Grow Your Own Seedlings

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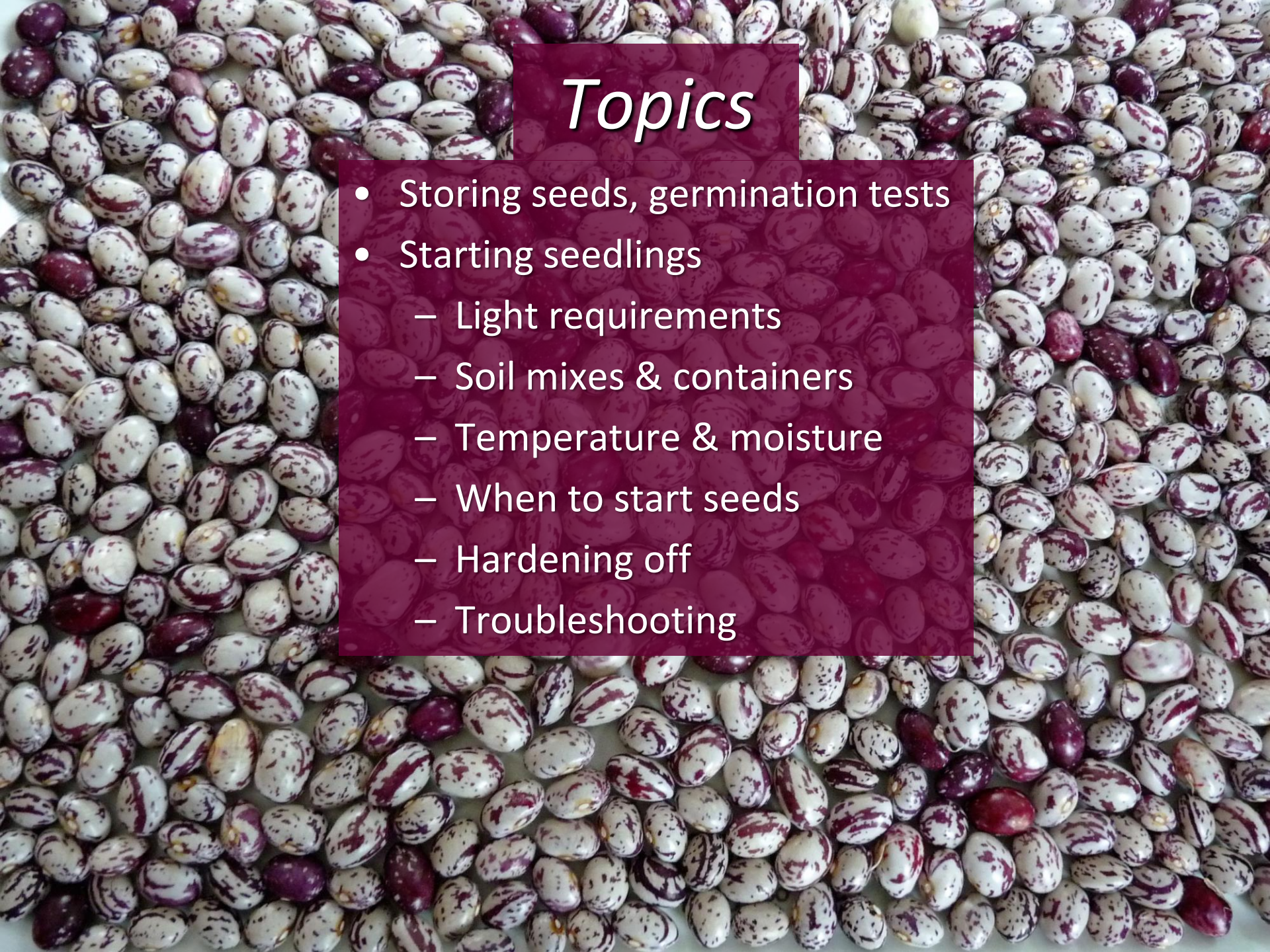


Topics

- Storing seeds, germination tests
- Starting seedlings
  - Light requirements
  - Soil mixes & containers
  - Temperature & moisture
  - When to start seeds
  - Hardening off
  - Troubleshooting

How long do seeds keep?

