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Act Locally. Breathe Globally.

Get Things Started

Growing your own transplants

March 12, 2022

New Gardeners Class 2

The Basics of When to Start What … and Why

- Know when to plant out transplants:
  Either side of the first frost-free date *based on variety*
- Plan to start seedlings based on how many weeks in advance you need to sow to get ideal size plants for transplant date
- Keep sowing for succession
- Use the Spring Sowing seed starting chart to figure timing—covered later

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Spring Sowing & Planting Dates

Vegetables

from http://www.johnnyseeds.com/e-pdgseedstart.aspx?source=W_InteractiveTools_122014

Enter spring frost-free date (include year):					5/10/2016^	
Crop: Sorted by when to start	Number of weeks to start seeds before setting-out date	When To start inside			Setting-out date	
		From	To	Safe time to set out plants (relative to frost-free date)	From	To
Onions	8 to 10	2-Feb	16-Feb	4 weeks before	12-Apr	
Parsley	9 to 10	9-Feb	23-Feb	2 to 3 weeks before	19-Apr	26-Apr
Leeks	8 to 10	16-Feb	1-Mar	2 weeks before	26-Apr	
Peas*	3 to 4	16-Feb	8-Mar	6 to 8 weeks before	15-Mar	29-Mar
Corn salad/mache	4 to 6	16-Feb	22-Mar	3 to 6 weeks before	29-Mar	19-Apr
Spinach	4 to 6	16-Feb	22-Mar	3 to 6 weeks before	29-Mar	19-Apr
Celery & celeriac	10 to 12	23-Feb	8-Mar	1 week after	17-May	
Collards	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Kale	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Kohlrabi*	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Mustard*	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Cabbage	4 to 6	1-Mar	12-Apr	4 weeks before	12-Apr	10-May
Lettuce	4 to 5	8-Mar	22-Mar	3 to 4 weeks before	12-Apr	19-Apr
Beets*	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Broccoli	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Swiss chard	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Eggplant	8 to 10	15-Mar	5-Apr	2 to 3 weeks after	24-May	31-May
Cauliflower	4 to 6	15-Mar	12-Apr	2 weeks before	26-Apr	10-May
Artichoke	8	15-Mar		on frost-free date	10-May	
Tomatoes	6 to 8	22-Mar	12-Apr	1 to 2 weeks after	17-May	24-May
Peppers	8	29-Mar		2 weeks after	24-May	
Basil	6	5-Apr		1 week after	17-May	
Corn*	2 to 4	12-Apr	10-May	0 to 2 weeks after	10-May	24-May

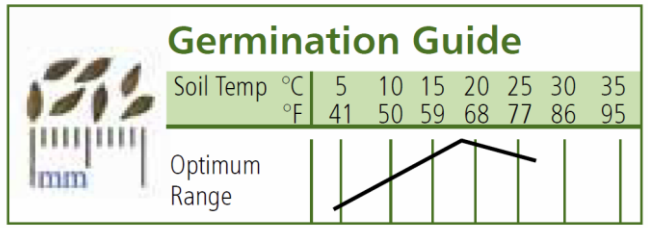
Things to Consider When Starting Plants

- Temperature, including frosts and differing cultural needs for cool & warm conditions
- Light levels
- Your available space, conditions, and personal time
- When to direct sow vs. when to use transplant starts

Soil Temperature

- Soil temperature needed for germination *per plant type* is available in catalogs from superior suppliers.
- High Mowing and Fedco have useful charts
- Johnny's has detailed graphs throughout catalog

LETTUCE



Planting Chart

HIGH MOWING Organic Seeds

Cut out this page & bring it with you! *Spacing requirements may vary. Due to the wide variety of tools and techniques available to both gardeners and commercial growers, this chart should only be used as a guide.

