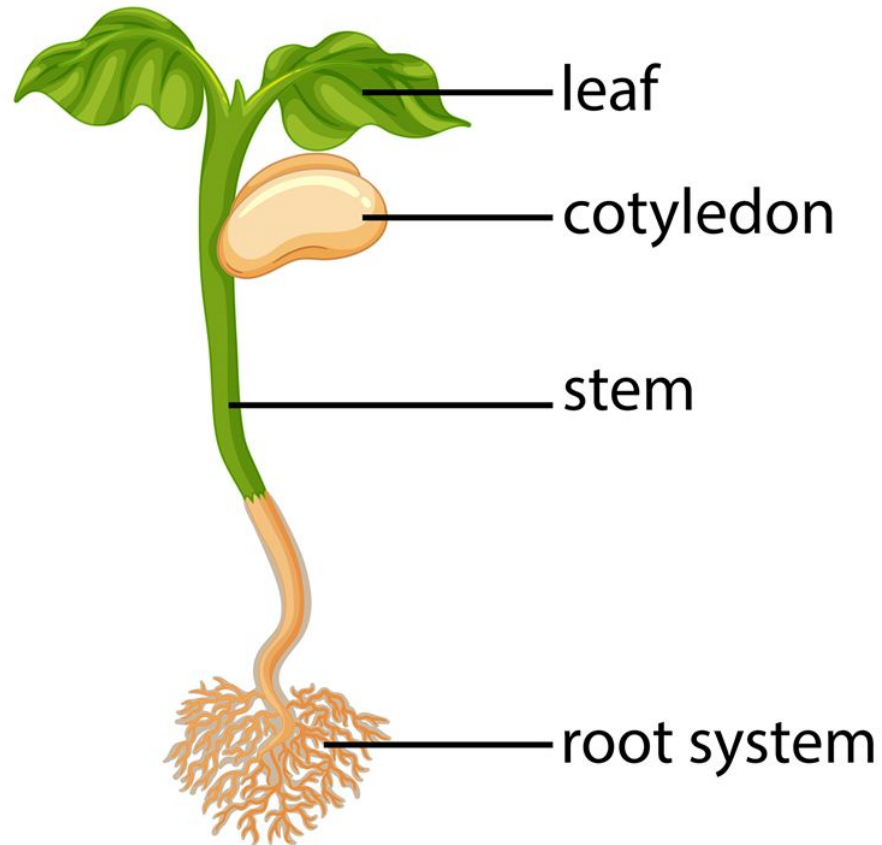


Master Gardener
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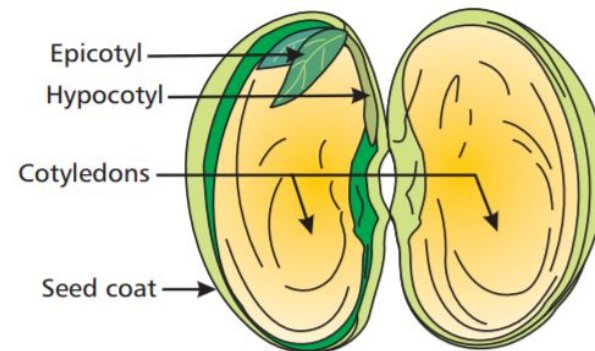
Seed germination

Anatomy of a Bean Seedling



The seed is the embryo of the new plant
Contains everything it needs to make a
new plant.

Energy is stored in the cotyledons--like a
backpack full of food.



Seed germination



- Seed coats absorb water and swell and soften. Germination process triggered
- Embryo starts to wake up and use proteins stored within seed to produce energy.
- This will trigger the emergence of the root.

What do seeds need to germinate?

- Proper soil temperature
- Proper soil moisture
- Air/oxygen
- Light
- Seed contact with soil

Proper soil temperature

- Seeds have minimum-maximum temperature range for germination.
- Any temp above or below that range will damage the seed or cause it to go dormant
- Look at the seed pack or chart for the best germination temperature for the fastest germination

Table 4 (continued). Seeding recommendations for common vegetable crops grown in Washington (adapted from Kumar et al. 2009, 3-4).

Vegetable	Seeding			Germination		Growth		
	Depth to Plant (inch)	Distance Between Plants (inch)	Distance Between Rows (inch)	Number of Days to Germinate	Optimum Soil Temperature Range (°F)	Base Air Temperature (°F)	Weeks to Grow to Transplant Size	Days to Maturity
Garlic	2	4-6	12-24	6-10	35-50	30	DS	90-150
Horseradish	4	12-24	24-48	10-20	45-75	40	DS	140-160
Jerusalem Artichoke (Sunchoke)	4	12-18	36-48	10-20	65-90	50	DS	110-150
Kale	¼-½	8-12	18-24	3-10	60-90	40	5-6	55-80
Kohlrabi	¼-½	8	18-24	3-10	50-80	40	6-8	60-70
Leek	¼-½	4-6	18-24	7-12	45-90	35	10-12	80-90
Lettuce, Head	⅓-¼	12-14	18-24	4-10	40-80	40	4-6	55-80
Lettuce, Leaf	⅓-¼	2-4	4-6	7-10	50-80	40	4-6	45-60
Pepper	¼-½	18-24	12-24	10-20	65-95	50	6-8	60-80
Tomato	¼-½	18-36	36-48	6-14	70-85	51	5-6	55-90

Home Vegetable Gardening in Washington

<https://s3.wp.wsu.edu/uploads/sites/2073/2014/09/Home-Vegetable-Gardening-in-Washington.pdf> Pages 10-11

Soil Moisture

- Not too wet, not too dry
-
- What's usually the best?
-
- Water that's about as moist as a wrung out sponge.



