



Direct seeding is the sowing of seeds directly into the garden or field.

While some crops fare best when they are started indoors and transplanted outdoors as seedlings, others should be directly sown in the ground. Most root crops, for example, such as carrots, parsnips, burdock, and radishes, should be direct-seeded for best results.

These guidelines provide direct-seeding advice that can be generally applied to crops suited to this planting method.

BENEFITS OF DIRECT SEEDING

- **Avoids disrupting the root system.** Disturbing a plant's root system during transplanting can shock the plant. A plant that experiences transplant shock can take several days to acclimate and resume growing. When directly sown, a crop is in place for its entire lifecycle, from seeding to harvest.
- **Avoids plants becoming rootbound.** Transplanted crops are typically confined within a container before being placed in the field. If they are not transplanted at their peak due to weather or other reasons, they can become rootbound, which makes them more prone to transplant shock.
- **More straightforward than indoor seed-starting.** Direct-seeding does not require a heated, well-lit space in which to start seedlings, nor seed-starting supplies, labor, time, and additional materials for growing on and bumping up the growing seedlings.

MATERIALS FOR DIRECT SEEDING

- **Bed preparation tools.** There are a number of tools useful for preparing beds for direct seeding. The ones you will need depend on the size of your garden or field. (For more details, see below.)
- **Soil probe thermometer.** To check whether the soil has reached a suitable temperature for germination, place a probe thermometer in the soil. Once the temperature reaches *at least* the minimum germination temperature shown on our germination guides, it is time to sow.
- **Seeds.** Decide which varieties you want to plant and order the proper quantity of seeds.
- **Seeder.** Small sowings can be readily hand sown, but for larger-scale sowings, a precision seeder can be indispensable. As with bed preparation tools, there are many types of seeders. The crops you are seeding and how precise you want to be can factor into which seeder you use. Most push-type seeders make use of different plates or rollers to calibrate the device for seeding various different crops. Others are compatible with a smaller range of crops based on seed size. Jab-type planters are used for sowing large seeds. All are equipped with a hopper for holding a quantity of seed. Select a seeder that makes the most sense for your crops and the size of your planting area. (For more details, refer to our [Guide to Choosing a Seeder](#).)

Crop-Specific Information

These guidelines combine the essentials of direct-seeding in one place.

For more information on both direct-seeding and starting transplanted crops, including timing, seeding depth, temperature, and light requirements, refer to our online [Key Growing Information](#), our catalog, or the back of each seed packet.

Refer to our [Chart of Direct-Seeded Vegetable Crops](#) for average seed quantities needed for planting and projected yield per 100' row or acre.

- **Labels or stakes.** Essential for indicating the start of rows, marking where a different crop begins, the date seeded, and the variety planted in each row or section.
- **Watering supplies.** These can range from a simple watering can to drip lines, soaker hoses, or overhead irrigation. The size of your planting area, access to a water source, water pressure, and crops planted will dictate which watering method(s) you choose.
- **Weeding tools.** Proper bed preparation can aid in reducing weed pressure during the growing season, but some hand weeding is almost always required. There are many hand tools, as well as mulches and flame-weeders to increase efficiency. (For more details, refer to our [Guide to Small-Scale Weeding & Cultivation Tools](#).)
- **Fertilizer.** If needed, soluble fertilizers such as a liquid seaweed or fish fertilizer will provide assimilable nutrients. (Before adding any inputs, however, we advise testing your soil, either by submitting a sample to a soil-testing lab or with your own test kit.)

BED PREPARATION FOR DIRECT SOWING

Proper bed preparation is very important. Most seeders perform at their best when the soil is firm and smooth. And whether you use a seeder or hand sow, a firm smooth bed favors seed-to-soil contact, which promotes better germination rates, stronger root development, and more vigorous growth. Here is how to prep your beds for direct sowing.

1. **Outline the beds.** Outlining the beds prior to preparation ensures the lines run straight and even. When the beds are consistently sized, it allows you to fit more beds into one area. A couple of stakes and enough twine for the length of the bed is a simple way to mark a row.
2. **If necessary, add amendments.** Soil amendments can include composted manure, sphagnum peat moss, lime, greensand, and gypsum, to name just a few. The purpose of amending the soil is to achieve the proper nutrient profile and pH for your crops and also improve the soil structure. Performing a soil test prior to planting can guide you toward which amendments to use.
3. **Till or broadfork the soil.** This helps to incorporate any amendments you may have applied. Tilling can also remove or incorporate plant debris from the previous year, destroy weeds, and decrease the number of insects that may have overwintered in the soil. Do not till when the soil is wet, as that may promote compaction and damage soil structure. On a smaller scale, tilling can be completed with a broadfork. The Tilther and the Tillie are electric tools that are helpful for tilling larger areas. For quite large areas, a gas-powered tiller or tiller attachment for a compact, garden tractor can provide for efficiency.



Foreground. A string was run across the front to provide a straight starting edge for the plot. **Background.** Stakes were driven along the back of the plot to ensure each bed row lay parallel and evenly spaced to the others.

Beds were formed using the [Tillie](#), smoothed with a [Bed Preparation Rake](#), and firmed with a [Seedbed Roller](#).

(For more details on tools and methods, see [Eliot Coleman's 6-Step Bed Preparation Method](#) or our [Guide to Small-Scale Bed Preparation Tools](#).)

4. **Level and smooth the bed.** This is most easily achieved with a Bed Preparation Rake. Leveling and smoothing the bed allows a seeder to move easily without hitting any bumps.
5. **Firm the bed.** For precision seeders a firm bed prevents soil from getting caught in the wheels. Firming can also help further smooth the bed. The Seedbed Roller, with additional weight placed in the rack on top, can help accomplish this step.
6. **Remove weeds.** If possible, wait a few days for any weeds to emerge. Use a flame-weeder or manually remove any weeds prior to planting. Smooth the bed again, if necessary.