CROP TYPE	Seeds/Unit, M=1,000	Plant Spacing for direct sowing or transplanting	Seed Planting Depth	Row Spacing	Direct Sow or Transplant	Soil Temp (°F) for germination	Start Transplants (before setting out)	When to Plant Out
Artichokes	625/oz	12-24"	1/4"	5'	TP	60-80°	10-12 weeks	After last frost
Bean, Bush, Dry	75-220/oz	8 seeds/foot	1"	18-30"	DS	60-80°	n/a	After last frost
Bean, Bush, Snap	75-220/oz	8 seeds/foot	1"	18-30"	DS	60-80°	n/a	After last frost
Bean, Pole	75-220/oz	8 seeds/foot	1"	5'	DS	60-80°	n/a	After last frost
Bean, Soy	75-220/oz	8 seeds/foot	1"	18-30"	DS	70-90°	n/a	After last frost
Beet	1.5-2.5M/oz	15 seeds/foot	1/2"	12-18"	DS	60-85°	n/a	As soon as soil can be worked
Broccoli	5.6-9.4M/oz	10-16"	1/4-1/2"	18"	DS or TP	65-85°	4-6 weeks	After last hard frost
Broccoli, Sprouting	4-9M/oz	3 seeds every 12"	1/2"	18"	DS	50-65°	n/a	After last frost or in late summer
Brussels Sprouts	7M/oz	18-24"	1/4-1/2"	30"	DS or TP	65-75°	4-6 weeks	As soon as soil can be worked
Cabbage, Chinese/Napa	5-9M/oz	10-16"	1/2"					
Cabbage, Fresh Market	5-9M/oz	10-18"	1/2"					
Cabbage, Storage	5-9M/oz	18-24"	1/2"					
Carrot	11-37M/oz	15- 40 seeds/foot	1/4-1					
Cauliflower	5-10M/oz	12-18"	1/4-1					
Celery/Celeriac	50-70M/oz	6-10"	1/8"					
Chard, Bunching	1.2-2.5M/oz	8-12"	1/2"					
Chard, Baby	1.2-2.5M/oz	40 seeds/foot	1/2"					
Collards	6-9M/oz	8-12"	1/4-1					
Corn	100-200/oz	2 seeds every 12"	1-2"					
Cucumber, Greenhouse	1-1.3M/oz	20"	1/2"					
Cucumber, Pickling	1-1.3M/oz	8-12"	1/2"					
Cucumber, Slicing	1-1.3M/oz	12-24"	1/2"					
Eggplant	5.5-7.5M/oz	12-18"	1/4"					
Fennel	5-7M/oz	6-8"	1/4-1					
Garlic, Softneck	50 cloves/lb	6"	2" w/ 3-4"					
Garlic, Hardneck	40 cloves/lb	6"	2" w/ 3-4"					
Greens, Baby Leaf/Salad	16-24M/oz	60 seeds/foot in 2-4" bands	1/8"					
Greens, Arugula, Full Size	15M/oz	60 seeds/foot in 2-4" bands	1/4"					

Soil Temp (°F) for germination	Start Transplants (before setting out)	When to Plant Out
60-80°	10-12 weeks	After last frost
60-80°	n/a	After last frost
60-80°	n/a	After last frost
60-80°	n/a	After last frost
70-90°	n/a	After last frost
60-85°	n/a	As soon as soil can be worked
65-85°	4-6 weeks	After last hard frost
50-65°	n/a	After last frost or in late summer
65-75°	4-6 weeks	As soon as soil can be worked
70-95°	3-5 weeks	When nights are at least 50°F

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Warm vs. Cool Crops

Some plants thrive in cooler air and some require warmth to thrive. Trying to grow out of season can stunt growth or just not succeed.

- *Frost-tolerant* cool-season crops
  - Asparagus, Broad Beans/Fava Beans, Broccoli, Brussel Sprouts, Cabbage, Collard, Garlic, Kale, Kohlrabi, Leek, Lettuce, Onions, Peas, Radish, Spinach, Turnip
- Cool-season crops *affected* by frost
  - Beets, Carrots, Cauliflower, Celery, Chard, Chinese Cabbage, Mustard, Parsnip, Potato, Swiss Chard
- Warm season crops which *need* heat
  - Basil, Beans (Bush Snap, Pole & Dry), Cucumber, Eggplant, Melons, Peppers, Pumpkins, Squash, Sweet Potato, Tomatoes

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Cool followed by Warm followed by Cool

Sow early cool-weather crops followed by warm-weather crops

Use the number of days to maturity and the crops' desire for cool vs. warm weather to plan plantings where different crops follow each other

- For example, spring spinach can be followed by summer bush beans; then plant kale in August for fall use.

Sow cool-weather crops in early spring, and again in late summer for fall crops.

- The fall crop of greens can follow earlier planting of early cucumbers or could follow something like beets or potatoes or onions, which could have been either spring or early summer plantings.
- Fall greens are much less likely to bolt, although sometimes hit by an early frost.
- Many fall greens are hardy and will be sweeter with a light frost; some will survive most winters and be a delight in early spring.

