

Starting

Cooperative Extension Fact Sheet FS787 | March 1995

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Vegetable Seeds Indoors

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Introduction

The easiest way to start any vegetable garden is direct seeding—wait until the weather warms and plant the seeds directly in the garden. Unfortunately, direct seeding is not practical for some crops. For example, tomatoes and peppers cannot be planted until after the last frost and after the soil has warmed. If seeded directly in the garden at that time, tomatoes and peppers require more than 100 days to produce the first fruit. In addition, newly emerged seedlings are very tender and easily killed by insects and disease or shaded by quicker growing weeds. Transplanting hardier young seedlings started indoors (transplants) allows an earlier start in the garden, which results in earlier yields of certain crops and makes better use of limited garden space. If a few simple guidelines are followed, transplants can be grown with a minimum of problems.

Potting Soil

Choosing the right potting soil is a very important part of starting seedlings indoors. The most convenient type to use is one of the commercial soilless mixes (Jiffy Mix, Pro-Mix, Redi-Earth, etc.) that contain peat moss, perlite, vermiculite, and usually some fertilizer (see Table 1 for a mix recipe). These are specially formulated for starting seeds indoors. Soilless mixes are sterile and reduce the risk of losing seedlings to damping off, a fatal soilborne disease. Using soil directly from the garden is not recommended, because it may contain insects, weed seeds, or disease organisms that could damage or kill the young transplants. If garden soil is to be used, combine it with equal parts of sand and peat moss to improve drainage and structure. A teaspoon of ground limestone per quart of mix should also be added to obtain the proper pH. The mix must then be pasteurized to eliminate pests by heating to 180°F for 30 minutes. Heated soil gives off a strong smell, so consider doing it outdoors.

Getting Started

Containers, pots, flats, etc., are another essential component for starting transplants. When choosing a container to start your seedlings (Table 2), the most important factor is that the bottom have drainage holes. A lack of drainage can cause the soil to become saturated and can encourage root rot diseases in the transplants.

Before doing any planting, one word of caution: **DON'T START PLANTS TOO EARLY.** Plants that are started too early become elongated, pale green, and weak. The goal is to produce a stocky, moderately sized plant that will recover quickly when it is planted outdoors.

Table 3 lists how many weeks pass between seeding indoors and transplants are ready for planting in your garden. This period varies widely by crop, ranging from 2 to 12 weeks. Here is an example using Table 3. Suppose tomato is the crop to be grown. Table 3 indicates that tomatoes are a warm season crop, which means they cannot be planted until after the last frost. Assume May 15 is the last frost date for the garden. Because tomatoes take about 6 to 8 weeks from seeding to transplant, seeding indoors should take place between mid-March and April 1. If the crop to be planted were a cool season crop like lettuce, planting in the garden would occur in mid-April. That would mean seeding 5 to 6 weeks before that date, or roughly early to mid-March.

Crops are also listed as being warm or cold season. Warm season crops cannot be transplanted into the garden until all danger of frost is past. In New Jersey, this will range from April 20 in extreme southern New Jersey to June 1 in the colder northwest. Contact the county Rutgers Cooperative Extension office (listed under county government in the phonebook) for the last frost date in the area. Cool season crops withstand frost and may be planted outside much earlier, usually in mid to late April.

Next to each vegetable in Table 3 is listed the ability of that crop to transplant. Some are very easy to establish as transplants, such as tomatoes and lettuce. Others, however, do not do nearly as well. Those listed as poor, such as beans or corn, need great care and a minimum of handling. The roots of these plants are easily damaged. To start these indoors, use peat pots or pellets to minimize root damage. Some vegetables, like carrots and beets and peas, should always be seeded directly in the garden.

Place seeds in containers at the depths recommended in the chart. Plant one or two seeds per individual container or, if using flats, in rows that can be thinned or transplanted into individual containers following germination. Be sure to label the flats to avoid confusion, using a pencil or water resistant marker. Once the seeds are planted, the container should be bottom watered by placing it in a shallow pan of water and waiting until the surface of the mix is moist. This method avoids overhead sprinkling, which can carry away some smaller seeds. The pot should then be removed from the pan and allowed to drain.

Germination is aided by maintaining high moisture levels in the mix and moderately high soil temperatures (Table 3). Sealing the container in a clear, plastic storage bag until seedlings emerge will keep the soil moist. Placing the starting containers in a warm place or on specially designed heating mats, available at some garden centers, can speed up germination. Once the seedlings emerge, remove the plastic bag and give the seedlings as much light as possible by placing them on a sunny window sill or 4 to 6 inches below a fluorescent light. Maintain room temperatures between 60 to 70oF. Higher temperatures or lack of light will promote unwanted, leggy growth. Seedlings can be lightly fertilized by watering with soluble fertilizers, such as Miracle-Gro or Peters, following the directions on the package.

When the seedlings develop their first true leaves, transplant those started in flats to individual containers. Dig the seedlings out of the mix with a small trowel or spoon. When transplanting, always handle the seedlings by the leaves, being careful not to damage the fragile seedling stem or root system.

