

# How to Succeed at Seed Starting

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*Any gardener can appreciate the benefits of home-started seedlings. If you start your own seeds, you will have a much greater variety of vegetables, flowers, and herbs to choose from than if you just go down to the local garden center to pick up six-packs of nursery-raised starts. From old-fashioned sweet peas to French tomatoes to tasty basil, seed starting opens a world of plants to explore and enjoy right at home. You will also be able to give your starts special personal care, and time your plantings so the seedlings will be ready to go into the ground at just the right time for your area.*

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Seed-starting may not seem a simple task if you have never done it before. Some seeds will do fine if they are sown right out in the garden — once the weather is warm enough.

With many vegetables, flowers, and herbs, you will want and need to get a jump on the typical North Dakota growing season by prestarting the plants indoors a few weeks before it is time to set them outdoors.

Many fruiting plants and flowers will not grow and flower and/or bear fruit in our northern climate zones unless they are given this head start indoors because our summers just aren't long enough. Light, moisture, fertility, temperature and timing are all factors that need to be managed properly.

What follows is a guide to help you shorten the learning process a little. After you have done it once, it will seem easy and routine.

Let's begin by breaking the whole operation into its basic components. Remember that *seeds* and *baby seedlings* are two different things — so you will have to treat them differently.

## What Seeds Need to Grow

### Soil

The first step is to make sure you have an appropriate growing medium for your plants. Inappropriate mixes can get rock hard after a few waterings. Your mix has to stay light and friable. For that reason, **don't** use plain garden soil. You may be able to find a good quality planting mix locally. Some growers start seeds in straight horticultural vermiculite ("popped" mica flakes) or a mixture of equal amounts of vermiculite, milled sphagnum moss, and perlite. Such ingredients are very light and hold moisture well. They have little nutritional value, but seeds contain the food they need to germinate. These ingredients are available at most nurseries.

Your planting mixture can be put in cutoff milk cartons, deep-sided disposable aluminum pans, or special seed-starting systems. They should be at least 3 inches deep for roots to grow and have small holes for drainage. Many gardeners prefer to make traditional wooden flats (14" by 12" by 6" is a good size). Leave about 1/8-inch gap between the bottom boards so extra water can drain out, and then cover this base with newspapers or a thin layer of leaves to keep the soil from draining out.

**Note:** Some gardeners grow seedlings in two indoor growing stages. They start them in one flat and then "pick them out" (i.e. transplant them) to another roomier flat for a few weeks, where seedling roots will have more room to grow before final transplanting into the garden. If you go this route, you might want to make your starter flats longer and shallower, say 14" by 23" by 3".

### Temperature

Many seeds are native to tropical or subtropical regions and are genetically programmed to grow only in warm soil temperatures. Generally, seeds germinate better if their soil (not air, *soil*) temperature is constantly 70°F or above (and at the other end of the range, some germinate best at 80° to 85°). See the chart on the last page for specifics. Keep the seed trays in a constantly warm place.

Examples include the top of a water heater, over a gas stove's pilot light (caution: some plants, such as tomatoes, are susceptible to gas leaks), above a floor register, or behind a wood stove, (but keep them high enough to avoid floor drafts and check daily for drying out). Another good solution is under and close to fluorescent lights. (They are a good source of additional warmth.) Look for any warm spot you can find. Do not put seed starting trays in a windowsill; it is almost always much too cool for good germination, particularly at night and the morning. Maintaining consistently warm temperatures, both day and night, signals the seeds to begin growing.

Probably no other factor will speed up germination time more than a constant warm temperature. As insurance, you may want to go to the extra step of buying a bottom-heating seed propagation mat (shown at bottom).