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Historical Frost Date Information

Nearest Climate Station	Altitude	Last Spring Frost	First Fall Frost	Growing Season
CHICAGO BOTANIC GARDEN, IL	629'	May 2	Oct 11	161 days

- NOAA and the State Climatologist Office for Illinois maintain this data.
- Last and first frost dates are 30% probability. Calculated using 1981-2010 “Climate Normals.”
- Latest date for 32 degrees at CBG was May 27 (1981-2010)
  Latest date for 28 degrees at CBG was May 3 (1981-2010)
- Your garden’s microclimate may vary from this.
  Wind and low areas (frost pockets) make a huge difference.
- Different plants need different levels of warmth to survive and to thrive.
  Some are fine with 28 degrees. Others will suffer if less than 35.

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Two Approaches:
direct sow vs. transplant

When to Transplant

- Spring transplants:
  - Long-season warm veggies like tomatoes, peppers and eggplant require climate-controlled head start
  - Controlling soil temperature and moisture provides predictable germination for a wide range of plants.
  - Avoiding wind and frost damage and pest pressure gives plants a most secure start
- Summer and fall transplants:
  - When your garden is full of larger plants, you can start replacements inside
  - When conditions outside are too hot and dry, you can get plants to germinate inside

Direct Sow Advantages

- Less disturbance
- Fewer supplies, energy/inputs, work
- Easier to insert into a row

Best to start outside (either):
Beans, Beets, Carrots, Cucumber, Garlic, Gourds, Melons, Okra, Peas, Pumpkins, Radish, Rutabaga, Shallot, Squash, Turnip, Zucchini

Best to start inside (either):
Basil, Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Chives, Dill, Eggplant, Greens, Kale, Kohlrabi, Leeks, Onions, Parsley, Peppers, Rhubarb, Spinach, Swiss Chard, Tomatillo, Tomato, Most Herbs

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Direct vs. Transplant Considerations

New beds and lasagna-mulch with immature compost may give poor germination if direct sown.

- To maximize yield, sow most of your spring starts inside;
  tap-root veggies are an exception, especially carrots
- Depending on conditions, direct-sown plants *might* catch up to transplants.
- With direct sow— if there's uneven germination—you can end up with gaps where failed or a need to thin if too many germinated.
- If you have problems with slugs (or cutworms) transplants are more likely to survive while direct-sown tiny seedlings may get devoured.
- Later in the season having transplants ready to go—to "pop in"—can improve use of space and yields.
- Summer lettuce and spinach and cilantro may be easier to start in the cool of a house or basement.

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Multiple sowings of something on a regular basis

A garden is, frankly, not a “set it and forget it” thing, especially if you want to grow leafy greens.

The goal should be to have a continuous fresh supply that’s enough for your household, but not more than you can handle.

This means a grow less, more often.

- Most greens tend to bolt, don’t store terribly well, and crop rather quickly. Frozen lettuce? Canned lettuce? Dried lettuce? Um, no!
- Don’t end up with too much of one thing.

Above: NO! Don’t end up with too much all at once
Below: Better! Multiple rows started over time, but still too much lettuce

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Starting Your Own Transplants from Seed

- Many gardeners grow some plants themselves from seed, but often only by directly sowing seeds in the garden.
- Now we will focus on **growing transplants inside**, because fruiting plants like tomatoes and peppers take too long to mature otherwise.

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Determining your quantity needs

- Be realistic!
- Easy to grow too many tomato plants
- Hard to grow too much basil

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Things to know before you start

In general, think like a seed in nature and mimic ideal natural conditions

- Plan and set up your space
- Determine what you want to grow
- Figure out the number of days before transplant date and determine transplant date for each type of plant
- Learn the temperature needs for germination of each plant type
- Control moisture and air circulation

  Seeds need both air and water to germinate.
  Slow-germinating seeds are most vulnerable.
  Keep soil light and porous, with lots of organic matter, to avoid crusting and improve drainage. After germination, avoid too much water.