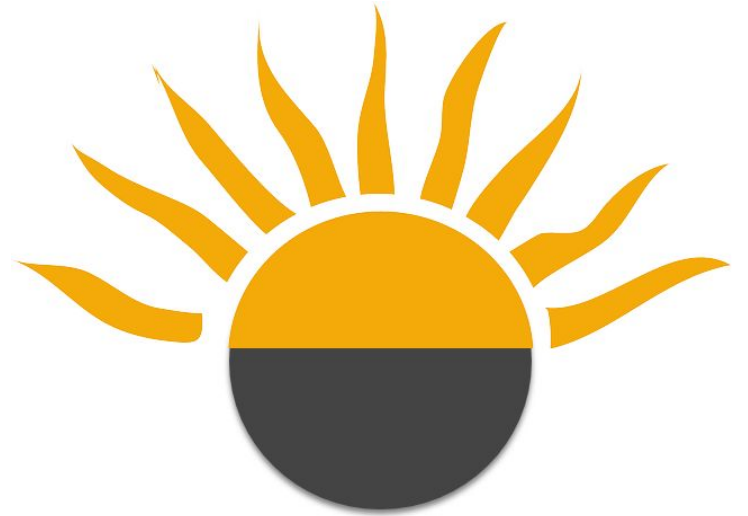
Oxygen

- Seeds need oxygen to start the chemical processes to start germination
 -
 - Too much water displaces the oxygen
 -
 - Too much water = no germination
- Use seed start mix, not garden soil or purchased potting soil



Light

- Seedlings need light to grow
- Most seeds DON'T need light to GERMINATE
- In fact, they germinate better in the dark!



Seed to soil contact

- Seed must have good contact with the soil for three reasons
 - The initial root needs to have a place to form an anchor for the seedling
 - The root needs access to soil moisture to continue the germination process
 - The seed coat needs to absorb water from the soil to continue the process

Timing considerations--what does it mean?

- When to start seeds
- Days to germination
- Days to maturity

When to start your seeds

- Need more information:
 - Last frost date-May 15
 - Seed packet information-- “sow 8 weeks before last frost date”
 - Work backward-Start seeds on March 15

Probably safer to start seeds 6 weeks before the last frost date, and plan on getting them transplanted outdoors 2 weeks later.

Extending growing season techniques
High elevation considerations

Can you start them earlier?

Yes, but it's risky.

- Artificial indoor environment probably not enough.
- Larger plant needs more light, larger pot, more fertility.
- You can plant it earlier than the expected frost date, but many precautions must be taken.

Days to germination

What influences how long it will take for germination?

- Soil temperature
- Amount of moisture
- Depth of seeds sown
- Light
- Age or quality of seed

Days to maturity

- Helps you to determine when you can expect to harvest your crop
- Read the seed packet labeling
 - Suggest direct sow in garden or starting indoors?
 - Direct sow: clock starts ticking the day you sow the seeds
 - Indoors: Clock starts ticking when you transplant to your garden
 - For indoor sown plants” Harvest = 8 weeks from sowing to transplant **plus** “days to maturity.”
- Example--tomatoes--sow seeds March 15, transplant May 15, “75 days to maturity”= harvest on August 1.

Organic vs non-organic seed

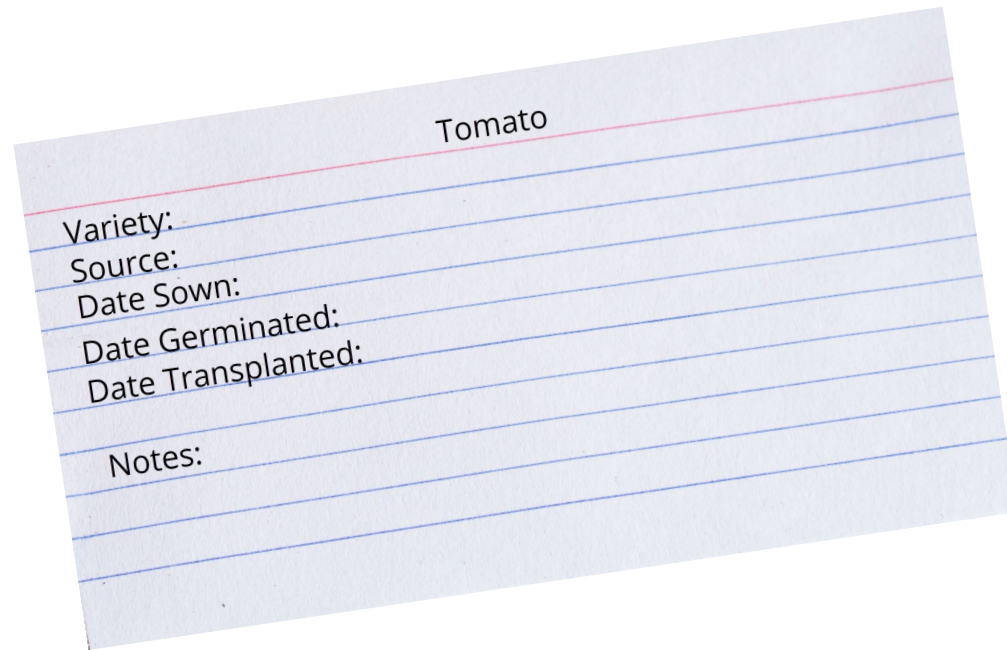
Organic seeds grow according to specific industry guidelines.

