

Seed Starting Basics

NC STATE EXTENSION

Master Gardener | Union County
Volunteer Association

NC COOPERATIVE
EXTENSION



NC STATE
UNIVERSITY

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Why Seeds?

- Less expensive than plants
 - Greater Variety of plants and cultivars
 - Control of timing – not tied to when plant is available in store
 - Amount – start as few or as many of one cultivar as you like
 - Cultural/historical/familial ties
 - New cultivars
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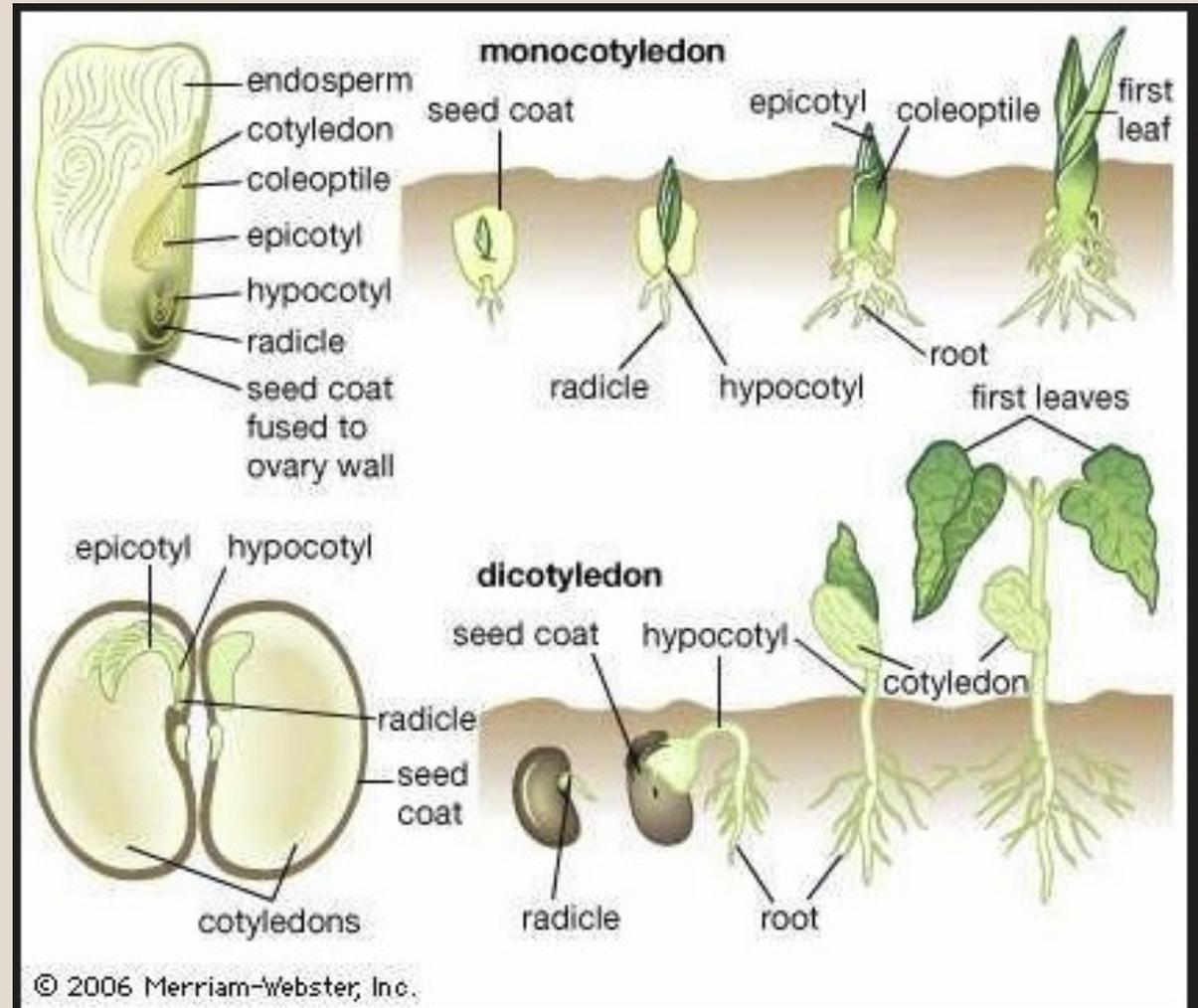
The background features a light grey base with large, overlapping organic shapes in muted green and brown. A white silhouette of a pine branch is visible in the upper left. A white wavy line curves across the bottom right. The text 'Seed biology' is centered in a white serif font.