### **Moisture**

Seeds also need to be kept constantly moist in order to germinate. Two key words here: *constantly* and *moist*. Never let the germination media dry out. In other words, the mix should be kept moist, but not too wet; the consistency of a just wrung-out sponge is about right and a good standard to use. Moisten the media thoroughly before sowing, mix it well to distribute moisture evenly, and be sure it doesn't dry out afterwards. One easy aid is to

draped a sheet of plastic wrap on top of newly planted seeds to keep moisture in. Be sure to check every single day to see if any seeds are starting to sprout. If they are, immediately remove the cover so they can get some light and air circulation.

Water as often as needed from above, but don't just pour water on unrooted seeds or they will wash right out of the soil mix. Use a plastic spray bottle or a watering can with a very fine, upward-pointing hose so the drops will fall very lightly on the soil. If the seedling tray has a plastic cover that is available, lift it up to water, then lay it down again. Check often. The water should be at least room temperature. It is advisable to allow any chlorinated water to stand for a day to allow the chlorine to dissipate.

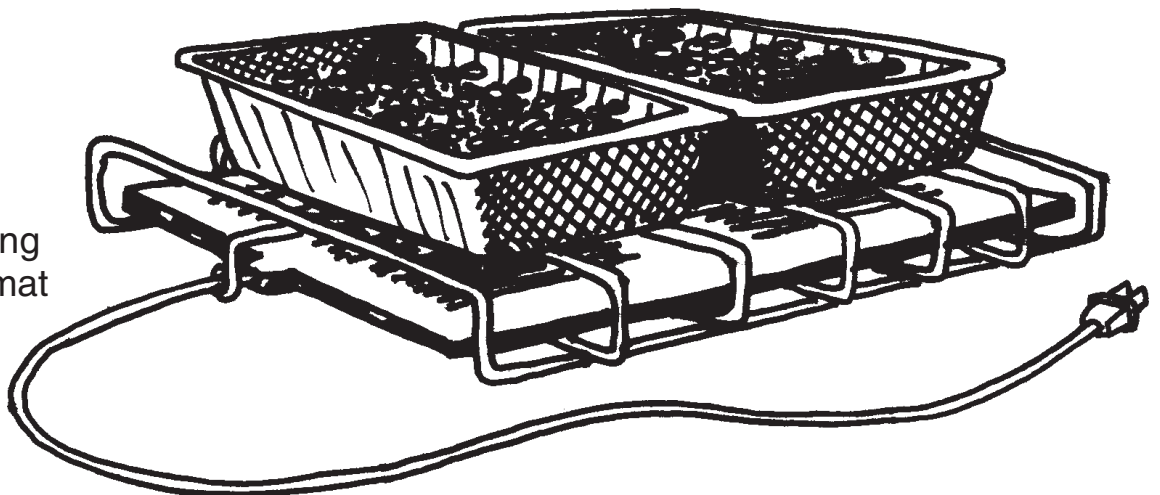
### **Light**

Most seeds don't need light to germinate, just warmth, moisture, and darkness. This applies only to germination or sprouting; after the seedling appears above the soil, light is a necessity.

### **Fertilization**

Fertilization is not necessary for seeds, as they carry their own food and have enough food energy to germinate on their own. Young seedlings, on the other hand, will need a weak fertilizer to grow successfully.