Non-organic seeds don't.

- Yes if you're selling organic produce
- Organically grown seed is more resilient because they don't rely on chemical support to become healthy and strong.
 - It can take a long time to get seeds from a plant. if they can get through it without pesticides, herbicides, chemical fertilizers, they will be resilient.
 - Best traits passed on.
- Supporting companies that have sustainability practices
- GMO vs non-GMO Marketing gimic. Seed companies don't sell GMO to public.

Keep records--SO important!

- Handwritten
- Free app: Day One Journal
- Take photos!



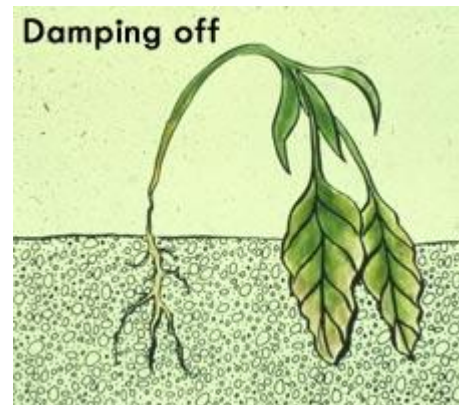
Tomato

Variety:
Source:
Date Sown:
Date Germinated:
Date Transplanted:

Notes:

Start with sterile seed-start mix

- Sterile mix is light, fluffy, dries out easily
 - But it allows roots to grow
 - Lots of oxygen
- Sterile mix helps prevent “damping off”
 - Pathogens from water, hands dirty pots
 - Cold, damp conditions
 - Poor air circulation



Preparing sterile seed start mix

- Dump a 12 Qt bag into a 5 gallon bucket
- Add about ½ gallon hot tap water
- Mix well with hands. Mix should hold together and feel like a wrung out sponge
- Fill the 3.5 inch pots to the very top



Planting the seeds

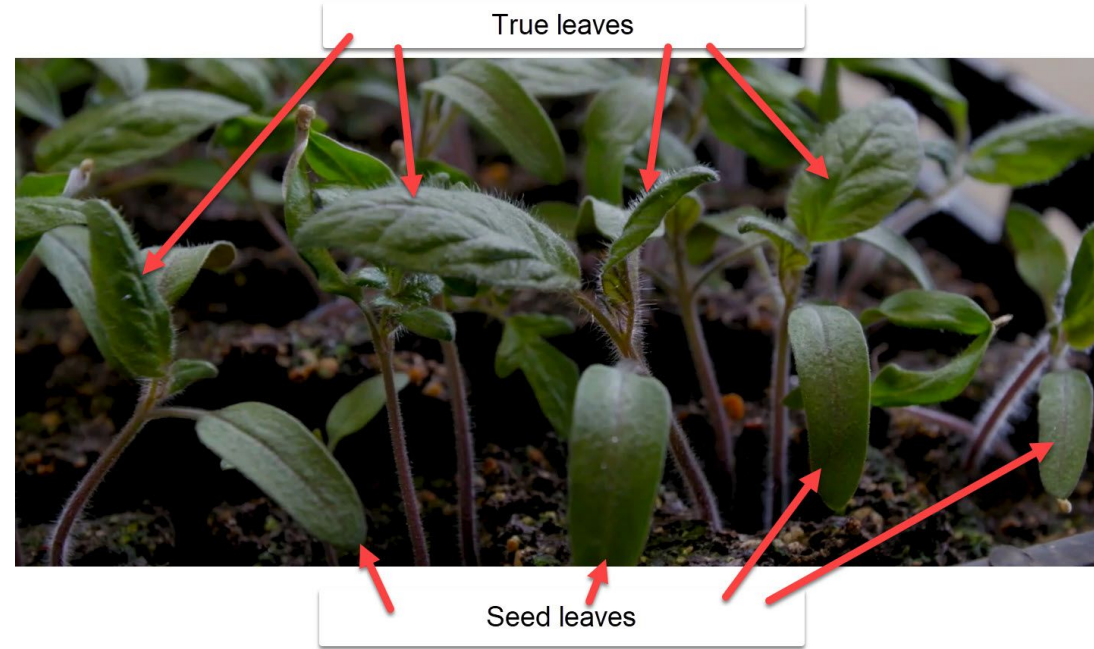
- You can either plant 2-3 seeds per pot, or 15/20 seeds per pot
- Place desired seeds on top of soil, gently brush over them to cover shallowly, or sprinkle prepared soil on top to cover seeds.
- Take another pot and use the bottom of it to tamp down the soil until soil level is about $\frac{1}{2}$ inch from the top of the pot.
- Check to make sure the seeds are covered

Next...