Seed biology

Seed biology

A seed is an undeveloped plant embryo and food reserve encased in a protective outer covering.

All seeds have the same biology but require differing environmental factors to germinate and grow vigorously.



Environmental Factors

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graph TD; Root((Environmental Factors)) --- Temp((TEMPERATURE)); Root --- Water((WATER)); Root --- Air((AIR)); Root --- Light((LIGHT)); Root --- Special((SPECIAL));
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TEMPERATURE

Seeds have an optimal soil temperature range

AIR

Seeds need proper oxygen and air flow

WATER

Seeds need moisture

LIGHT

Seeds have specific light requirements

SPECIAL

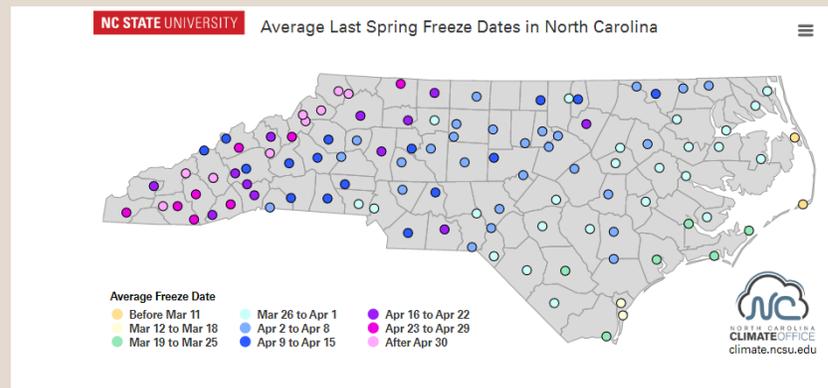
Some seeds require special methods to break internal and external dormancy

The background features a light grey base with several overlapping organic shapes. A large, dark brown shape is on the left, and a muted green shape is on the right. Faint, stylized foliage patterns are visible in the top left and bottom right. A white, wavy line curves across the bottom right.

Indoor seed starting

Get Prepared – Seeds and Timing

- Select and order seeds!
- Prepare to start seeds as per packet instructions – 4-12 weeks prior to last frost date
- Remember – last frost date in Union County is 16 April



<https://products.climate.ncsu.edu/freeze/map.php>

Get Prepared – Containers

- Any container that can hold soil/medium and drain water will work
 - Seed pots
 - Peat pots
 - Solo cups
 - Food containers
 - Dixie cups
 - Milk containers
 - Paper/roll pots
- Containers should be large enough to accommodate a growing seedling
- Put individual containers into a tray or baking pan to allow for “bottom” watering
- If reusing pots – scrub and sanitize - helps to prevent damping off disease later
- Soil Block – if using a soil block system, clean and sanitize your blocker as well as the tray and mix container prior to use

Get Prepared – Medium/Soil

If you are using any sort of container:

- Soil should be light enough allow air and water to circulate easily
- Soil should be able to hold moisture
- Particles should be uniform in size
- Soil should be relatively sterile and low in fertility

Seed-starting mix is available in pre-packaged form, or you can mix your own with a combination of :

- Sphagnum Peat Moss
- Perlite
- Finely shredded coir or pine bark

Most Seed Starting mixes have some light fertilizer - although Seeds do not require fertilizer to germinate, they will need it once they become seedlings.

If you are using a soil blocker:

Seed Starting mix should be a bit “thicker” to hold shape after blocking. (Recipe in Appendix)

- Do not use regular garden soil! It is generally too dense and does not drain!
 - Do not reuse soil for seed starting!
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Get Prepared - Light

Most seeds do not need light to germinate, but once germinated, seedlings will need light to continue to grow and be vigorous. Seedlings that do not have adequate light will grow leggy and unable to support their growth.

For plants that require light to germinate, the light should be broad enough to give all the seeds equal coverage.