One week before the seedlings are transplanted, they should be hardened off to better acclimate the transplants to outdoor conditions. Harden plants outdoors in an area protected from wind, and subject them to longer doses of sunlight each day, while cutting back on watering. One exception, harden tomatoes by reducing water only. Tomatoes exposed to cool temperatures may develop a disorder called catfacing which causes the fruit to be misshapen.

After hardening, the seedlings are ready to be transplanted into the garden at the spacing indicated on the seed packet or the fact sheet Planning a Vegetable Garden FS129). Seedlings should be planted at the same depth at which they were growing indoors, except for tomatoes, which may be planted deeper. Firm the soil around the root ball, and water immediately with a solution of water and starter fertilizer. Try to transplant on a cloudy day to minimize wilting or transplant shock. If it's sunny, provide the plants with some shade.

Table 1. Simple plant growing mix.^a

Shredded sphagnum peat moss	10 gallons
No. 2, 3, or 4 domestic or African vermiculite ^b (horticultural grade, dust screened)	10 gallons

Pulverized Limestone	1 1/4 cups
Dolomitic Lime for mixes with domestic vermiculite	or
or	3/4 cups
Calcitic Lime for mixes with African vermiculite	
Superphosphate (20% P)	1/2 cup
or	or
Triple superphosphate (46%)	1/4 cup
Fertilizer (5-10-10) 10 gallons	1 cup

^aThis mix is used for germination. Supplemental fertilizer will be needed to grow plants to transplant size. Three weeks after seeding, apply soluble fertilizer like 20-20-20, 2 tsp/gallon of water. Apply weekly.

^bVermiculite should be pea size and free of dust. Final pH should be 6.0-6.5.

Table 2. Types of containers used for starting vegetable seedlings.

Types	Comments
Peat Pots	Made from compressed peat moss. These pots are filled with mix and seeded. The whole pot is then planted with the seedling. When planting outside, make sure the entire peat pot is covered with soil to avoid drying out.
Peat Pellets	Compressed peat which expands when placed in water. Seeds are placed directly in the pellet after it has expanded. The entire pellet is placed in the soil and covered like peat pots. Peat pots and pellets are recommended for seedlings that transplant poorly since roots remain relatively undisturbed.
Plastic Pots and Flats	These are filled with mix and seeded. When planting, carefully slide the seedling out of the container. Plastic flats can be reused if cleaned after use with a 1:10 solution of household bleach and water. Soak them in this solution for 10 minutes. Allow them to thoroughly dry before using. This will eliminate any disease problems

Table 3. Recommendations for starting vegetable seeds indoors.

Vegetable	Ability to Transplant	Weeks to Grow	Depth of Seed (in.)	Season ^a	Optimum Soil Germination Temp. (°F)
Beans, snap	poor ^b	2-3	1	warm	80
Broccoli	good	6-7	1/4	cool	80
Brussels Sprouts	good	6-7	1/4	cool	80
Cabbage	good	6-7	1/4	cool	80
Cauliflower	good	6-7	1/4	cool	80
Celery	good	10-12	1/8	cool	70
Collards	good	5-7	1/4	cool	80
Corn, sweet	poor ^b	2-3	1/2	warm	90
Cucumbers	moderate	2-3	1/2	warm	90
Eggplant	good	8-10	1/4	warm	85
Kohlrabi	good	6-7	1/4	cool	80
Kale	good	4-6	1/4	cool	80
Leeks	good	10-12	1/8	cool	75
Lettuce	good	5-6	1/4	cool	75
Melons	moderate	2-3	3/4	warm	90
Okra	good	2-3	3/4	warm	90
Onions	good	10-12	1/4	cool	75
Peppers	good	8-10	1/4	warm	85
Pumpkins	moderate	2-3	1	warm	90
Squash	moderate	2-3	1	warm	90
Tomatoes	good	6-8	1/4	warm	85

^aCool season refers to transplants that can tolerate frost. Warm season refers to plants that can not be transplanted until after all danger of frost and soil has warmed.

^bTo minimize root disturbance, start these seeds in peat pots or peat pellets.

Seed Starting Lights

Materials needed

1. 1/2 inch PVC in lengths as follows:
 - (4) 4' long
 - (4) 2' long
 - (4) 15" long
2. (8) 90 degree with side slip on joints
3. (4) screw in cup hooks or (4) sets of screw eyes and S hooks
4. (2) 4' long sets fluorescent shop lights with chains

Instructions

Screw cup hooks or screw eyes into two of the 2' PVC lengths six inches in from each end. These will go in the top of the frame to hold the lights.

Slip together two 4' and two 2' lengths to form two rectangles, one for the top of the frame and one for the bottom.

Connect the top and bottom with a 15" PVC piece at each corner.

Place seed trays and position the lights about 2 inches above the trays. Move the lights up as the plants grow.

Slip apart for off-season storage.

