




Seed Starting

Lisa Johnson
Dane County UWEX Horticulture Educator
608-224-3715
Johnson.lisa@countyofdane.com
Mike Maddox, MGV State Program Office
Sharon Morrissey, Milwaukee County UWEX





Dane County UW extension

- Master Gardener Volunteer training
 - <http://dane.uwex.edu/horticulture/master-gardener/>
- UW Extension
 - <http://hort.uwex.edu/>
 - <http://learningstore.uwex.edu/>
- UW Plant Disease Diagnostic Clinic
 - <http://labs.russell.wisc.edu/pddc/fact-sheet-listing-all/>
- <http://www.missouribotanicalgarden.org/>



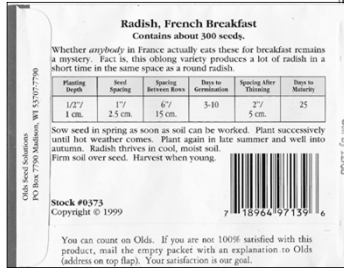

Starting Plants From Seed

- Purchasing Seeds
- Storing Seeds & Viability
- Timing of Seeding
- Containers
- Media and Sowing
- Germination
- Temperatures
- Lighting
- Watering, Fertilizing
- Thinning
- Transplanting
- Hardening off

Starting Plants From Seed

Check the seed packet for information –
Freshness Date
Germination Time
Planting Suggestions

Seed Packet Info, continued

Use disease resistant cultivars when available—especially for tomatoes and cucumbers

CAULIFLOWER, Early Snowball -- *Brassica oleracea* (Botrytis)
When planted in early spring or late summer so that it can mature in cool weather, this popular cauliflower variety rewards you with large heads of snowy white curds. Enjoy this mild-flavored vegetable raw, steamed or pickled.



Planting Depth	Seed Spacing	Days to Sprout	Spacing After Transplanting	Spacing Between Rows	Days until Harvest
1/2"	2 seeds per pot or cell	5-10	18"	24-36"	60*

*From setting out transplants.

PLANTING: For a spring crop, start seeds indoors 4 to 6 weeks before planting outdoors. Harden off seedlings by putting them outside during the day for 1 week before transplanting. Plant after danger of a hard spring frost is past. For a fall crop, transplant seedlings into the garden in mid to late summer. Before transplanting, enrich the soil with compost.

GROWING: To avoid disease problems, don't plant where cauliflower or related plants grew within the last 2 years. Water regularly and fertilize monthly. When the head begins to form, tie the outer leaves up over the top of the head to "blanch" it (make the curds white).


HARVESTING: Cut the stem just below the central head while the flower buds are small and tight.

Disease Resistance Codes

<http://www.a-harvest-to-remember-vegetable-gardening.com/disease-resistant-plants.html>

Code	Disease Resistance or Tolerance
A	Alternaria Stem Canker
BLS	Bacterial Leaf Spot
BMV	Bean Mosaic Virus
CMV	Cucumber Mosaic Virus
DM	Downy Mildew
F	Fusarium Wilt
FF or F2	Fusarium Wilt (Races 1 AND 2)
LB	Late Blight
N	Nematodes
NCLB	Northern Corn Leaf Blight
PM	Powdery Mildew
R	Rust
SCLB	Southern Corn Leaf Blight
St	Stemphylium or Grey Leaf Spot
SW	Stewart's Wilt
T or TMV	Tobacco Mosaic Virus
TSWV	Tomato Spotted Wilt Virus
V	Verticillium Wilt



Seed Starting

- Fresh seed germinates best
- Store seeds in a cool, dry place. Best kept in tightly closed containers at $\pm 40^{\circ}\text{F}$ at low humidity.
- Germination rate decreases with the age of the seed. Some seeds are viable longer than others
- Onions: *1 year*
Corn and peppers: *2 years*
Beans, carrots, peas: *3 years*
Beets, pumpkins, squash, tomatoes, watermelons: *4 years*
Broccoli, cabbage, cucumbers, lettuce, cantaloupes, radishes, spinach: *5 years*

UW Extension
DANE COUNTY

Seed Starting

- Germination rates for fresh seed: 80-100% will germinate, 60-75% will grow into useful seedlings
- Seed Roll Test: take 10 seeds, put in a moist paper towel in a plastic bag (not sealed). Keep at 70°F or so for the amount of time the package says is normal for germination. If rate is 60-80%, plant, but maybe a bit more thickly than usual

