# Starting Vegetable Seeds Indoors: II. Materials

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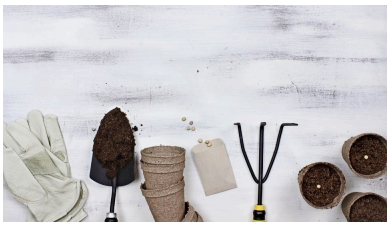

## Introduction

This second of four fact sheets in this series explores materials needed to start seeds indoors—specifically, seeds, containers, soilless mix (potting soil), lights, water, fertilizer, a heat source, fans, labels, and a general growing space. Our focus is mainly starting vegetables. However, the principles discussed apply to starting herbs and other ornamental annuals and perennials. Online propagation protocols, books on plant propagation, and other Utah State University (USU) Extension resources discuss how to start other unique and less common plants.

## Seeds

Seeds can be obtained from many sources, including last year's crops, a neighbor, a seed swap, your local big box store, or seed companies and providers. Any of these sources can be good, but as you invest time and money, the more you know about the seeds, the better. Some things to be aware of include:

- Are the seeds from disease-free plants?
- How old are the seeds?
- What is the storage history of the seeds?
- Are the seeds viable (able to germinate)? If so, what is the germination rate? If seeds are purchased commercially, the seller must perform various seed quality tests and have them listed on the seed package or at least available. When in doubt, a simple seed germination test can be performed as described in "Are My Seeds Still Good? Testing Seed Germination" by the University of Illinois Extension.
- Are they hybrid seeds?
- Were seeds collected from hybrid plants? If so, the seeds will not grow back true to type.

These and other questions (cost of seed, timeframe, etc.) should be considered before purchasing, trading, saving, and using seeds.

## Growing Containers

There are many container options for starting seeds (Figure 1). Cost, material, durability, and sustainability are all considerations. Sanitation is also essential in starting seeds, and the container you use should be either new or scrubbed free of any previous debris and sanitized using a quaternary ammonium product or a 10% bleach solution (which can make plastic more brittle). Plastic pots, trays, and inserts vary in thickness and durability, with the majority being single-use products, but some can be reused for several years.

*Growing containers must allow water to drain away from the potting soil to avoid waterlogging and killing plants.*

Growing containers must allow water to drain away from the potting soil. If seedlings are continuously in waterlogged soil, roots will rot, killing the plants. Plastic trays, inserts, and pots usually have holes in the bottom as drains. Some pots made from clay or plastic do not. Drainage is not as crucial with clay pots because water evaporates from them due to their porous nature, but it is still easy to accidentally waterlog plants. Holes can be drilled in the bottoms of plastic pots for drainage.

### *Plastic Flats and Trays*

Ubiquitous in the nursery trade, these flats (sometimes called trays) hold inserts that have individual cells for seeds/plants. Inserts that have up to 288 cells are available. These high-count inserts are efficient when hundreds or thousands of seeds must be started at once, but they require increased care and specialized equipment such as mist benches because the small cells can dry out quickly. Seedlings' roots fill the small cells rapidly, and they must be transplanted into larger cells or containers.

It is common for hobbyists to sow seeds into inserts that have fewer cells that hold a larger potting soil volume. The larger cells do not require the specialized equipment or practices to maintain soil moisture that trays with higher cell counts do. Hobbyists' common insert sizes contain 36, 48, or 72 cells per flat. These inserts are often perforated to split into "pony packs" containing four to six cells each.

You can also start seeds in flats filled with potting soil (no inserts used). As the seeds emerge, their roots often grow together, and the roots must be carefully teased apart because they are easily damaged before seedlings are transplanted into a pony pack or container.

### *Pots*

Pots can be made from plastic, clay, and sometimes resin. Pots are most often used as a second or third container after seeds emerge, begin growing, and need transplanting. Clay pots require more water than plastic due to their porosity.

### *Biodegradable Containers*

Biodegradable containers are designed so seedlings don't require removal when transplanted (Figure 1). They are meant to degrade when planted outdoors in garden soil. Due to our dry climate, they often do not degrade quickly enough. These containers may also dry out quicker, necessitating more frequent irrigations. However, biodegradable containers are useful when starting seeds of crops with roots sensitive to transplanting, such as cucumbers, melons, and squash. This reduces root disturbance because you do not have to remove the transplants from the pots. When using biodegradable containers, cut three or four of the pots' sides with a sharp knife or razor, disturbing roots as little as possible when placing them in the garden. Roots will grow through the slits you made.

### *Compressed Peat Pellets*

These dehydrated discs expand when watered. Plant seeds directly in the expanded pellets, then transplant them to a larger container or the field when needed. Keep the pellets moist but not soggy and handle them gently.

### *Upcycled and Do-It-Yourself Containers*

This broad category of containers includes plastic food containers, such as those used for single-serve green salads with clear tops, which can be repurposed as seed trays. You can grow seedlings in them, but it may not always be practical. Only start critical seeds in these if you have vetted and practiced the process beforehand. Social media offers many do-it-yourself seed container ideas but consider the materials first. For example, while biodegradable, options like cut-up cardboard egg cartons or toilet paper rolls may not provide optimal drainage or structure. Experimentation is encouraged before going all in.