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About seeds, seed types

- A seed is more than a package of genetic material:
  It's a fully formed structure made to last until conditions are right
- Dicotyledons vs.
  Monocots (Allium, Grasses)
- Seed size & shape varies by family (cotyledon/seed leaf shape does, too)
- Need for light, dark, heat, cold
- Annuals vs. perennials frequently have different needs

- Seed coat—hard protective
- Radicle—future root—emerges first
- Seed leaves vs. true leaves

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Seed viability

- Proper seed storage conditions are cool and dark.
- The moisture content within the seed greatly affects germination rates.
- Seeds should be stored in original packaging, below 50 degrees F, dark place where moisture content will stay stable.
- I use a basement.
- If you use the refrigerator, put in a glass jar with desiccant.
- When retrieving seeds from storage, allow the container to reach room temperature before opening it. To prevent condensation from forming.
    - Note that both germination rate and seed viability decline with age of the seed.
    - Viability refers to the seed's ability to produce a vigorous seedling.
    - Viability typically declines before germination rates decline, so it is possible for old seed to still germinate yet produce weak seedlings.

https://www.highmowingseeds.com/blog/seed-viability-chart/
https://www.johnnyseeds.com/on/demandware.static/-/Library-Sites-JSSSharedLibrary/default/dw913ac4d0/assets/information/seed-storage-guide.pdf

Seed Type	Viability under proper storage	Seed Type	Viability under proper storage
Artichokes	1-5 years	Kale	4 years
Arugula	3 years	Kohlrabi	4 years
Beans	3 years	Leeks	1 year
Beets	4 years	Lettuce	5 years
Broccoli	3 years	Melons	5 years
Brussels Sprouts	4 years	Mustard	4 years
Cabbage	4 years	Okra	2-3 years
Carrots	3 years	Onions	1 year
Cauliflower	4 years	Peas	3 years
Celery/Celeriac	5 years	Peppers	2 years
Chard	4 years	Pumpkins	4 years
Collards	5 years	Radish	5 years
Corn	2 years	Rutabagas	4 years
Cress	5 years	Spinach	2-3 years
Cucumbers	5-6 years	Summer Squash	4-6 years
Eggplant	4 years	Tomatoes	4 years
Endive/Escarole	5 years	Turnips	5 years
Fennel	4 years	Watermelon	4 years

How many seeds?

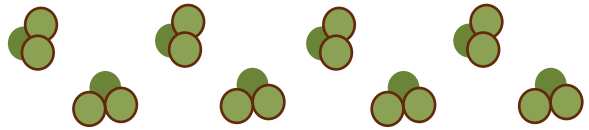
Generally, our goal is to sow or thin to a single plant.

What is the seed germination rate going to be?

With old or hard to sow seeds you may want to sow more and then thin.

A special technique for some crops is multi-sowing: a very, very different approach to thinning and spacing, but still generally is planted in normal rows.

Groups fit best if staggered in their rows:



Multi-sowing works surprisingly well for crops like beets and radish, chard, spinach, onions and leeks.

The idea is to sow a few seeds together (3 to 6). When planting out, *do not thin*, but leave large gaps between groups, resulting in more plants per sq. ft.

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Planning and timing

- Determine frost-free date
- Figure transplant date desired
- Check the packet, catalog or chart to determine the number of weeks before your transplant date to start your seeds
- Edible Evanston has a chart from Johnny's Seeds available as a handout
- Every week check the chart to learn what you should be starting.

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Mustard*	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Cabbage	4 to 6	1-Mar	12-Apr	4 weeks before	12-Apr	10-May
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Peppers	8	29-Mar		2 weeks after	24-May	
Basil	6	5-Apr		1 week after	17-May	
Corn*	2 to 4	12-Apr	10-May	0 to 2 weeks after	10-May	24-May
Okra*	4 to 6	12-Apr	10-May	2 to 4 weeks after	24-May	7-Jun
Cucumber	3 to 4	19-Apr	3-May	1 to 2 weeks after	17-May	24-May
Melons	3 to 4	26-Apr	3-May	2 weeks after	24-May	
Pumpkins	3 to 4	26-Apr	3-May	2 weeks after	24-May	
Squash	3 to 4	26-Apr	3-May	2 weeks after	24-May	
Watermelon	3 to 4	26-Apr	3-May	2 weeks after	24-May	

Timing tips & how to use the chart

continued

Re-sort your seeds during the season by when and where you want to sow them: Each week inside, plus early and late direct sow outside

Know your plant families:

e.g. Asian greens like pak choi are brassicas and have similar needs to kale & mustard.