Bottom-heating propagation mat



## Sowing Your Seeds

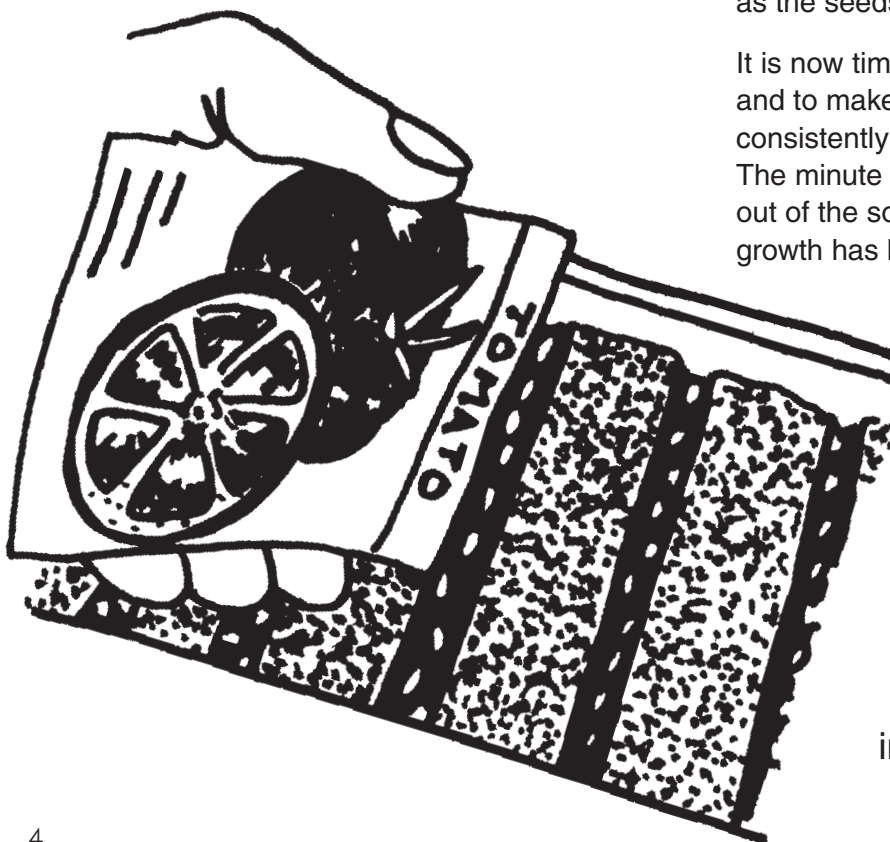
Now that the five basic conditions necessary for germinating seeds have been covered, it is time to get ready to sow them. In addition to containers and soil mix, the following will be needed: some clean popsicle sticks, strips of stiff plastic, old fashioned plant labels, and a pen with indelible ink to write the plant name, variety, and date sowed. Don't skip this step. If labeling flats are neglected, it is almost guaranteed that what was planted will be lost.

One last critical thing: timing. Most gardeners time their plantings relative to the average date of the last spring frost in their area. Find that out from neighboring gardeners, a county agricultural extension agent, even the local weatherman. Depending on the flower or vegetable crop, plant seeds anywhere from four to ten weeks before that frost date. The chart on the last page lists sowing and transplanting dates for many common plants. Seed packets also contain this information — be sure to read them! Sowing seeds at the proper time indoors allows them to grow into robust seedlings ready to plant out into the garden when outdoor weather conditions are right in spring.

Fill containers almost to their brims with moistened soil. Smooth it out and tamp it down. Then begin carefully setting the seeds in, planting them shallow. Seed packets inform how deep to sow seed — be sure to read them carefully. To keep better track of planting areas, set all the seeds on the surface of the flat and then sift extra soil mix on top to cover them. With tiny flower seeds like petunia and begonia, simply press them into the surface and then cover with a sheet of clear plastic wrap.

If individual containers are being used, put only a couple of seeds (the extras are for insurance) into each container. With flats, space seeds a half-inch apart if the intention is to transplant them to a second grow-out flat later, or 1 to 2 inches apart if they are going to be kept in the same flat until garden time. It is always best to plant more seeds than what is needed. They may not all germinate, and it is best to have many seedlings so only the healthiest are chosen. Thin out the smallest and weakest ones later. If more than one type are planted in a tray or flat, choose ones that have about the same germination time and transplant date. Again — read the packet backs for this information. Don't forget to label each variety as the seeds are sown.

It is now time to set the trays in that warm spot and to make absolutely sure they are evenly and consistently moist. Check them every single day. The minute some pale seed heads start to pop out of the soil, rejoice! The miraculous cycle of growth has begun.



Seed sowing  
in sterile media

# Growing Seedlings

## Light

Without adequate light, the seedlings will end up wimpy, leggy, pale, and weak.