Light can be in the form of a light bulb, a light bar, or just a sunny window.

For best results, the light should be able to be raised to maintain a 4-6 inch distance from the seedlings as they grow. (Post germination)

Get Prepared – Other Kit

Additional items you will want to have easily on hand –

- Labels! Tag your plants !
 - Pencil for writing labels
 - Tool to poke holes and fluff soil (chopstick, pencil, small dibbler)
 - Seed starting tracker – keep track of your successes
 - Heat mat if desired
 - Plastic wrap, humidity dome, or clear plastic bag
 - Emery board or sandpaper (for seed scarification)
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The Process – First, the seed

Find your seeds 😊

Check if the seeds require special care:

- Stratification – if the seed needs cold or warm stratification
 - Scarification – if the seed needs physical alteration
 - Both – some seeds will need scarification followed by a period of stratification
 - Group seeds by recommended start date so you can start them accordingly
 - If you are using older seeds (1 year or more) do a germination test
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The Process – The seed bed

To prepare the seed bed for containers:

- Soak your soil – make sure it is completely wet!
- Ensure your container has enough drainage holes to allow water to drain away quickly
- Fill the container(s) with selected soil – do not pack!
- Gently wet (again) thoroughly and allow to drain – tepid or warm water
- “Fluff” the top two inches of the soil

To prepare the seed bed if using a soil blocker

- Soak your soil – make sure it is completely wet!
 - Fill your work container – where you will “chonk” the blocker for filling
 - Fill the blocker tool and release on the planting tray (tray should have plenty of drainage)
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The Process – Introducing seed

For seeds that need darkness to germinate:

In your container, make 1-3 dimples of 1/8-1 inch deep

- Carefully drop one seed into each dimple
- Cover the seed and press lightly– gentle!
- Water gently – or just mist if soil is very wet – or soak the container in a larger container of warm water until wet
- Cover with plastic wrap, humidity dome, or plastic bag (clear)
- Place in a warm place, or on a heat mat with indirect light

Alternatively:

- In your container, furrow some narrow rows 2 inches apart roughly 1/4- 1/2 inches deep
- Gently sprinkle seed evenly in the furrow
- Cover the seed and press lightly – gentle
- Water gently – or just mist if soil is very wet – or soak the container in a larger container of warm water until wet
- Cover with plastic wrap, humidity dome, or plastic bag (clear)
- Place in a warm place or on a heat mat with indirect light

The Process – Introducing seed

For seeds that need light to germinate:

- In your container, press soil down lightly
- Scatter seed sparingly over top of soil
- Mist or soak the container in a larger container of warm water until wet
- Cover with plastic wrap, humidity dome, or plastic bag (clear)
- Place in a warm place, or on a heat mat in a lighted location – under a grow light or a sunny window

*if fungus gnats are an issue, cover seeds with light coat of vermiculite

For soil blocking –

- Gently place 1-2 seeds per block.
 - Lightly cover with additional soil or vermiculite
 - Lightly mist
 - Cover with plastic wrap or a humidity dome or plastic bag
 - Place in a warm place, or on a heat mat with indirect light
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The Process – Waiting for germination

While waiting for germination:

- Keep an eye on moisture – add additional water as needed – bottom watering or mist
 - If algae begins to form on the surface, raise the plastic and allow for air flow and some drying of the top layer
 - Prepare your lights and grow area for the germinated seedlings
 - Prepare pots and soil mix for when you need to “pot up” your seedlings
 - Seed can take anywhere from 5 to 21 days to germinate.
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The Goal – Germination

Once seeds begin to sprout :

- Monitor for germination – once most have germinated, remove the plastic or humidity dome
 - Remove the heat mat
 - Move to a well-lighted area. Set lights roughly 4-6 inches above the sprouts (if possible) to encourage stocky stems
 - Keep an eye on moisture – sprouts can dry quickly. Do not let them wilt!
 - Avoid drastic changes in temperature – warm day to cold night
 - If algae attempts to form on the surface – add a fan to dry the surface of the soil
 - If you need to “thin” sprouts – cut them off at the soil line
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The Goal – Seedlings

Once seedlings are growing and showing true leaves – pot up!