Dannylipford.com

UW Extension
DANE COUNTY

Timing of Seeding

- Average growing season in metro Madison
 - May 15th – Oct. 21st = 164 days
 - Avg. Frost Free Date to Avg. First Frost
 - Average frost-free date still means a 50% chance of frost!
- Count back from days to harvest (on packet)
 - Include germination time
 - Often there is guidance on when to start inside (ex. 6 weeks before average last frost)
 - In Madison, most seeds can be started inside in mid- to late-March.
 - Wait longer to start cucurbits

UW Extension
DANE COUNTY

Timing of Seeding

- Squash, cucumbers and melons don't transplant well, so if starting indoors, start in peat or coir or paper pots that can be put directly into the ground and will biodegrade

UW Extension
DANE COUNTY

Why Start Seeds Indoors?

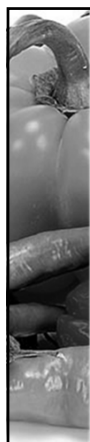
- Why Indoors?
 - Small seeds
 - Seeds that need warm temperatures to germinate
 - Long season plants
- Supplies needed
 - Clean containers (with drainage)
 - Bright natural light or grow-lights
 - Sterile seed starting medium
 - Location with proper ventilation and temperature
 - Bottom heat—maybe

UW Extension
DANE COUNTY

Containers



- Containers
 - Any container with drainage will do (except ones with copper insides or ones that diseased material grew in)
 - Disinfected
 - Clean off any soil with a brush. Soak several minutes in 10:1 bleach solution
 - Good drainage
 - Adequate root space but not excessive

UW Extension
DANE COUNTY


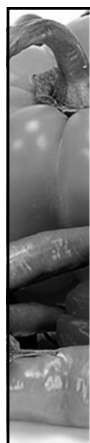


Containers

- Containers
 - Flats
 - Broadcast or sow rows 2" apart
 - Transplant to packs or pots later
 - Plastic cell packs
 - Peat or coir pots
 - Cardboard egg cartons (these may decay before the seedling can go outside)
 - Deli, yogurt and fast food containers with holes cut into the bottom







Containers



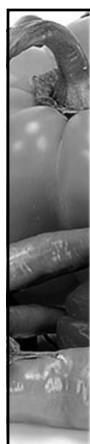
Seed Starting Media

- Use seed-starting mix to plant seeds indoors as opposed to potting soil
- Usually soilless mixes with ground sphagnum, vermiculite. Are porous, fine-textured, hold water, aerated, not high in nutrients, pasteurized, balanced pH
- Make sure the medium is moist! Mix in water with clean tools
- Use a sprinkling head on the watering can with small holes so seeds aren't washed away



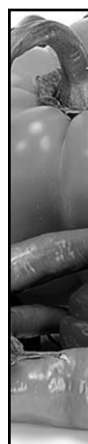
Seed Starting

- Moisten media so it almost drips when squeezed
- Fill pot or cell-pack to top with moistened medium
- Gently press down and add more medium if needed, leave a small water reservoir
- Can use fine sand or sugar to help evenly distribute tiny seeds
- Can use Dial-A-Seed planter, or a moistened popsicle stick or pencil eraser to help plant seeds
- After planting, water in gently


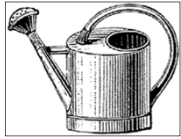

Germination

- Factors affecting germination
 - Seed age
 - Moisture
 - Temperature
 - Light (or dark)
 - Oxygen
 - Genetics

Watering Seedlings

- Can water from below in tray before seeds germinate and when seedlings are very small, but don't allow packs or pots to sit in water
- Allow slight drying between waterings
 - Helps prevent disease
- Don't let seedlings wilt
- Plants shouldn't stay wet, though humidity is important

Soil Temperatures

- **SOIL Temperature:** Many seeds have minimum, maximum, and optimum soil temperatures at which they germinate.
- Generally, 70° to 75°F works for most plants.
- <http://cmg.colostate.edu/gardennotes/720.pdf>
- A heat mat may be helpful. Don't use heating pads meant for people!