- Plant as many pots as you'd like
- **Gently cover with plastic to retain moisture (remove after seedlings pop up!)**
- Check every day--shake or tap off moisture condensation onto seeds--if you pre-moistened the soil, you may not have to water until sometime after germination when the cover is removed.
- Remove the cover when a the START to pop up.
- Monitor to make sure the soil doesn't dry out--the seeds are on top!

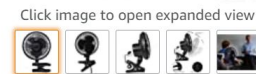
And then...

- Check every day. Flip over the plastic . Remove plastic after plants pop up.
- When your seeds germinate, you'll see the stem, then the "seed leaves," followed by the "true leaves"
- You'll need to continue keeping your seedlings warm (55-60°F night temperature and a 65-70°F day).



And then...

- They need light. 12-16 hours of it. 1-2 INCHES above the seedlings! (fluorescent)
- They need air circulation from the time you remove the cover--
- Get a clip-on fan-gentle, low setting
- Keep on 24/7 until transplanted outdoors.



Comfort Zone 6 INCH - 2 Speed Tilt, Whisper Quiet Operation C 5.5 Foot Cord and Steel Safety

[Visit the Comfort Zone Store](#)

★★★★☆ 3,461 ratings

Best Deal

List Price: ~~\$16.99~~

Price: **\$14.99** ✓prime & FREE Returns

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May be available at a lower price from other sellers, p Prime shipping.

Size: **Single Pack**

2 Pack
\$24.99
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Single Pack
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Color Black

Brand Comfort Zone

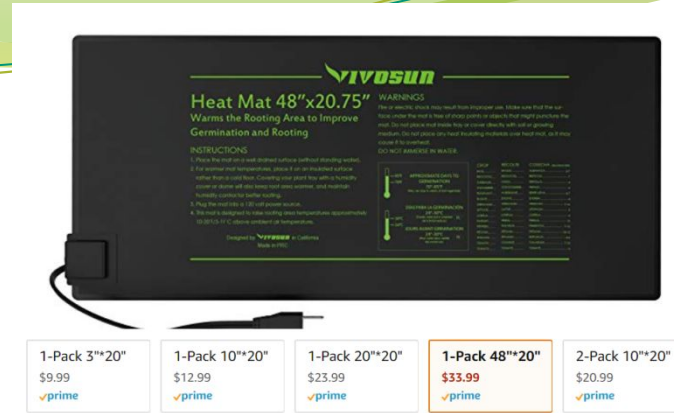
Item Dimensions 17.5 x 17.8 x 19.3 inches

LxWxH

Material Other

Keys to healthy plant starts

- Sterilize all used pots
- (Wash pots with soap/hot water to remove soil, place in “bath of 1 part bleach 9 parts water for 10 minutes.
- Use NEW potting mix to fill trays
- Clean all tools
- Use a heating pad under trays to warm soil to 70-80°F for indoor plant production.
- Wait until garden soil has reached optimal temperature for germination before planting outdoors (usually >50 degrees)



Keys to healthy plant starts: watering

- Water to keep it **moist but not soggy**. Use pots with drainage holes. I prefer to water from below. Find that sweet spot—more plants are killed from overwatering!
- Too much water promotes leggy growth--not good for the plant's strength
- Too much water can rob plants of oxygen
- Better to let it get nearly dry before watering again.
- Keep hoses and water heads off the floor.
- Use clean **WARM WATER** (68 – 77 F).
- **When to water?** Watch for ONE SEEDLING beginning to wilt--then it's time to water.

Bottom Watering

- Place pots on tray, pour about ½ inch warm water into tray
- Water should wick up into the seed mix within an hour. Drain off any remaining water after an hour.
- Use your built in hydrometer—your finger. Is the soil moist? Add more if necessary. Avoid overhead watering on delicate seedlings.
- Place in a WARM place—heat mat or top of refrigerator

Under-watering

- You can't look at the soil and discern that it's too wet - let your plants show you those signs:
 - Foliage starts to droop or become limp
 - Foliage turns pale
 - Seedlings lack vigor