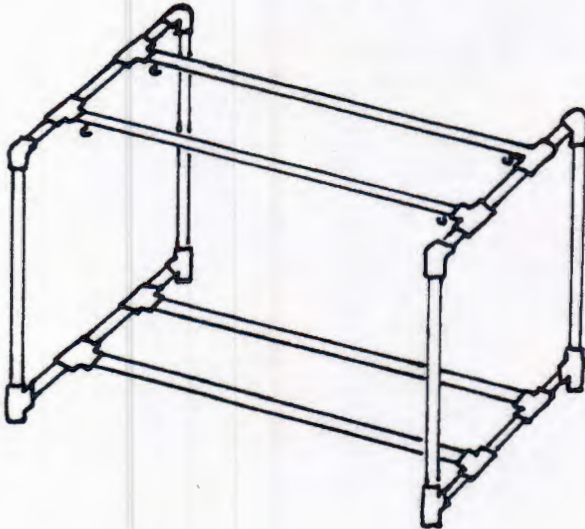
INDOOR LIGHT GARDEN CONSTRUCTION

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FRAME



PVC FRAME MATERIALS:

¾" schedule 40 PVC pipe:

4 ea 4 ft lengths

4 ea 20 in lengths

8 ea 4 in lengths

4 ea 10 in lengths

(total of about 29 feet pipe)

Connectors:

12 T's

4 L's

4 (or 6) hooks or screw eyes

OTHER MATERIALS:

2 (or 3) ea 4 ft long shop light fixtures

4 (or 6) ea shop light fluorescent bulbs (cool white, warm, or full-spectrum)

Surge-protector power strip **OR**

GFI-protected electrical outlet:

Outlet box

GFI-protected outlet

Outlet box cover, with gasket

2 ea machine screws, 1 ½" to 2" long

2 ea locking nuts

3-prong extension cord

Heavy duty electrical timer (3-prong)

Fabricated sheet metal pan, or plywood 'pan' with thick plastic liner.

TOOLS for assembly:

PVC cutters or hacksaw

Electric drill and drill bits

Optional GFI outlet tools:

Wire cutters/strippers

Needle-nose pliers

Screwdriver

Adjustable wrench

Directions for assembly of PVC frame:

1. Cut PVC segments to correct lengths.
2. Drill pilot holes for hooks at the ends of the 4 ft segments, 1" in from the edges. Be sure that the holes line up so both will be at the bottom of the pipe. Insert the screw eyes or hooks into the pilot holes.
3. Taking care to not jam the pieces too tightly together, attach connectors to PVC segments.

4. Assemble the structure as illustrated on front page, but leave out one of the 4" segments if you are attaching the GFI outlet to the unit. Again, do not jam the pieces too tightly together.

If a power strip is being used rather than the GFI outlet, go ahead and assemble the entire frame.

Directions for wiring the GFI-protected outlet:

1. Gather the outlet, outlet box, outlet face plate, extension cord, the 4" PVC segment, machine screws and nuts.
2. Drill holes through the back of the outlet box and 4" PVC pipe to attach the box to the pipe. Fit machine screws through the holes and attach nuts.
3. Cut the female end off the extension cord and strip outer wire cover about 2 inches. Strip inner wire covers to about ½".
4. Feed the stripped extension cord end up through the bottom hole of the outlet box. Attach the stripped wires to the outlet wire connections, matching wire cover color to the matching color terminals.
5. Attach the wired outlet into the outlet box.
6. Attach the outlet face plate to the outlet and outlet box.
7. Insert the 4" PVC segment (with electrical outlet now attached) into the Indoor Light Garden frame structure.

Completing the Indoor Light Garden Assembly:

1. Install fluorescent tubes into shop light fixtures.
2. Attach chains to the light fixtures and hang from the screw eyes or hooks.
3. Plug the light fixture electrical cords into the GFI-protected outlet or power strip. Plug the outlet cord into heavy-duty timer. Plug the timer into the nearest electrical outlet then turn the timer 'ON'. If your lights do not light up, unplug the main cord and push the GFI 'reset' button or switch on the power cord. Try plugging the main cord in again. If the lights still won't light, you will need to re-check your wiring. Set the timer to light 16 to 18 hours per day.
4. Place the "pan" (sheetmetal or plastic-lined plywood) at the base of the frame.

Other options:

- Use three spotlight fixtures instead of two for more uniform light coverage.
- Make a wood tray to fit on the bottom of the Indoor Light Garden rather than a fabricated metal tray. Use 1/4" plywood with a fir strip or molding tacked on the outer edge as a lip. Line the wood tray with plastic film (trash bags, visqueen, etc.)

Tips on using your ILG:

Keep the lights as close to the seedlings as possible, without letting the leaves actually contact the light tube surface. Move the lights up or down by adjusting the length of the chain. Heavy duty paper clips will serve as extra chain links in a pinch.

Water your plants in a tub or tray outside of the light garden tray. Let the plants drain a few minutes before returning them to the ILG tray. Never allow water to stand under plants for more than one or two hours.

Flowering plants like African violets will respond better to a full-spectrum type light tube. Seedling and vegetative growth is satisfied with the inexpensive cool white tubes.