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Plan your area, supplies and equipment

Space needs

- Remember that potting-up will increase the amount of space needed under lights
- Often germinating seeds need only bottom heat and frequently do not need light until sprouted. Therefore, you can germinate in a different space.
- Frost-tolerant plants can go out in protected area to harden off early
- Flats can go out under row cover or in cold frames prior to planting out to free indoor space for others.

Where to set up

- Under-utilized space like basement or extra room in house is commonly used
- Access to electricity essential
- Can be unheated as long as you supply bottom heat to warmth-loving plants
- Decent air circulation is a plus to keep plants healthy
- Standard flats are 11x21, so work with surfaces that accommodate that size

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Equipment and supplies

- Soil
- Heat/Temperature Control
- Light
- Containers
- Labels

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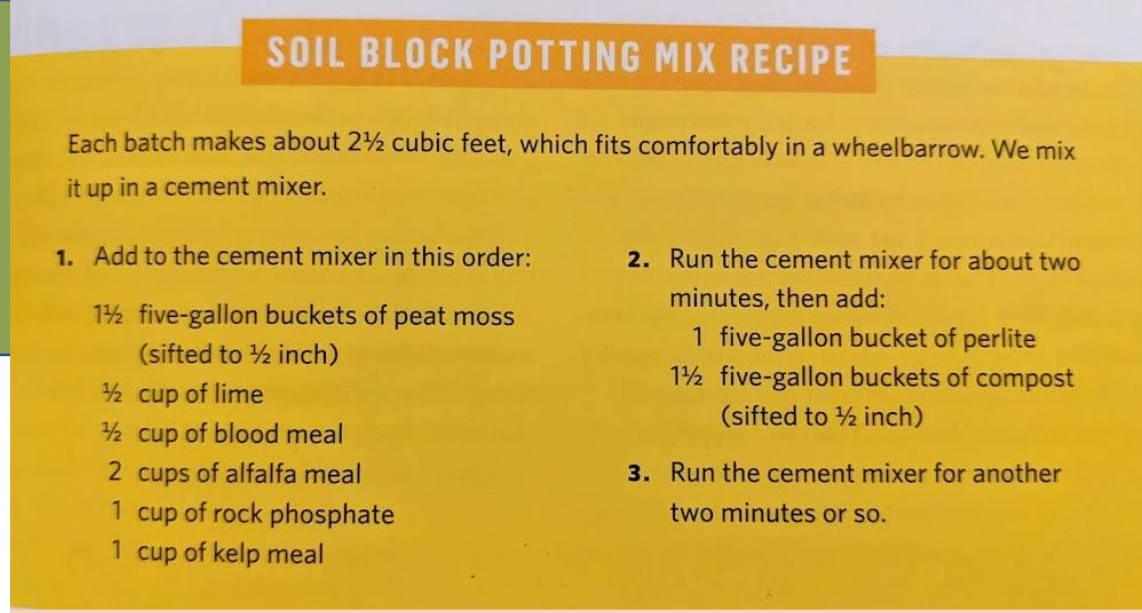
Soil

- Different opinions on need for fertilizer components and on need for it to be sterile. (Having it sterile can prevent damp-off, a fungal disease. But active biology is desired.)
- Soil-less medium
  - Peat-based
  - Coconut-Coir based
  - Compost based
- Purchase specialty mix



SOIL BLOCK POTTING MIX RECIPE

Each batch makes about 2½ cubic feet, which fits comfortably in a wheelbarrow. We mix it up in a cement mixer.

1. Add to the cement mixer in this order:
   - 1½ five-gallon buckets of peat moss (sifted to ½ inch)
   - ½ cup of lime
   - ½ cup of blood meal
   - 2 cups of alfalfa meal
   - 1 cup of rock phosphate
   - 1 cup of kelp meal
2. Run the cement mixer for about two minutes, then add:
   - 1 five-gallon bucket of perlite
   - 1½ five-gallon buckets of compost (sifted to ½ inch)
3. Run the cement mixer for another two minutes or so.

Make your own from

Peat moss or coconut coir
Perlite or vermiculite
Compost or worm castings

Can add:

Greensand, kelp meal
Soft rock phosphate
Cottonseed meal, dried whey, bloodmeal or alfalfa meal
Mycorrhizal powders
Lime to balance acidity of peat

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Temperature

Warmth for germination, if needed

- Heat mat (smaller ones usually do not require a separate thermostat) — about $25 each to fit a flat
- Box with incandescent bulb for warmth
- Radiator with plenty of spacers to avoid overheating

Be sure to check temperature requirements of seed you are planting!