- Most seeds keep 3-5 years – many keep much longer if stored correctly
- Shortest viability (1-2 years): Parsnips, corn, onions
- Longest: Cabbage family (over 7 years)

Keep bulk amounts in airtight containers in a freezer for longest storage

Storing Seeds

- Keeping seeds dry is essential (moisture is the enemy)
- Put seeds in air tight containers
- Store in dry, cool, dark location, where temperatures don't fluctuate (a garden shed is the worst place to store seeds)

To use a freezer for long-term storage of bulk amounts:

- *Be sure to* allow container to reach room temperature before opening to avoid condensation on seeds
- Take bulk seeds out of the freezer once a year to refill packets for the current growing season

Dry conditions increase seed storage life dramatically

Use desiccants to keep seeds in closed containers really dry:

- Small metal cases containing silica gel are sold by Lee Valley Tools to keep tools dry (search for “dehumidifiers” in catalog); the crystals can be re-activated with 3 hrs in an oven
- Others types of desiccant packets are sometimes sold by seed houses
- Sachets saved from pill bottles, shoe boxes, etc. can help too

Germination tests for old seeds

To check % germination:

- Count out 5-25 seeds onto a wet paper towel or cloth
- Enclose in plastic container or bag and keep in a warm place
- When seeds sprout (2-7 days for most), count ‘sprouted’ vs. ‘unsprouted’ seeds

Is the seed still good?

Calculate % germination: [e.g., 15 seeds sprouted out of 20 = 75% germination rate]

- Germination rates above 75%: Seeds are fine
- Below 75%: Sow more seeds to compensate for lower germination
- Below 50%: Use up seeds this year & buy or save new seed for next season

If seeds were slow to germinate, it shows they are losing vigour: another clue that it is time to get new seeds

Should you grow your own seedlings?

Advantages:

- Gives you the widest choice of varieties
- Ensures you have seedlings when you want them
- Avoids bringing pests and diseases to your garden from elsewhere

But, to be successful:

- Must have the right growth conditions, especially bright enough light
- Requires 5-10 weeks of daily care

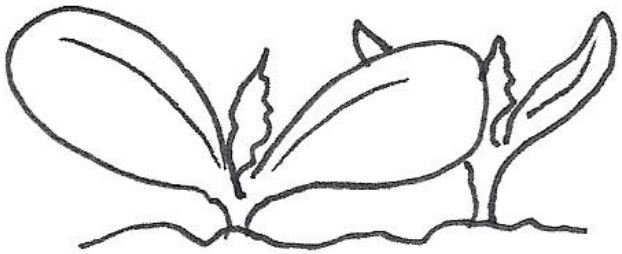
Can you provide high enough light levels for seedlings?

- Some sun porches & south-facing bay windows may provide (barely) adequate light very close to the glass
- Most windows don't provide enough light & rooms may be too warm for healthy growth
- Unheated greenhouses and cold frames provide excellent light levels and can be used to grow good quality seedlings if seeds are not started too early in the season
- Most gardeners would need invest in supplemental lighting or grow light set-ups

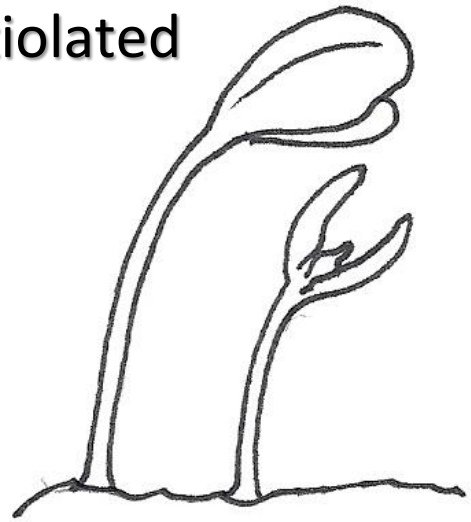
Once they sprout, seedlings must have very bright light during the day