If a windowsill is going to be the source of light, be sure to rotate the plants every day or two (they will grow toward the window). Be sure the windowsill doesn't cool down drastically at night, which is a common problem.

Growing seedlings under florescent tubes will often produce the best results. Don't use household incandescent light — 90% of it is lost to heat, and it doesn't have the right spectrum for plants anyway. Use a pair of standard 4 to 6 foot florescent "shop" tubes. Greenhouse windows are better bets, but be sure to guard against cold nights. Special grow-light tubes are not needed; regular fluorescents will do fine. Combine a warm-white tube with a cool-white or daylight one for the best possible light mix.

Use a fixture with chains that will allow the lights to be easily adjusted up and down. Once germination occurs, the light should be practically on top of the seedlings — no more than an inch away. Simply move the light fixture up as the seedlings get taller. Light duration is important! Sixteen hours a day is fine. Too little, and they will not develop properly.

## Moisture

Once the seedlings are up and growing, begin watering them *slightly* less often. When seedlings are at least a few inches tall, it is okay to let the top half-inch or so of soil actually have a chance to dry out between waterings. Check daily by putting your index finger into the soil. This "finger test" is to see how moist the soil is works best; it's hard to tell from just looking, even for experienced gardeners.

Too much moisture encourages root rot or "damping-off," the infamous fungus that can fell seedlings right at ground level. So water a little less frequently, but deeper each time. Again, use the finger test to see if water has penetrated deep enough. Damping-off can be controlled by providing good air circulation around the plants.

## Temperature

Seedlings can grow well at air temperatures between 65° and 75°F. They don't require the same incubator environment that seed germination did. Bottom heat, though, does seem to speed things up. Allowing them to stay on the heating coil or propagation mat will benefit the developing plants.

## Soil/fertilization

Shortly after germination, start giving seedlings some nutrients. Any all purpose fertilizers such as Rapid Grow™ or Miracle Gro™ will provide what is needed for healthy growth. An organic feed, such as Shepherd's Sea Mix or garden-center fish emulsion, can also be used. Seedlings are delicate. So begin by applying fertilizer only at a *half strength concentration*. Feed seedlings once or twice a week. As they get bigger with several sets of true leaves, the dose can be increased to full strength, according to the manufacturer's directions.

# What to Do With Seedlings

## Growing to garden transplant size

Thinning out seedlings and keeping only the very best specimens is important to success. This can be done by using a small scissors and snipping off the weaker and excess seedlings at soil level.

Yanking them out disturbs the roots and soil of the remaining plants. Thinning is a critically important step. It is hard for "first timers" to discard seedlings nurtured so carefully, but it is a necessary step. Overcrowded seedlings always develop into inferior plants never likely to succeed in the

garden. Their roots become intertwined and crowded, preventing separation of individual plants; they are weaker, more disease prone, leggy and chlorotic. Initiate thinning and spacing seedlings properly as soon as they have a set of “true leaves.” (See below.)