If several seedlings in a container –

- With a knife or label (thin, to get between soil and the side of the pot), gently remove seedlings
- Allow seedlings to “fall” apart and carefully pick out individual plants, discarding any that are damaged or weak
- In a larger pot with clean, moist soil, make a hole the size of the seedling and gently set into place - Handle by the leaves, not the stem!
- Carefully press the soil to the seedling (gently) to form good bond and provide stability
- Water the new plants gently – bottom watering is best
- Return to lighted area, add a fan to provide air circulation and build strong stems

The Goal – Seedlings

Once seeds are growing and showing true leaves –

If a few,

- Gently tease seedlings out and repot in their own containers to continue to grow on or discard the weakest two. Handle by the leaves, not the stem!
- Carefully press the soil to the seedling (gently) to form good bond and provide stability
- Water the new plants gently – bottom watering is best
- Return to lighted area, add a fan to provide air circulation and build strong stems

If single seedling in a container –

- Leave in place and plan to repot once seedling has several sets of true leaves or you are seeing roots working out of the bottom
- Keep in a lighted area, add a fan to provide air circulation and build strong stems

For soil blocking –

- Build a larger block of soil and gently move the small block to fit into the bigger one.
 - Continue environmental protocol for seedlings
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Going forward

As the seedlings continue to grow:

- Continue to maintain good lighting –move the light a few inches away from the plant as needed – don't let plants grow into the lights as they may scorch
 - Continue to water as needed from the bottom – encourages roots to grow deeper and protects foliage and stem from fungal diseases
 - Continue to “pot up” as needed – you may have to repot your seedlings two or three times while waiting for favorable conditions to plant outside
 - Fertilize with a diluted liquid fertilizer about every-other week. The seedlings food source in the cotyledon has been exhausted.
 - Set a fan on them to blow lightly and help with air circulation and to build resilient stems
 - Get them outside! As weather allows, get them out into dappled shade, increasing their duration over a couple of weeks. Ease them into full sun
 - Once threat of frost passes, they can be gently transplanted into the garden
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Sowing Directly

- If you are planning to plant seeds directly in the garden:
 - Prepare your garden soil:
 - Add amendments as per a soil test or compost to help with drainage
 - Dig at least 12 inches down for root growth
 - Ensure the top 3-4 inches are fine tilth with no rocks or sticks. Particle size should be relatively uniform
 - Monitor soil temperature - Using a soil (or repurposed meat) thermometer, monitor when your soil is warm enough for germination – do not plant prior!
 - Dig furrows, holes, or make mounds at the proper planting depth for that crop
 - Spread seed uniformly in rows or plant individual seed in prepared holes, cover and press gently to get good contact
 - Water uniformly and keep moist as seeds germinate
 - Once germinated, thin by trimming at the soil line, and keep an eye out for any weeds that will steal nutrients
 - After sprouts are well established, mulch the garden, keeping mulch off the individual plants.
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Questions and Lab



The background features a light grey base with several organic, overlapping shapes in muted colors: a large brown shape on the left, a green shape at the top right, and a light blue-grey shape in the center. A white, stylized pine branch silhouette is visible in the top left corner. A white, wavy line graphic curves across the bottom right portion of the page.

Appendix

Easy Germination Test

To perform a germination test:

- Place seeds in a damp paper towel about an inch or so from the bottom
- Roll the towel up and place in a jar with a little water in the bottom (the towel will absorb the water and keep the seeds moist)
- Check the seeds every couple of days to make sure the seeds are moist and there is a little water in the bottom of the jar (if doing this in January, the seeds need to be kept in a warm location)
- Between seven and 10 days later, unroll the paper towel and see what germinated