- Insufficient light (especially in conditions that are too warm) causes elongated seedlings, leaning toward the light
- Such stems are weak and easily attacked by damping off fungi

Normal



Etiolated



Growing seedlings under lights

- Grow lights:
  - High intensity fluorescent tubes & high intensity LED ‘tubes’ are now available to fit into fluorescent fixtures
  - Old school: Four 40-watt fluorescent tubes plus 1 or 2 incandescent light bulbs
- Lights must be close to top of foliage for sufficient intensity (within 15-20 cm); mount lights on chains or movable supports to allow them to be raised as seedlings grow
- Use a timer to turn lights on for 16 hours per day
- Keep air temperature relatively cool (18-20^{o}C)

E.g., Small grow light set-up

- Sunblaster™ T5 high intensity, narrow fluorescent tube (LED tubes also available)
- Tubes rest on a clear plastic dome designed for this purpose
- Limited space, but is a good combination with using a coldframe or greenhouse for older seedlings

‘Old school’ grow light set-up: fluorescent tubes + incandescent bulbs
The light bank is on chains to be lowered and raised as needed

Other examples

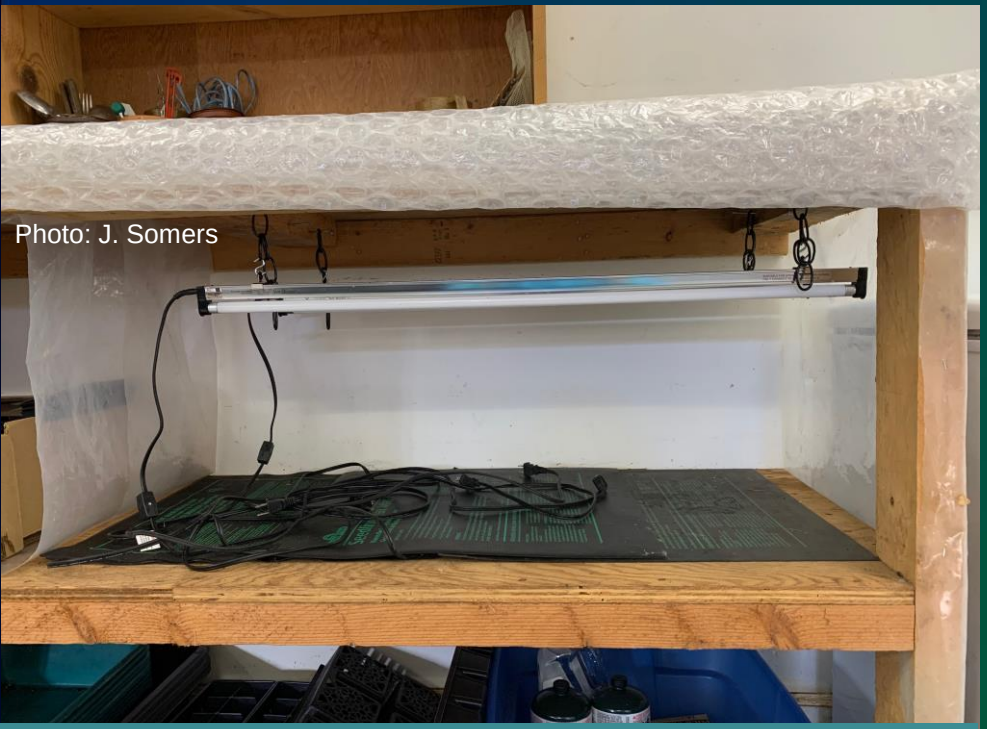


Photo: J. Somers

Set-up in a garage surrounded by plastic to keep in heat

Photo: M. Hargrove

Light stand with a watering mat base

Photo: B. Metzger

High intensity tube hung from cabinet

Using cold frames for seedlings

- Wait until days are longer & warmer before starting seeds (3-4 weeks later than under grow lights)
- Germinate seeds indoors in warmth
- Move seedlings out to the cold frame for the day
- Be sure to prop frame open to cool it on sunny days
- Move seedlings indoors at night until nights stay above 12°C