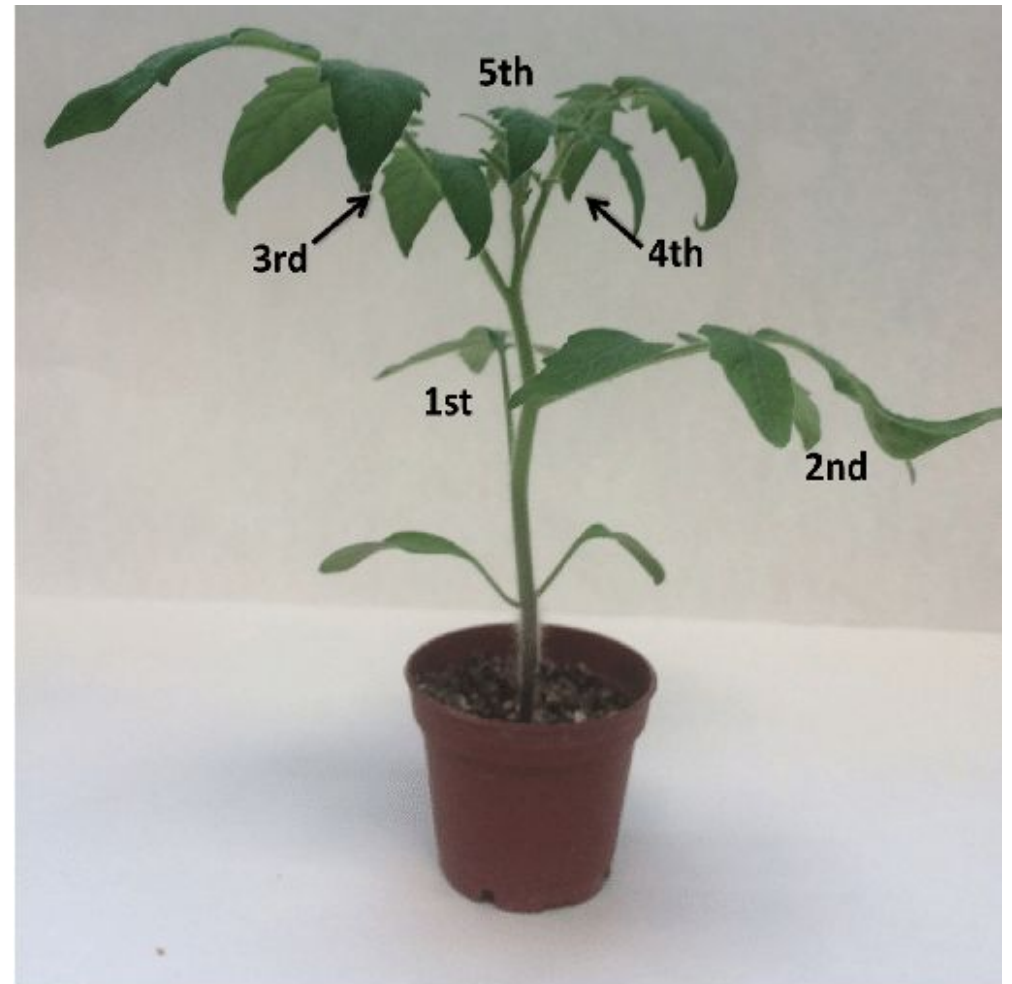
Over-watering

- Symptoms of too much and too little water are often very similar.
- Seedlings that lack water:
 - Can be limp
 - Lack vigor
 - Foliage turns yellow
 - Foliage will look dry



Keys to healthy plant starts-nutrition

- When seedling has 2 or 3 sets of true leaves--about 6 weeks--complete **water soluble fertilizer at 1/4 strength once a week (optional--listen to your plant)**.
 - I like fish emulsion (around 5-1-1 N-P-K)
- If you need to water again during the week, use lukewarm water only

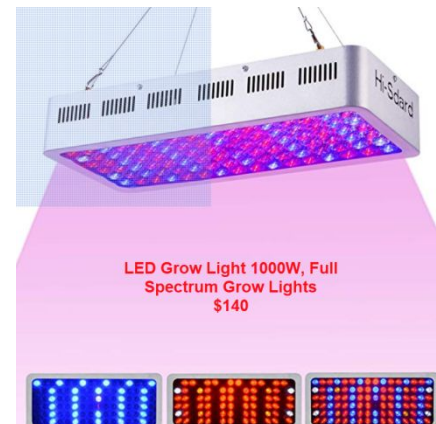
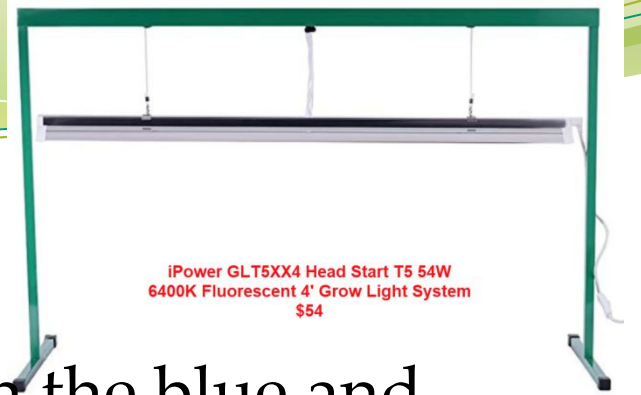


Keys to healthy plant starts-light

- Start lighting 2 days before expected germination
- Provide **12-16 HOURS OF LIGHT** from a fluorescent or grow light
- A combination of cool white and natural daylight tubes provides good light for plants—
- **Must be 2 inches above the TOP OF THE SEEDLINGS—NO MORE THAN INCHES ABOVE SEEDLINGS.**

About lighting

- **Cheap:** Cool, white tubes (40 watts) produce light in the blue and yellow-green and are okay for greens & veggie transplants
 - Or buy two bulbs--5000-5600K and 6500K
 - can produce healthy, stocky salad greens and vegetable transplants.
- **More \$\$** full-spectrum fluorescent tubes (“grow lights”) produce a balance of warm (red) and cool (blue) light.
 - Thicker stems, better leaf growth, flower production.
- Some gardeners use **one of each**.
- **LEDs:** Cheap expensive
 - Experiment with distance from plant



Lamp spacing

The closer you can get your lights to the plants *without burning them*, the better.