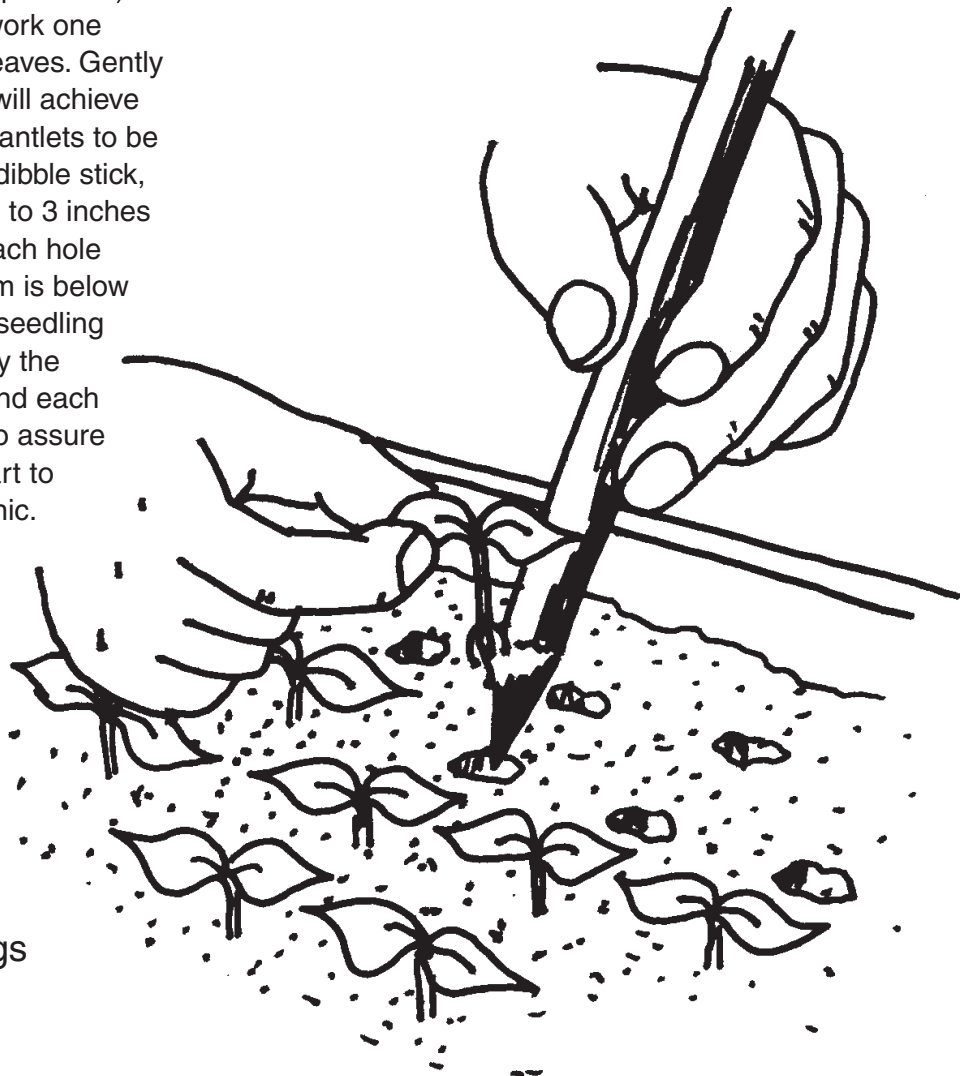
As mentioned, many growers transplant seedlings to wider spacing in new growing trays once they have developed their first true “regular” leaves. There are a couple of advantages to this:

1. The best emerging seedlings can be selected from a large population.
2. The remaining plants are given more room for normal development.

To transplant, remove a section of starts out of the tray and rest them on a damp cloth. (Keep those roots covered and as moist as possible.) With a butter knife or fork, carefully work one plant free and pick it up by its seed leaves. Gently shaking a small cluster of seedlings will achieve separation, allowing the separated plantlets to be picked up. Using a pencil or tapered dibble stick, make holes in the transplant media 2 to 3 inches apart. Set individual seedlings into each hole deep enough so that most of the stem is below the surface. This usually produces a seedling that is less leggy than one where only the roots are covered. Pack the soil around each seedling and softly water them well to assure good soil-to-root contact. If plants start to wilt right after transplanting, don't panic. Let them rest for a day or so and they should perk back up once they get over the temporary shock of being moved.

### **Damping off fungus**

If the damping-off fungus attacks the seedlings, the young plants suddenly and mysteriously keel over at the soil line and die. Throw out every one of the infected seedlings. Then make sure those that didn't get infected have plenty of ventilation and not too much water. Don't reuse any infected soil mix. Wash any containers with a weak bleach solution (10%) and let them air dry before using again. In theory, if a sterile soil mix is used, there shouldn't be any problem with damping-off. Giving seedlings occasional mistings with solutions of kelp or chamomile tea appear to provide some good fungal control. Consider laying a quarter-inch layer of sand or vermiculite on top of seedling containers to promote drainage at the base of the plants' stems.