UW **Extension**
DANE COUNTY

Air Temperatures

- **AIR temperatures:**
- Day temperatures about 65-75°F
- Night temperatures 60-68 °F (about 10°F lower)
- Cool season crops need cooler day and night temperatures, about 65°F for day and 55°F at night



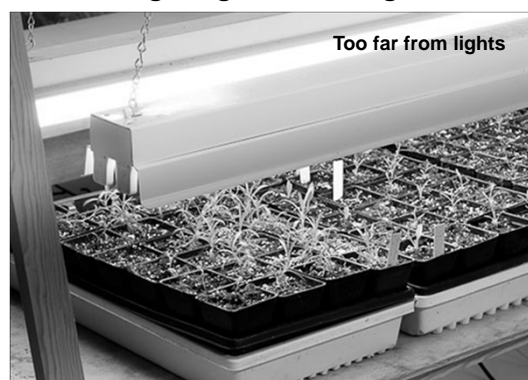
UW **Extension**
DANE COUNTY

Lighting for Seedlings

- Seedlings need bright light. If you use a window for growing, rotate the plants to prevent a phototropic response.
- It may be best to use artificial light. Use a 40-watt cool-white and a warm-white fluorescent tube OR plant growth lights. Do not use incandescent bulbs!
- Position seedling 1-3" from the tubes and keep the lights on about 16 hours each day. Timers are helpful. Spinach and lettuce may bolt with more. Move either the lights or flats as the seedlings grow so they don't grow into the lights.

UW **Extension**
DANE COUNTY

Lighting for Seedlings



DANE COUNTY

Germination

- Barriers to Germination
- Dormancy—may need a cold period to break dormancy
- Scarification
 - Soaking or scratching the seed
- Stratification
 - Exposing seed to moisture and specific temperatures degrades chemical inhibitors causing dormancy




UW **Extension**
DANE COUNTY

Fertilizer

- Apply after seeds germinate and reach about ½-1 inch in height.
- A half-strength dose of a water-soluble synthetic fertilizer such as 10-10-10 fertilizer OR a liquid organic product like fish emulsion or pasteurized compost tea can be used.
- Use the synthetic fertilizer every two weeks; may need to apply the organic product more often depending on its analysis.






UW **Extension**
DANE COUNTY




Thinning

- Thinning out of seedlings can be done as soon as the first set of leaves comes out.
- Thin to prevent physical and disease problems.
- Snip off weaker plants at soil level with a small scissors so roots of the “keepers” are not damaged or disturbed.







Transplanting

- Move to larger container after thinning if needed
- Handle seedling gently by cotyledons or leaves & support from below when transplanting, don't pull the stem
- Lift seedlings using a small flat tool (ex. plastic knife or popsicle stick)
- Gently tease apart tangled plants/roots
- Use a “dibble” (pencil or spoon) to make hole in the new media and press in gently, then water






crystalgh.hubpages.com




Hardening Off

- After seedlings establish, move them to an airy, cooler location, with air temperatures of 55°F to 60°F night and 65°F to 70° F day (in general).
- Cold frames work well
<https://store.extension.iastate.edu/ItemDetail.aspx?ProductID=4182>
- Hardening off alters the quality of plant growth through cuticle development so plants can handle rapid environmental changes.



Hardening Off

- Move seedlings to a sheltered location outdoors for a couple hours
- Best in the early morning or early evening.
- Start a couple of weeks before planting the seedlings in the garden.
- Each day the plants stay outside longer and in sunnier, more exposed locations.


Direct Seeding Outdoors

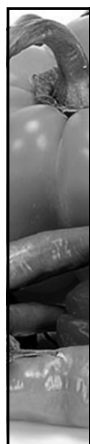
- Direct seeding outside avoids transplant shock
- Shorter season available than for seedlings started indoors, which means a later harvest
- Less work but more risk with weather, insects, disease, erosion, squirrels and rabbits
- Radish, leeks, carrots are best direct-seeded outside. Lettuce and spinach can be started inside or out. Tomatoes and peppers best started indoors
- Peas, onion sets & potato ‘starts’ can go out on April 15, depending on weather in Madison
- Beans go out mid-late May depending on weather in Madison

Seed Starting Resources

- “The Seed-Starter’s Handbook”, Nancy Bubel
- <http://learningstore.uwex.edu/Vegetable-Garden-The-P518.aspx>
- “Ball Culture Guide: Encyclopedia of Seed Germination”, Jim Nau
- “The Plant Propagator’s Bible”, Miranda Smith
- Virginia Extension:
 - <http://pubs.ext.vt.edu/426/426-316/426-316.html>
- “Vegetable Gardening in the Midwest” C.E Voigt and J.S. Vandemark





Thank You!

Lisa Johnson
Dane County UWEX Horticulture Educator
608-224-3715
johnson.lisa@countyofdane.com
and Dane County UWEX
Master Gardener Volunteers
608-224-3721