- 16 hours a day
- For fluorescent lights, 2-4 inches above the plants,
- For LEDs--start with manufacturer's recommendations, and monitor your plants.
- Too little light--leggy plants stretching/bending for the light
- Too much light--bleached out, yellow, pale leaves, that may stop growing, leaves may wither and fall from plant
- Solution--shorter duration of light, or more distance from light
- TAKE NOTES!

Keys to healthy plant starts-Air flow

- Help to prevent fungal disease
“Damping Off”

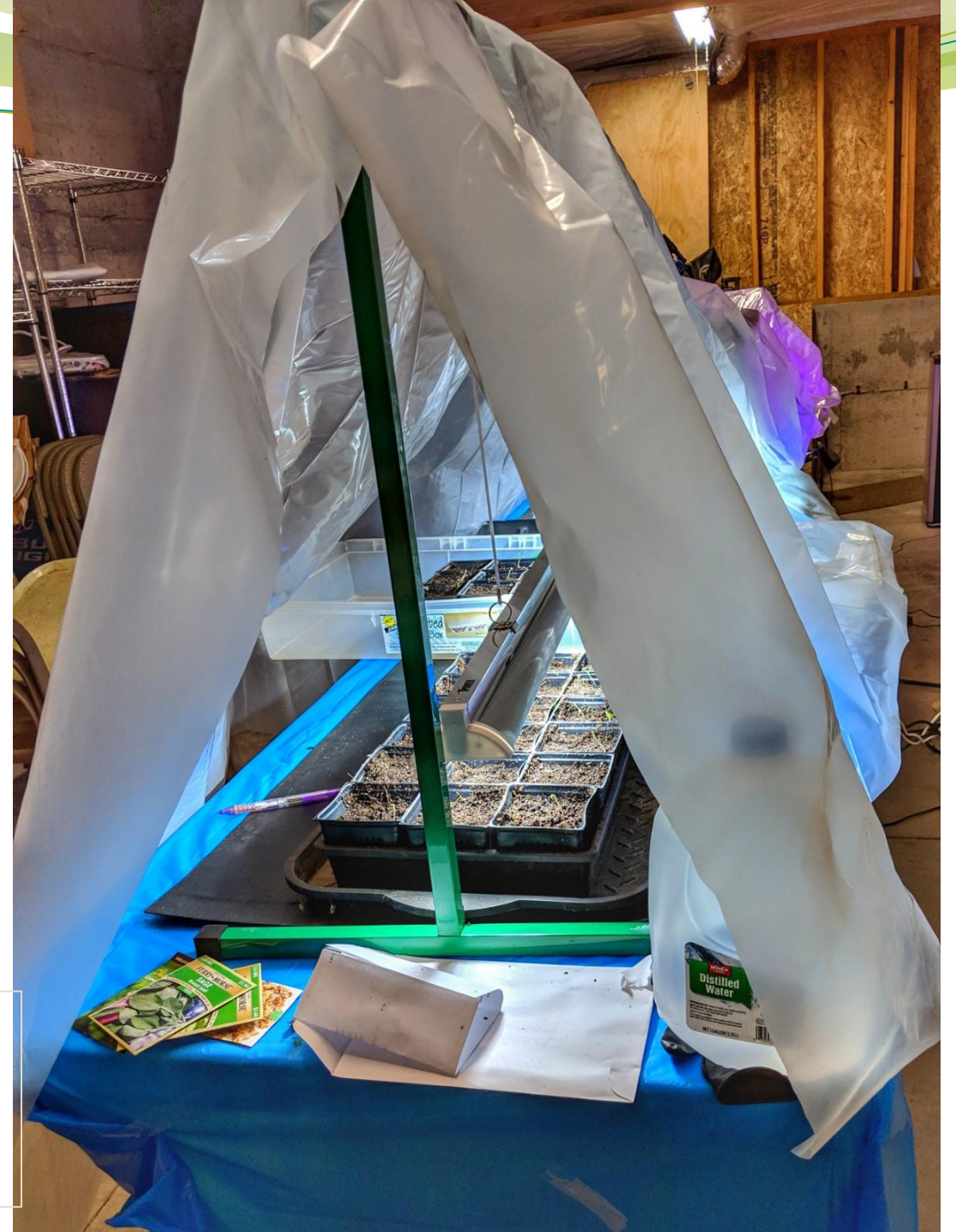


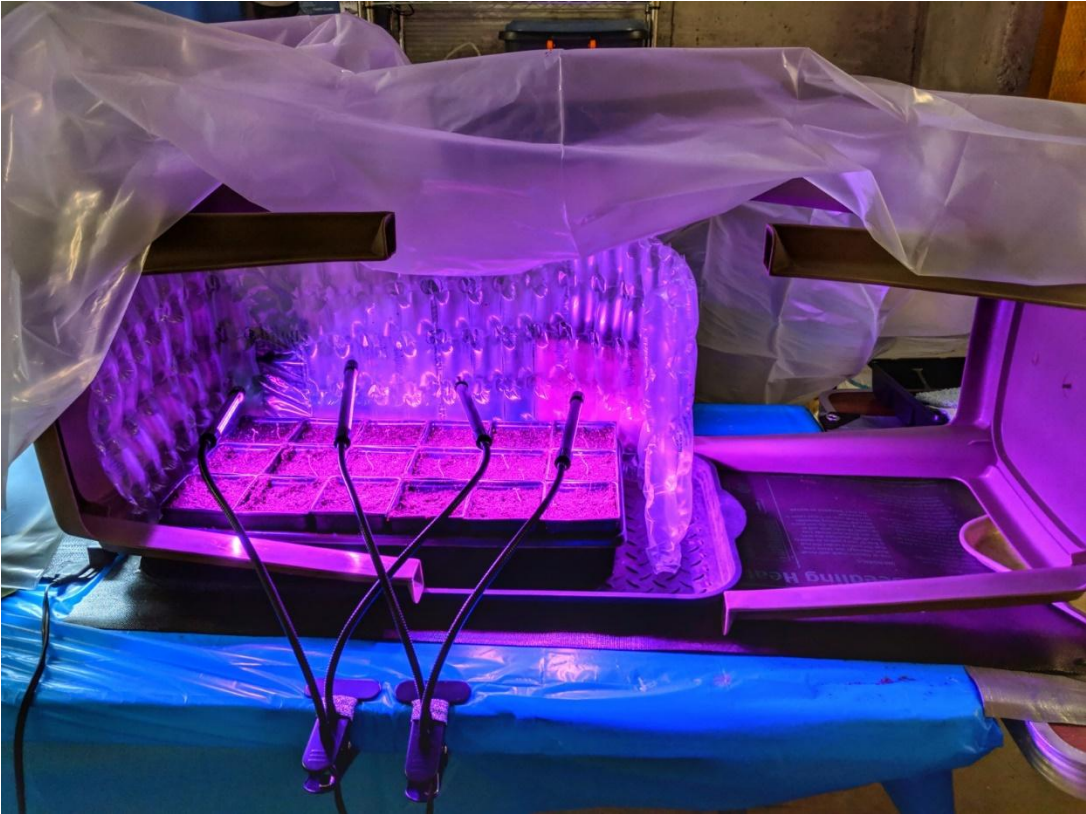
<https://hort.extension.wisc.edu/articles/damping/>





Clip-on fan at one end to keep air circulating to help prevent damp rot (fungal disease).





To fertilize or not to fertilize?

Your goal for indoor plant starts is to have a compact, healthy plant to transplant in 6-8 weeks.

Plants don't need extra nutrition support from germination until they have their first set of true leaves

Some people have great success by not fertilizing until transplant.

Too much fertilizer promotes vigorous but lanky growth. Plant isn't strong--fragile stems.

Listen to your plant. If lighting and watering are okay, and the leaves start to look pale yellow, you can use a very dilute ($\frac{1}{4}$ strength) liquid fertilizer. Do NOT use granular fertilizer.

What next?

- Transplant into a larger pot when seedlings are 4-5 inches tall.
- Plastic cups with holes punched in their bottoms work well.
- Lift seedlings by the root ball using a spoon or plant tag for support if necessary.
- Never hold the seedling by its stem, as you may crush it, or harm the growing tip.