Transplanting  
the best seedlings

## Hardening Off and Transplanting

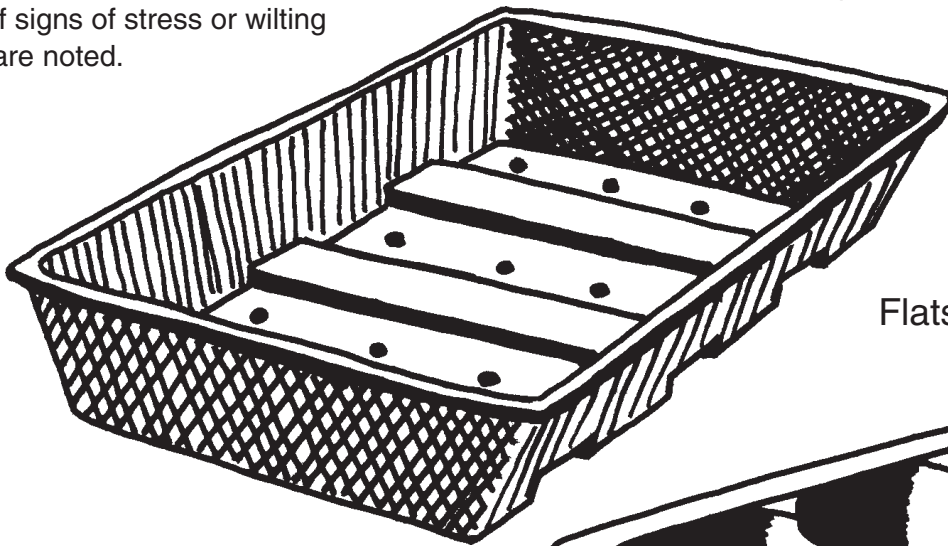
Six to eight weeks after germination, the seedlings should be vigorous and lush. If nature has cooperated, outdoor weather will be warm, the gardening season begun, and transplanting to the garden can begin — but only after a period of hardening.

Tender seedlings grown indoors under constant greenhouse conditions need to be gradually acclimated to the harsher outdoor environment so they can withstand exposure to direct sun, winds, and changing temperatures. This process is called “hardening off.” When weather is warm and settled both day and night, set seedling containers outdoors in a lightly shaded, sheltered spot, gradually increasing time outdoors until seedlings spend a half day, then a full 24 hours outside. Keeping seedlings well-watered and protected from winds, make the transition into direct sun. Begin with just a few hours and increase to a half, then several full days in the sun before transplanting seedlings to their permanent garden position. Make these transitions more slowly if signs of stress or wilting are noted.

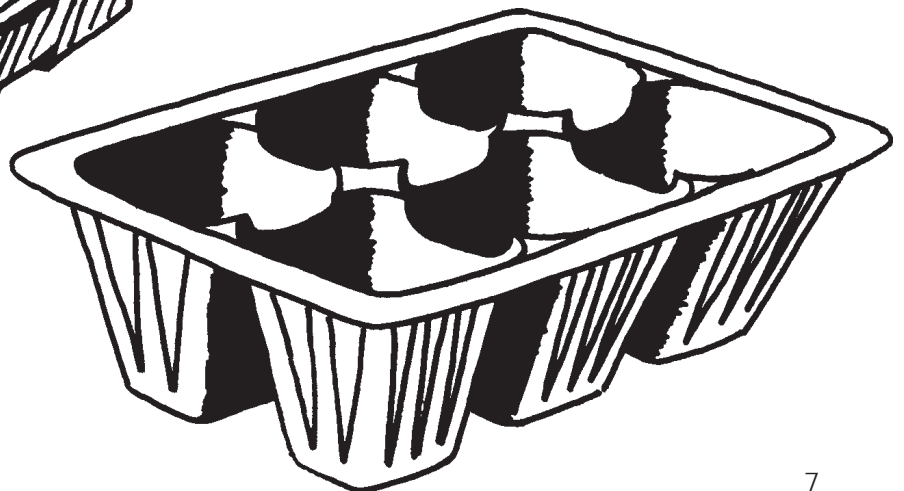
After seedlings are hardened off, the most satisfying ritual arrives: transplanting. To make the adjustment as mild as possible for the plants, pick a late afternoon or overcast day. Then, make sure they are neither too moist nor too dry and carefully dig the plants from their flats as they are planted. Try not to handle the root balls as the seedlings’ fine root hairs are quite fragile. Pick plants up very gently by their stems, trying to keep soil around roots as intact as possible. Keep roots covered and don’t expose them to the air any more than necessary.