Labour intensive, but can produce excellent starts, as long as they never experience overheating or prolonged chilling

Using unheated greenhouses

Provide excellent light levels, but are cold at night and on cloudy days in early spring

- Germinate seeds indoors in warmth
- Until nights stay over 12°C, bring seedlings indoors at dusk
- Greatest risk is cooked plants: It can easily be 30°C inside on a sunny February day!
- Ventilate to keep daytime temperatures below 22°C

Seedling soil mixes

- For most gardeners the best option is often a commercial organic planting mix
- Make sure it contains nutrients: if it doesn't, mix in 25% good compost + 1 T complete organic fertilizer per gallon of mix

Always check the labels:

Potting mixes don't have nutrients

Planting mixes do have nutrients

Homemade soil mix

For large quantities, it may be worth it to make your own:

Mix 1 part each of:

1. Coir or peat moss
2. Vermiculite, Perlite or sand
3. Screened compost (use the best available)
4. Good garden soil

Plus, for each gallon of soil mix, add 1 tablespoon each of:

- Agricultural lime
- Complete organic fertilizer

Seedling containers

- Anything works: recycled plastic pots, food trays, milk cartons, etc. as long as it has drainage holes cut in the bottom
- Disposable pots can be made from newspaper
- To save space: Start seeds in a small container & transplant seedlings later to individual pots

Peat pots?

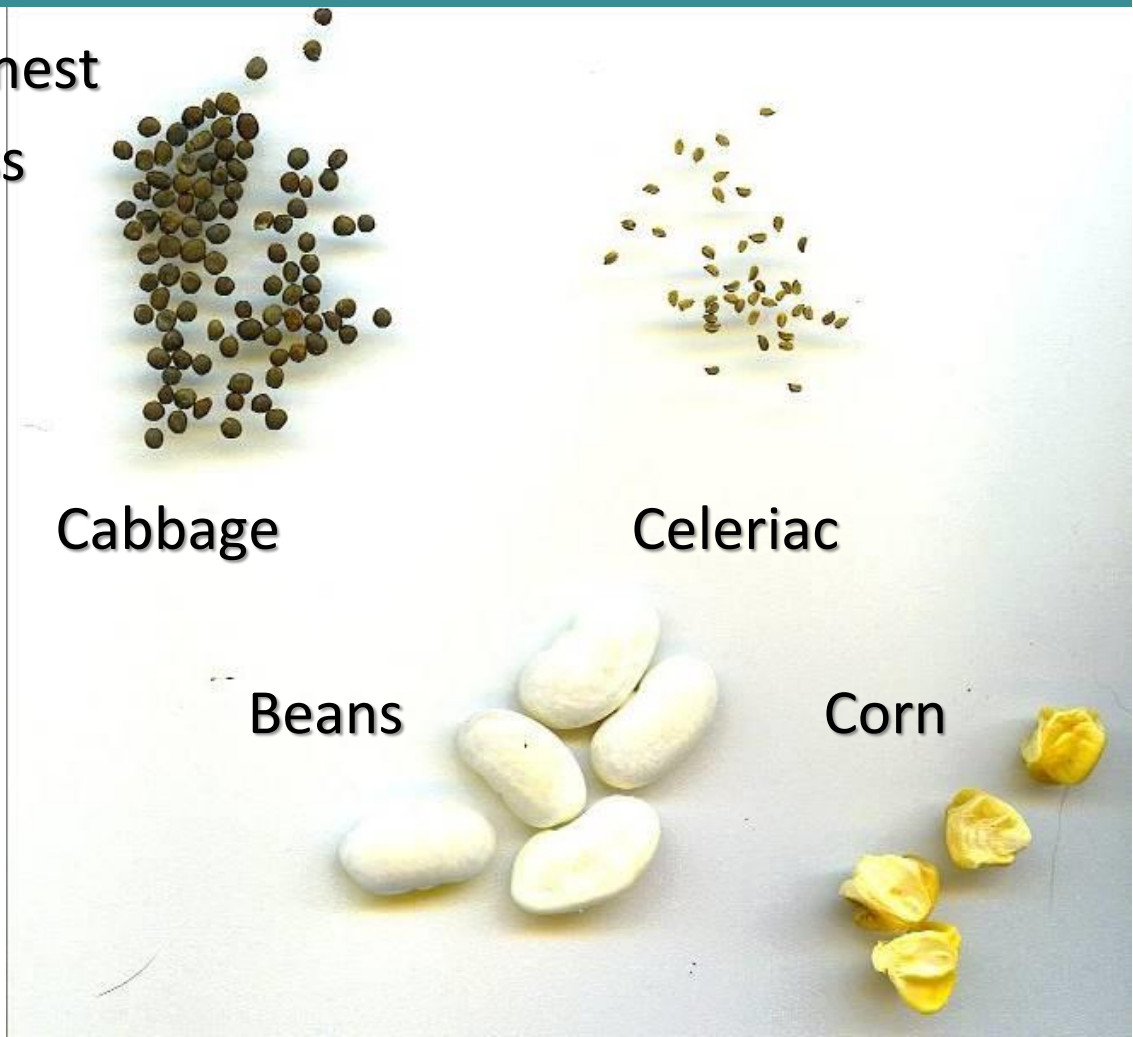
- Avoid peat or coir pots: Most fine roots can't get through the pots. You end up tearing the pot off the roots at transplanting time, causing a lot of damage