Light and soil temperature requirements

Plant	Approximate Time to Sow Before Last Frost (weeks)	Time Seeds Take to Germinate (days)	Temperature (°F)	Light/Dark Requirement
Ageratum	8	5–10	70	Light
Alyssum	8	5–10	70	Either
Aster	6	5–10	70	Either
Balsam	6	5–10	70	Either
Begonia	12 or more	10–15	70	Light
Broccoli	8	5–10	70	Either
Browallia	12 or more	15–20	70	Light
Cabbage	8	5–10	70	Either
Cauliflower	8	5–10	70	Either
Celosia	8	5–10	70	Either
Centaurea	6	5–10	65	Dark
Coleus	8	5–10	65	Light
Cosmos	4 or less	5–10	70	Either
Cucumber	4 or less	5–10	85	Either
Dahlia	8	5–10	70	Either
Dianthus	10	5–10	70	Either
Eggplant	8	5–10	70	Either
Geranium	12 or more	10–20	70	Light
Impatiens	10	15–20	70	Light
Larkspur	12 or more	5–10	55	Dark
Lettuce	8	5–10	70	Light
Marigold	6	5–10	70	Either
Muskmelon	4 or less	5–10	85	Either
Nicotiana	8	10–15	70	Light
Pansy (Viola)	12 or more	5–10	65	Dark
Pepper	8	5–10	80	Either
Petunia	10	5–10	70	Light
Phlox	8	5–10	65	Dark
Portulaca	10	5–10	70	Dark
Snapdragon	10	5–10	65	Light
Squash	4 or less	5–10	85	Either
Tomato	6	5–10	80	Either
Verbena	10	15–20	65	Dark
Vinca	12 or more	10–15	70	Either
Watermelon	4 or less	5–10	85	Either
Zinnia	6	5–10	70	Either

How To Scarify

Scarification is the process of modifying a seed's outer coating to allow it to break external dormancy.

In nature, this is generally done by animals chewing or eating the seed, or by freezing temperatures cracking the seed coat. Here are a few processes to mimic nature:

- Mechanical – with a metal file, sandpaper, or an emery board, gently scratch the seed coat. You do not need to grind, just lightly sand the top layer until you see the kernel. You only need to do this in one place
- Chemical – In a clean jar, add seeds in a single layer and add vinegar to cover. Stir gently and allow to sit for about an hour and no more than overnight. Drain, rinse well, and allow to dry
- Water – Boil water in a small pot. Remove from heat, place seeds into the water, allow to cool. drain. And dry

How To Stratify

Stratification is the process of forcing a seed to break internal dormancy.

In nature, this is generally done by seeds being in a winter environment. Here are a few processes to mimic nature:

- Cold – Dry Stratification – Place seeds in a plastic bag and put in a refrigerator or a rodent-proof container in an unheated building over the winter for 30 days (or more, depending on species)
- Cold –Moist Stratification – Place seeds in a container with an equal volume of moistened inert material – sand, peat, sawdust, vermiculite, or similar. Close the container tightly and store in the refrigerator two to four weeks. Check the container occasionally to ensure it has not dried out.
- Warm-Moist Stratification - Place seeds in a container with an equal volume of moistened inert material – sand, peat, sawdust, vermiculite, or similar. Close the container tightly and place in a warm area maintained at 68-86 degrees (depending on species) for two to four weeks. Check the container occasionally to ensure the medium has not dried out.

SOIL BLOCK RECIPE

From *The New Organic Grower*, by Eliot Coleman

A standard 10-quart bucket is the unit of measurement for the bulk ingredients. A standard 1 cup measure is used for the supplementary ingredients.

The following recipe makes approximately 2 bushels of mix.

3 buckets brown peat (standard peat moss).

- ½ cup lime. Mix ingredients together thoroughly.
- 2 buckets coarse sand or perlite.
- 3 cups base fertilizer (equal parts blood meal, colloidal phosphate, and greensand). Mix thoroughly.
- 1 bucket garden soil.
- 2 buckets well-decomposed compost. Mix all ingredients thoroughly.

Moisten the mix thoroughly using 1-part tepid water for every 3 parts blocking mix. Successful soil-block making depends on the mix being wet enough. The mix should have the consistency of soft putty or wet cement, so that a small amount of water oozes through small openings in the blocker as the blocks are made, and the individual blocks cling to the blocker until you are ready to release them.

Common issues

Issue	Potential Cause
Seeds did not germinate at all	Soil not at temperature Planted too deep Needs Scarification/Stratification Poor seed quality
Seedlings are long and spindly	Not enough light Need to be thinned
Seedlings are wilted	Not enough water
Seedlings leaves are yellow and wilting	Too much water
White fuzz (mold) or algae on surface	Too much water
Soil smells weird or bad	Too much water
Seedlings collapse at base of stem	Damping off Disease
Seedling heads missing	Insect/Mouse damage