SOWING TO THINNING STAGES

Before seeding, ensure that soil temperature and moisture are adequate to promote consistent and even germination. Identify your plant hardiness zone beforehand or contact your local Cooperative Extension Service to determine appropriate planting date, to avoid late-spring and early-fall frosts that can damage or destroy your crop. Seeds planted in soil that is too wet or cool may rot or germinate poorly.

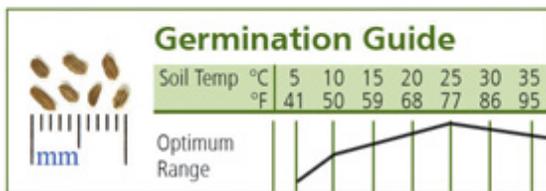
Soil Temperature & Johnny's Germination Guides

Air temperature (ambient temperature) and soil temperature usually differ. For direct sowing, focus on the correct soil temperature.

For most crops, 55–65°F/13–18°C is an acceptable range for germination, though some prefer or require cooler or warmer soil temperatures.

Refer to the Germination Guides shown on each product page and in our catalog for optimum temperature range. In the example shown below for carrot, germination can take place within a wide range of 41°F to over 95°F, but peaks between 68°F to 86°F, with an optimal temperature of 77°F.

QUICK FACTS



LATIN NAME

Daucus carota var. sativus

Check the soil temperature with a soil probe thermometer prior to sowing to avoid poor germination.

Special Seed Treatments Prior to Planting

Certain crops, especially many flowers, need an extra step prior to sowing, to help the seed overcome dormancy barriers. Treatments can include soaking the seed, stratifying the seed, or scarifying the seed.

For instance, sweet peas benefit from soaking for 24 hours prior to sowing. Should soaking the seeds prove insufficient to break dormancy, the seeds can be nicked with a small file or rubbed with sandpaper.

In many though not all cases, pelleted seeds are primed during the pelleting process, to increase germination uniformity and break thermal or light dormancy. (To learn more, read [About Our Seeds.](#))

Sowing Seeds

Sow each crop at its appropriate sowing rate, depth, and spacing between rows. When direct seeding, the sowing rate is typically higher than when seeding-starting indoors for transplants. Direct seeding exposes the seeds to the elements, and seeding at the recommended rate can ensure there are enough seedlings for a good stand.

As a general rule on seeding depth, most small-seeded crops can be sown 1/8–1/4" deep and larger seeded crops 1/2–1" deep.

Watering

Once sown, water in the seeds so that there is adequate and even moisture and seed-to-soil contact. Mist or lightly water small seeds to avoid displacing them. Ensure even and consistently moist, but not overly wet conditions until germination. The germinating embryos and small seedlings are delicate and need consistent moisture to fully germinate and complete the earliest life stages; a dry period can kill them. Note that pelleted seeds require more water initially to split or dissolve the pellet and allow for germination.

POST GERMINATION

Watering

Water as necessary to prevent the soil from drying out. This could be as often as once per day or not at all, depending on rainfall, temperature, and sunlight levels.

Weeding

Weed regularly. Weeds compete with crops for nutrients, water, and space. It is critical to keep the crop weeded until the seedlings are large enough to outcompete weeds.

Mulching

Mulching can reduce weed pressure and conserve moisture. Once the seedlings are well-established, a layer of mulch can be added. Mulching materials can include straw, grass clippings, leaves, or many other readily available materials. Avoid materials that harbor weed seed. Alternatively, lay paper or plastic mulch prior to sowing. (Note that only jab-type seeders can be used to direct sow through plastic.)

Thinning

Thinning is the process of removing excess seedlings in high-density stands once they have developed their first set of true leaves. This allows the other seedlings room to grow and access to nutrients. Thin the crop to the correct stand by cutting or pinching out the stem to prevent disturbing the root system of the remaining seedlings. Thinnings can be left aside or composted.

Fertilizing

If needed apply a soluble fertilizer about 4 weeks post-germination. Follow the instructions on the label. Fertilize about once per week. If the crop looks green and healthy there is usually little or no need to fertilize.

PROBLEMS TO AVOID

- **Poor germination and thin stands.** These can be caused by a number of factors, including the following.
 - The soil could have been too cold or damp at time of sowing.
 - If a seeder was used for sowing, it may not have been correctly calibrated to the size of the seed, resulting in skipping and/or the seeds being planted too shallow or too deep.
 - Insects, birds, or other pests or pathogens could have damaged the planting.
 - Too much water could have caused the seed to rot.
- **Birds and other animal pests.** One of the earliest challenges when direct-seeding crops is to prevent the seeds from being eaten by birds, mice, and other small rodents.
 - Shield newly-sown seeds with bird netting or row cover if birds are an issue.
 - Repel rodents by applying Plantskydd®.
- **Slow maturity.** Seedlings started indoors for later transplanting receive ideal conditions during the germination and early-growth stages, leading to faster initial growth. In contrast, the date for direct-seeded crops is limited by acceptable planting temperatures at the beginning of the growing season. Ensure an early planting for long-season crops, or grow transplants.
- **Weed competition.** Newly-germinated and young seedlings have trouble competing with weeds, as they won't have extensive root systems to reach nutrients or a large canopy to shade out weeds. Remain attentive to weed pressure to prevent weeds from overtaking the crop.
- **Elevated insect pressure.** Small direct-sown seedlings are at greater risk of succumbing to insect pressure than transplanted seedlings. Their leaves are more tender and feeding by insects can do a lot more damage on a small plant. Row covers may offer some protection plus additional warmth for direct-sown crops.

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