- Root balls slide more freely from plastic or waxed cardboard containers

Sowing depth

General rule: Cover seeds to a depth 3 times the width of the seed

Tiny seeds: Cover with thinnest layer of soil mix or just press them into the soil mix and don't cover



Optimum germination temperatures

21°C	24°C	27°C	30°C	35°C
Celery	Asparagus	Lima bean	Snap bean	Cucumber
Parsnip	Endive	Carrot	Beet	Muskmelon
Spinach	Lettuce	Cauliflower	Broccoli	Okra
	Peas	Onion	Cabbage	Pumpkin
		Radish	Eggplant	Squash
		Tomato	Parsley	Watermelon
		Turnip	Pepper	
			Sweet corn	
			Swiss chard	

E.g., Note how warm peas “like” it. Though they can germinate in cooler temperatures, they germinate best in warm conditions

Germinate warm, grow cooler

- Germination of all vegetables is best in very warm conditions (21-30^{o}C)
- Growth is best 5-10 degrees cooler (18-20^{o}C)
- As soon as seeds germinate, when 1st leaf tip shows, move seedlings to growth temperatures with maximum light levels during the day

Use bottom heat mat to germinate seeds, but not (usually) to grow out seedlings

Moisture: Don't overwater seeds

- Water seeds sparingly & avoid saturating the soil
- If possible, water seed trays from below

Barely damp	Moderately moist	Wetter soil
Cabbage family Pumpkins Squash Radishes Corn Melons	Beans Carrots Leeks Onions Peppers Tomatoes	Celery* Beets Endive Lettuce Chinese cabbage

*Also needs exposure to light to germinate so don't cover with soil

What to start early

- Jan/Feb: Celery, celeriac (need grow lights)
- Feb/March: Onions, leeks
- March: Tomatoes, peppers, eggplant, early cabbage, broccoli, cauliflower, sweet basil
- April: Zucchini & other squash, melons, cucumbers
- May: Corn, beans*

*First plantings benefit from an early start indoors, later plantings may be sown directly in the garden

For greenhouse crops

If you will be growing tomatoes, peppers, basil, cucumbers or other warmth-loving plants in a greenhouse all season, start seeds in February if you can provide the necessary light and warmth for good growth

Starting peas & beans indoors

- Get an earlier start by germinating & growing indoors for 2-3 weeks
- Avoids early pest damage (birds, slugs, weevils, pillbugs, cutworms)
- Seedlings grow on food stored in large seeds so no soil nutrients are necessary: use vermiculite, sand, perlite or a loose potting mix