 - If you feel the need to steady the plant from above, lightly hold the plant by a leaf.
- Tomatoes—PINCH OFF all the leaves except the newest 2-4 leaves, BURY THE STEM and roots UP TO THE TWO LEAVES



Germination information for selected plants

Plant	Approximate time to seed before last frost date (weeks)	Time seeds need to germinate (days)	Temperature (F)	Light/dark requirement
Broccoli	8	5 to 10	70	Either
Cabbage	8	5 to 10	70	Either
Cauliflower	8	5 to 10	70	Either
Cucumber	4 or less	5 to 10	85	Either
Eggplant	8	5 to 10	70	Either
Lettuce	8	5 to 10	70	Light
Muskmelon	4 or less	5 to 10	85	Either
Pepper	8	5 to 10	80	Either
Squash	4 or less	5 to 10	85	Either
Tomato	6	5 to 10	80	Either
Watermelon	6	5 to 10	70	Either

Troubleshooting-No Germination

If your seeds aren't germinating, some reasons include:

- **Seeds are potentially too old.**
- **Seeds are planted too deep.**
- **Soil is: too wet, too dry, too heavy, or compacted**
- **Soil was out of preferred germination range.**
- **Seeds may have needed special treatment.**
- **Seeds were poor or inferior quality.**

Troubleshooting-Damping off

Prevention:

- **Use lightweight, sterile soil. Garden soil is likely to contain the pathogen which causes damping off.**
- **Start with clean equipment and containers.**
- **Remove the humidity dome or cover as soon as seeds have germinated to prevent humidity around the tender sprouts.**
- **Provide good - and constant - air circulation.**

Troubleshooting-Leggy Seedling

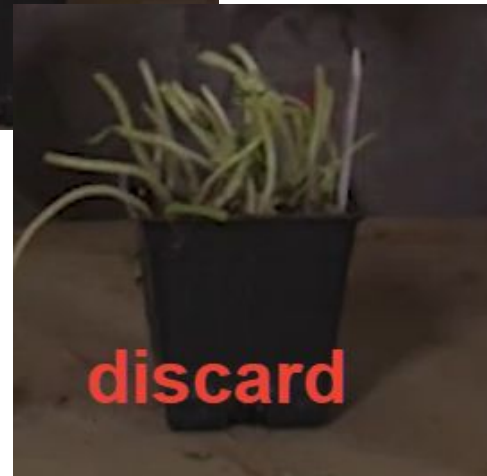
If seedlings grow leggy, stretched and thin; it can be caused by:

- Humidity dome or cover
- Weak light volume
- Excessive fertilization
- Over watering
- Over crowding



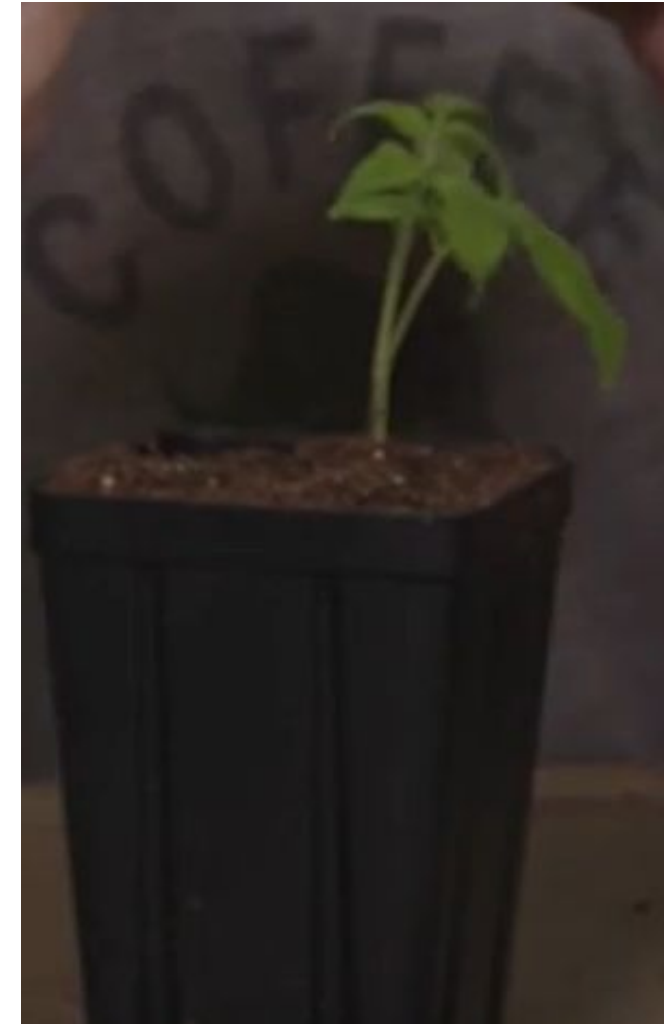
Troubleshooting-Leggy Seedling

- Snip ‘ Dip—Cut them in half! Snip the top of the leggy seedling, discard the stems and roots
- Root cuttings in water—roots in one week!



Troubleshooting-Leggy Seedling

- Transplant 2 weeks after Snip 'n Dip



Troubleshooting-Stunted Growth

- Nutrient Deficiency
- Excess Salt Content
 - Can occur if using coconut coir harvested near ocean
 - Run water through soil medium for 15-20 minutes
- Excess light- growth will stop
 - Also dried, discolored leaves
 - More distance between lights and plants
 - Timers to adjust light

Troubleshooting-Discolored foliage

Discolored Foliage

- Seedling foliage can start to look discolored, and that can be caused by:
- Nutrient deficiency-
- Yellow — low nitrogen, soil too dry or too wet.
- Red underside of leaves, phosphorus deficiency — Give seedling mild fertilizer with high middle number NPK



Troubleshooting-Discolored foliage

- Bleached white or tan—light is too intense, especially if top leaves are bleached.
- * Improper soil moisture » Excess light—adjust lighting time and distance
- Excess heat can also cause pale leaves—greater separation from lights

Troubleshooting-Wilting

- Transplant shock—root disturbance
- Be careful when transplanting—they'll recover within 48 hours



Troubleshooting Hardening off

- Sun is POWERFUL
- Leaves will look bleached.
- Dappled sunlight for 20, 40, 60 minutes on successive days, gradually increasing over the period of about a week.

Troubleshooting Brown leaf margins

- FERTILIZER BURN!!
- Apply fertilizer at $\frac{1}{2}$ or $\frac{1}{4}$ strength
- Stop fertilizing, flush pot with water.
- Within a week, new foliage should look good.

Troubleshooting Insect pests

Fungus gnats

- Usually don't damage seedlings
- Ease off on watering - don't allow the soil surface to remain wet.
- Buy yellow sticky traps, or make your own using yellow index cards coated with Vaseline (much safer for beneficial insects)



Resources

- Growing Tomatoes

http://extension.oregonstate.edu/mg/metro/sites/default/files/growing_tomatoes.pdf

- [The ultimate resource for gardening in Washington](http://gardening.wsu.edu/): Gardening in Washington State

<http://gardening.wsu.edu/>

- [Home Vegetable Gardening In Washington](https://s3.wp.wsu.edu/uploads/sites/2071/2014/04/Home-Vegetable-Gardening-in-WA-EM057E.pdf) (Fantastic resource)

<https://s3.wp.wsu.edu/uploads/sites/2071/2014/04/Home-Vegetable-Gardening-in-WA-EM057E.pdf>

- DIY PVC Light Stand <http://extension.umd.edu/growit/food-gardening-101/pvc-light-stand>

- [Growing Tomatoes Guide: from seed to garden planting](#)