**Figure 1.***Different Seed-Starting Containers: Inserts With Individual Cells (top left), Open Flats (top right), Plastic Pots (middle left), Biodegradable Pots (middle right), Compressed Peat (bottom left), and Upcycled Plastic Container (bottom right)*

### *Humidity Domes*

Humidity domes can boost your seed germination success. These clear covers trap humidity and soil moisture inside your container, creating a more ideal environment. It also reduces watering needs. Many seed-starting kits already come with a dome, but repurposed items like clear plastic bags or wraps can be used (Figure 2). Remember to remove the dome once your seedlings emerge to prevent them from getting fungal diseases and excessive stem growth (i.e., leggy growth).

**Figure 2.***Humidity Drones*

## Soilless Mix

Most seed-starting mixes are "soilless" because they do not include garden soil (Figure 3). Instead, they contain mostly peat moss or coconut coir with other additives such as vermiculite, perlite, and pH conditioners. In the green industry, they are commonly called soilless mix, potting soil, or seed-starting mix. They are lighter than garden soil and are usually disease-free. You can buy premade seed-starting mix or create your own.

### *Store-Bought Mix*

Seed-starting mixes should be made with peat or coconut coir for adequate drainage and moisture retention. Avoid those with larger wood chips for starting seedlings.

Instead, choose mixes blended for starting seeds called seed or plug mix. Box stores and local retailers carry them, and they are also readily found online.

**Figure 3.** *Seed-Starting Soiless Mix*

### *Do-It-Yourself Mixes*

You can include equal parts of peat moss, perlite, and/or vermiculite for a basic seed-starting mix. You can find detailed recipes online. It may be interesting to make your own, but do not expect to save money. For detailed instructions about mixing your own, find detailed instructions in the publication "Growth Media for Container Grown Ornamental Plants" by the University of Florida Extension.

## Supplemental Lighting

Healthy seedlings need supplemental light, but you do not need special, expensive "grow lights." Simple shop lights with fluorescent or LED bulbs are affordable and sufficient (Figure 4). In general, seedlings typically need a certain light intensity of about 200–400 µmol/m²/s of light, measured in photosynthetic photon flux density (PPFD). This ensures the seedlings receive enough light for photosynthesis. Specialized grow lights may not emit the various spectrums of light needed by new plants (Wollaeger & Runkle, 2014). An inexpensive timer also offers convenience. Set it for a photoperiod of 12–14 hours daily. Also, if possible, place your seed-starting table or bench next to a window. Natural sunlight is a beneficial addition when starting seedlings.

**Figure 4.** *Supplemental Lighting Options*


**Figure 5.** *Heating Pad With Thermostat*

## Irrigation

Tap water is usually fine for irrigating your seedlings. If you suspect it has a high mineral content or you use well water, consider having it tested by an appropriate lab to ensure it is suitable for growing plants. You should irrigate when needed using a spray bottle or bottom watering. Bottom watering involves placing seed containers into a basin containing a few inches of water. Water is absorbed through drainage holes in the bottom of the seed container. Both methods prevent seeds from being washed away accidentally.

## Fertilizer

Potting soils often lack nutrients and are not usually pre-charged with fertilizer. Fertilize your plants as soon as they develop their first true leaves. Among the easiest to use and most economical are powdered concentrates you mix yourself. There are also slow-release, pelletized fertilizers that last for several months. These can be used with seedlings but are more commonly used after seedlings are established. Be sure that fertilizers you use also have micronutrients included in the formulation. Refer to instructions on the fertilizer, but if not mentioned, a half-strength solution is usually recommended once or twice a week.

## Head Source (optional)

You may need supplemental heat to germinate seeds. An acceptable temperature for both cool- and warm-season crops is 70 °F. Inexpensive heat mats placed under growing trays will likely be needed if the room is cooler and you want to grow warm-season crops. We suggest using a thermostat connected to a heat mat so seed containers do not get too hot (Figure 5). Supplemental lighting can also raise potting soil temperatures to a more acceptable level over time—gauge soil temperatures using an inexpensive kitchen thermometer. Refer to seed packs or fact sheets online for specific crop temperature preferences.

## Fan (optional)

Airflow promotes stem strength in seedlings. Optimum airflow (“light air” as described by the National Weather Service) increases the seedlings' stem diameter, stem hardness, and strong root development (Li et al., 2020). Additionally, good air circulation curtails certain diseases that cause problems for developing seedlings, such as damping-off.

## Labels and Recordkeeping

Labels are often included with seed trays or can be purchased online or from retailers. However, they also can be as simple as craft popsicle sticks or other upcycled materials. If you keep the tag with the plant as it is planted outdoors, use a pencil (best UV resistance) to mark plant tags.

In addition to using plant tags, have a way to identify plants if tags are lost. This may involve attaching weather-resistant stickers to seed trays marked with what is planted or making a paper map of a previously marked tray with what is planted where. Additionally, journal what you planted, germination rates, what you used, how well you liked the plants, approximate yields, etc. This information is easily forgotten but important for future use.

## Growing Space

You will need an appropriate space. A countertop or a shelf is sufficient for starting a limited amount. If you start more, you will likely need a designated bench or shelves dedicated to the purpose. Many relatively inexpensive kinds and sizes of light benches for germinating seeds and growing plants are available online and from local retailers. You can also construct your own. Remember that you must be able to regulate lighting, and soil and air temperatures. Additionally, because you will irrigate plants, find a location where water will not damage carpet, flooring, or furniture, or take measures to prevent such damage.

## Photos

Authors provided all figure photos.

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