But don't try to start seeds too early

You will have better quality plants, fewer problems (and less work) with a later start

Vernalization: A key reason not to start biennials too early

Late spring cold weather fools biennials into 'thinking' winter passed, causing them to produce flower stalks (bolting):

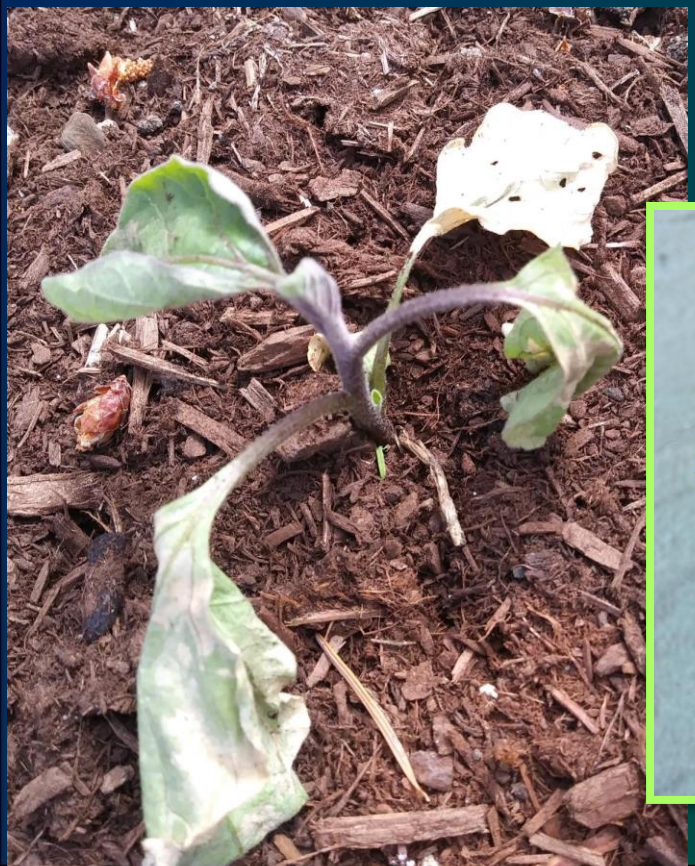
- 2 weeks exposure to 5-10^{o}C stimulates flowering in leeks, onions, beets, chard, celery, kale, cabbage & other biennials
- Can only occur if seedlings are big enough:
  - Leeks stems thicker than a pencil
  - Cabbage seedlings with >5 leaves

Remedy: Just don't start seeds of biennials too early

Hardening off seedlings

Sunburn can be fatal

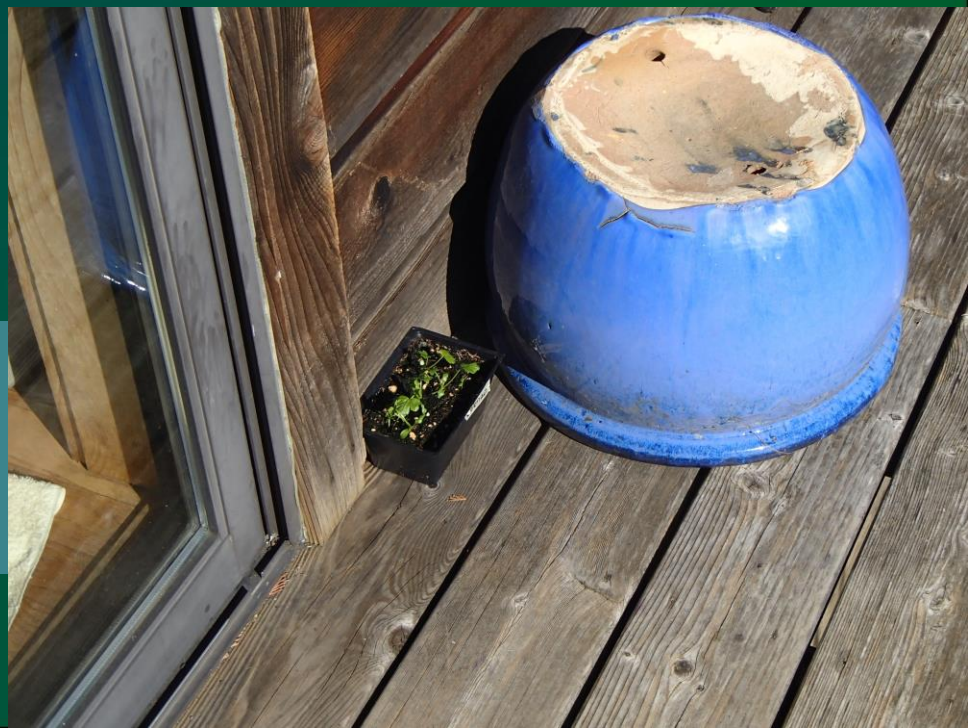
- Plants grown under lights or in greenhouses can be damaged or die from sunburn if suddenly exposed to full sunlight all day
- Typical sunburn damage: white or light tan spots & blotches on leaves, stems