- Often growing plants will no longer need added heat
- Fluctuations in heat for larger seedlings can cause bolting

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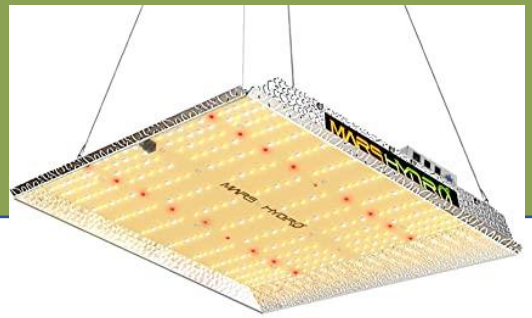
Light



Light for growing once germinated

- Old fluorescent shop-light (<$20)
- LED shoplights tend not to be full-spectrum or in 6400K range
- Specialty T5HO and full-spectrum LEDs now easy to find
- Fluorescent tubes should be cool AND warm set of 2
- Very bright south window.
  Frequent rotation required
- Use reflectors to maximize light

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Relationship of heat and light

Too much heat without enough light

- Heat causes most plants to grow faster
- Warm growing conditions without enough light will lead to weak, leggy seedlings
- Crowding (not thinning) and too much moisture or fertilizer also can cause this

If you are working with limited light:

- Keep it cool
- Use heat and high light-levels for warmth-loving plants which need it most
- After germination, don't overwater. But if using heat, check water needs frequently.

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Light characteristics to consider

Intensity, distance, color, timing

- **Intensity** is brightness. It is not lumens, and is not watts: it's plant usable light.
- What matters is: Photosynthetic Photon Flux Density (PPFD):
  The amount of light that actually reaches your plants within the PAR region or the number of photosynthetically active photons that fall on a given surface each second, expressed in ?mol/s. m^2.
- **Distance**:
  Too close, and heat can a problem depending on the source. Also, may be uneven.
  Too far, and intensity fades to nothing. Traditional grow lights should be about 4–6 inches from seedlings. New powerful LEDs may be better farther.

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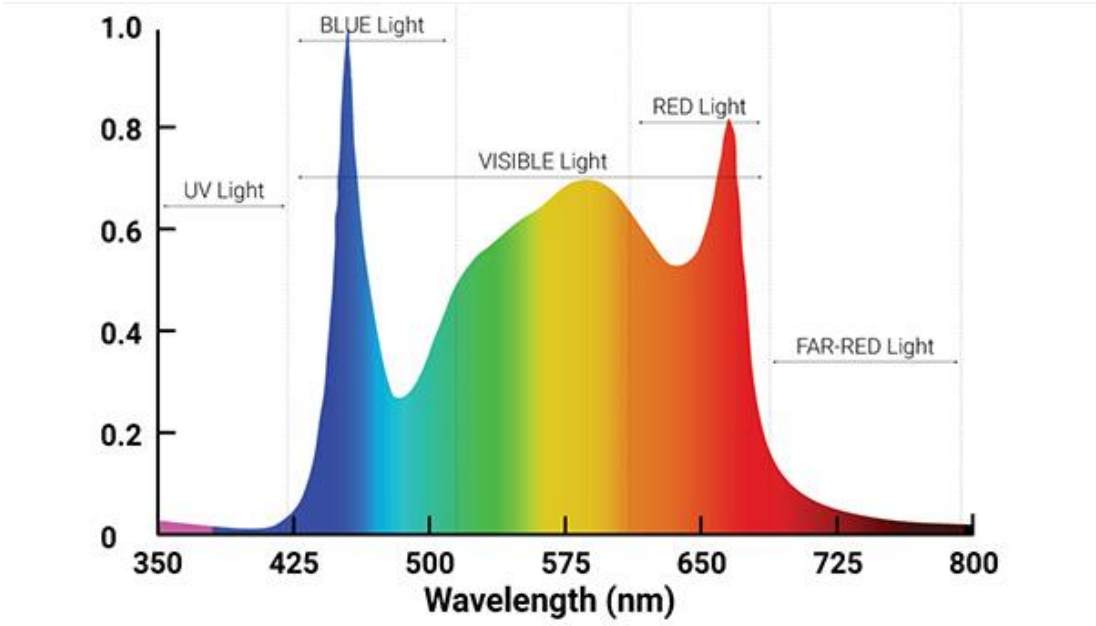
Color, wavelength, Kelvins, etc.