Set each plant in a prepared hole, up to its first true leaves, tamp the soil firmly around it, then always water it well to get rid of air pockets and assure good root-to-earth contact. If seedlings should get too tall and somewhat leggy, they can be planted deeper or laid in a trench and then covered with soil. The plants will often root along the stem section buried under the soil, producing a larger root mass and a stockier transplant.

The final tender transfer of carefully nurtured seedlings out to the real world is always a very rewarding act — a moment of real accomplishment and pride.



Flats for starting transplants



# Time and Temperature Chart

Here are some sowing and setting-out dates for a few vegetables and flowers that are commonly started indoors. Use them as approximate guides; the best planting times will vary depending on your locale and gardening practices.

Plant Type	Sowing Date (Number of weeks before last frost date)	Optimum Germination Temperature	Approximate Days to Germination	Transplant Date
Peppers: sweet, chile	8 weeks	80-85°	10 to 15	2 weeks after
Tomatoes	6 weeks	80-85°	7 to 10	2 weeks after
Broccoli	10 weeks	70-75°	5 to 10	3 weeks before
Cabbage	10 weeks	70-75°	5 to 8	3 weeks before
Cauliflower	10 weeks	70 to 75°	5 to 10	3 weeks before
Kale	10 weeks	70-75°	5 to 8	3 weeks before
Eggplant	8 weeks	80-90°	10 to 14	2 weeks after
Leeks	10 weeks	75-85°	5 to 10	2 weeks before
Lettuce	8 weeks	65-75°	3 to 5	4 weeks before
Onions	10 weeks	75-85°	5 to 8	2 weeks before
Basil	3 weeks	70-80°	5 to 7	2 weeks after
Oregano/marjoram	6 weeks	65-70°	8 to 10	2 weeks after
Parsley	10 weeks	70°	10 to 15	3 weeks before
Canterbury Bells	2 to 4 weeks	70-80°	10 to 20	4-6 weeks after
Carnations	10 weeks	65-70°	10 to 20	2 weeks before
Columbine	6 to 8 weeks	70-75°	20 to 25	2 weeks before
Delphinium	2 to 4 weeks	65-75°	10 to 18	4-6 weeks after
Foxglove	10 weeks	65-70°	10 to 15	2 weeks before
Lobelia	10 weeks	75-80°	14 to 21	2 weeks after
Marigolds	6 weeks	75-80°	5 to 7	3 weeks after
Nicotiana	6 weeks	75°	14 to 21	2 weeks after
Pansy/Viola	10 weeks	65-75°	10 to 15	2 weeks before
Petunia	10 weeks	75-78°	7 to 10	2 weeks after
Phlox	4 weeks	60-65°	10 to 15	2 weeks after
Schizanthus	8 weeks	60 to 70°	10 to 15	2 weeks after
Snapdragons	8 weeks	65-70°	7 to 10	2 weeks before
Statice	6 weeks	70°	10 to 15	2 weeks after
Stock	6 weeks	65-70°	7 to 10	2 weeks after

**For more information on this and other topics, see: [www.ag.ndsu.edu](http://www.ag.ndsu.edu)**

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