Expose seedlings to full sun as early as possible

- For seedlings growing under lights or under glass: On warm sunny days, set them outdoors in direct sun in a sheltered spot, even if only for 1-2 hours
- Can make up for less-than-ideal indoor growing conditions if they can be set outdoors periodically

Even in late February, a sunny spot up against the house can be warm enough for a few hours



Hardening off seedlings

Seedlings started indoors or under glass need time to grow a protective leaf cuticle, build up sun screen chemicals in cells & grow stronger stems:

- If they have been under warm grow lights, reduce growth rate by growing in cooler conditions
- Gradually expose plants to full sun for longer periods each day:
  - Start with 1 hour (longer in cloudy weather), then move them to shade or back indoor
  - Increase exposure period over a week until they are in full sun all day

If plants must be transplanted outdoors immediately, shade the seedlings in place for the first week

Using a cold frame?

No need for the hardening off step:

- By opening the cold frame on warms days to cool it over the growth period, seedlings have become used to full sun and outdoor conditions by planting time

Avoid over-hardening

This occurs when seedlings:

- Suffer uneven watering, have been chilled or heat stressed during early growth
- Are started too early or held too long in small pots so they become rootbound

Such plants are slow to resume growth & may never fully recover, resulting in lower yields & later maturity

Severely stressed, over hardened seedlings →

Troubleshooting

Beware of 'damping off'

- Attacks germinating seeds or stems of seedlings: can cause total loss of seedlings in a container or seedbed
- Caused by a variety of soil organisms

Damping off is worst in cool, wet soil conditions

Preventing damping off

- Germinate seeds in warm conditions
- Soak soil before sowing, then take care to avoid over-watering
- Ensure good air circulation over seedlings (don't cover seed trays)
- Sow seeds thinly & thin seedlings early if required
- Don't pre-soak seeds (risks cracking large seeds)
- Use sterile seedling mixes OR use mixes enriched with unpasteurized compost (it has disease suppressing organisms)

Other tips:

- Cover seeds with vermiculite or perlite to keep surface drier
- Sow in individual pots to prevent spread of disease to all seedlings

Purplish tomato leaves

- Signs of a phosphorus deficiency due to being grown in conditions that are too cool
- They will outgrow this when they are warmer and older

Severe nutrient deficiency

- These were grown in “potting mix” which doesn’t have nutrients
- Look for seedling soil mixes that contain nutrients (read the label)

Recap: Steps for growing healthy seedlings

1. Start with a very warm germination period indoors (light is not necessary), on a heat mat or other bottom heat source until tips of shoots show (4-8 days for most vegetables)

2. As soon as seeds germinate, move trays to cooler conditions with maximum bright light for 16 hours/day for the growth period

3. Prepare seedlings for planting out by gradually exposing them to full sun and outdoor conditions


From tiny seeds your beautiful garden will certainly grow—
Happy gardening!
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