- “Burple” lights were popular, but now more full spectrum solutions are available
- Blue light or mixed light bulbs are suitable for starting seeds and leafy greens, as well as non-flowering house plants.
- Red light or mixed light bulbs are suitable for promoting bud formation in flowering plants as well as keeping the plants shorter.
- White lights or mixed/balanced light bulbs are suitable for most plants at any stage of growth.



UV Light (10nm-400nm)
While it won't contribute to photosynthesis and is still under research, UV light has been shown in studies to increase production of terpenes and anthocyanins which can enhance the color profile, aroma, and flavor of your flowers.

BLUE Light (400nm-525nm)
Contributes to photosynthesis and has effects on the plants morphology, causing it to grow stockier and more dense. Many HID lighting technologies are weak in producing these spectrums.

VISIBLE PAR Light (400nm-700nm)
This is the spectrum range which can be used by the plant for photosynthesis and thus is the most important range of light for growth. 400nm-700nm is the currently accepted range, many scientist have conducted tests showing far-red light also contributes to photosynthesis and advocate expanding it to 400nm-750nm.

RED Light (600nm-700nm)
Contributes to photosynthesis and has effect on the plants morphology, causing the plant to stretch. Red light is particularly useful as it is the most efficient light to produce using LEDs, meaning you will get the most light per watt of power used.

FAR-RED Light (700nm-750nm)
Recent research has shown this previously ignored section of the spectrum can have immense benefits for plant growth. It has been seen to increase leaf size which can increase a plants ability to absorb light ultimately increasing overall growth. Contrary to prior belief, it has also been shown to contribute to photosynthesis.

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Duration/Photoperiod

- How much darkness a plant gets is critical, depending on the plant stage.
- Seedlings are less finicky about having darkness, but as plants grow and get more nodes, daylength change will trigger tendency or ability to flower/bolt, or for onions, bulb.
- Seedlings do best with 16-18 hours per day, so 6 to 8 hours of darkness
- I use a Westek TM1613DOLB Outdoor Grounded Daily Mechanical Timer with two outlets

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Photoperiods:
The Long and the Short of it

- Long-day plants want to flower as we move toward the longest days of the year. A **long-day** plant requires >12 hours of sunlight— or <12 hours of ***uninterrupted*** darkness—to produce a bloom or flower.
- Short-day plants want to flower earlier in spring or in fall. A **short-day** plant requires <12 hours of sunlight, or >12 hours of ***uninterrupted*** darkness, to produce a bloom or flower.
- Plants that disregard the day length and determine their flowering on factors such as temperature or the stage of maturity are called **day-neutrals** and do not initiate flowering based on photoperiods.

Long Day Plants (Day Length > 12 hrs)		**Short Day Plants** (Day Length < 12 hrs)	**Day Neutral Plants** (Ignores Day Length)
artichoke	lettuce	black-eyed peas	apples
barley	oats	blueberries	apricots
beets	onions	cotton	Brussels sprouts
carrots	peas	mung beans	cabbage
cilantro	potatoes	raspberries	corn
clover	radishes	rice	cucumbers
dill	rye grass	soy beans	kale
fennel	spinach	sugar cane	peaches
flax	turnips	sweet potatoes	pears
lentil	wheat		tomatoes

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Why they Bolt and What to Do About It

Too little sleep and stress!

The biggest triggers for bolting are stress and day length.

Stress causes plants to focus on reproduction

- Common factors are lack of water, tight spacing, poor soil health

Plants native to non-equatorial regions are sensitive to **day length** (actually, it's night length).

- Many are triggered to flower by shortening nights (longer days)
- A few are triggered by shortening nights, so after solstice.
- If you interrupt the darkness, you will disturb the cycle.

A few controls & exceptions for daylength-based bolting

- Very young plants too small to set flower will often not bolt.
- Pinch or cut back brassicas regularly to force them back into vegetative mode.
- Plant very early (under protective cover) ***or*** wait until after solstice.
- Use the space in your garden anticipating bolting is likely to occur.

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Containers

- Trays to hold seedlings and allow bottom watering
- Tray lids or plastic bags for germination period
- Used six-packs and other seedling pots
- Peat pots/jiffy pots/cow pots
- Tofu or mushroom containers and toilet tubes; deli or yogurt containers
- Don’t use egg cartons or tiny things
- Berry-style ventilated, and lettuce mix unvented containers
- Soil block maker and NO pots at all

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Labels

- Something waterproof to note at a minimum:
  - —plant type
  - —variety
  - —start date
  - (add more data to the label so you don't have to look it up later)
- Popsicle sticks will work, but wood may lead to mold. Cut up old milk containers.
- Paper labels are not great but work.
- Pencil is the best thing to write with.
- Does not run or fade and can be erased if needed.

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Cleanliness

I NO LONGER DO ANY OF THIS unless I had disease problems.

- Washing everything in 2% bleach solution or 3% hydrogen peroxide (like from drug store) keeps away disease.
- Protect your hands from this solution and rinse after washing

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Seeds with special needs

- Pre-treating is required for some seeds
- Many hard-to-germinate seeds benefit from warm-water soak
- Seaweed soaking (or water) can help reluctant seeds
- Scarifying, or filing or nicking seed coat: Speeds germination of tough seeds.
- Stratification or pre-chilling or humid chilling is needed for some seeds to germinate. Many perennials and wildflowers need this to simulate nature.
- Lettuce and spinach do better, especially in summer, with pre-chilling. Keep seed sealed in glass in the refrigerator in the summer. Watch out for condensation!
- Lightness or darkness during germination—check packet or quality catalog

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Step-by-step how-to: 1

- Moisten mix.
  Use warm water and moisten until very damp yet still crumbly
  - Best to do this a day or more ahead and then adjust moisture as needed
  - Peat moss will NOT absorb cold water when it is dry.
  - Use warm water
- Fill pots to top; bang lightly to settle. Top off as needed.
  Keep filled to brim
- Soil blocks are much wetter and very dense. Drips a bit when squeezed.
- Choose soil blocks or biodegradable pots for plants with sensitive roots to avoid transplant shock
- The extra density of soil-block media provides a longer time before plants run out of nutrients/need potting up

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Step-by-step how-to: 2

- Seed spacing and depth based on seed type.
  Read packet or reference chart
- Rule of thumb based on seed size (2 to 3 x diameter)
- Make depressions with label or a pencil, etc.
- One to three seeds max per cell usually:
  - Based on germination rate and willingness to thin/transplant.
  - Some things work as multi-sown clumps
- Tips for controlling seeding rate
  —clean cut, crisp folded-ridge on packet and tapping.
- Cover seed, unless needs light.
  (Then might use a bit of vermiculite to keep moist.)

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Step-by-step how-to: 3

- Bottom water
- Maintain humidity during germination. Use bag or lid (much better). Then reduce humidity

  Germination period ends with emergence of first TRUE leaves, not seed leaves.
- Water, humidity and air circulation are all needed during growing

  Do not overwater after germination!

Fertilization needs:

- None initially—it's in the seed.
- Then infrequent dilute use of compost tea, fertilizer (fish emulsion is good) or sea-weed extract.

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Handling larger seedlings

- Pot up/transplant and/or thin as they grow
- Do not let get root bound
- Split by pricking out <u>as soon as have true leaves.</u>
  Do not do this for plants that don't like root disturbance.
- If indoors a long time, fertilizer needs increase
- Yellowing or drying out probably means high time to pot up
- Soil ball method, etc.

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Harden off before planting in garden

- Indoor conditions are mild, and plants need gentle exposure to toughen tissue
- Start a few hours a day (2–3) in a protected, partly shady location
- Do not let freeze; bring indoors at night
- Wind is especially tough on plants grown indoors
- Increase exposure to sun and wind over 1 week to 10 days
- Use of row cover or shade cloth allows for transition period with less moving
- Avoid significant temperature fluctuations

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Plant out when appropriate

Some plants hate root disturbance when transplanting, others don't mind.

- e.g. Squash dislikes root disturbance, so, use soil blocks or peat pots or toilet tubes and don't disturb roots, while onions can be pulled apart and abused and bare-root transplanted.
- Tear back any paper/peat pots to prevent wicking moisture

- Plant deep—bury any stem at least up to cotyledon leaves
- Coleman's transplant tool—insert, pull soil towards you, place plant, remove tool

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