

# Starting garden transplants at home

Starting annual flowers and vegetables at home can be fun and offers several advantages. Many gardeners prefer to grow their own seedlings so they can select specific cultivars (varieties) and control seedling growth. By starting seedlings indoors, gardeners can enjoy vegetables and blooming annuals earlier in the growing season. Transplanting also reduces some of the hazards (birds, insects, rains, and weed competition) that can occur when seeds are sown directly in the garden.

Success with growing transplants requires the following:

- Quality seeds
- Well-drained, disease-free growing medium
- Warm, moist conditions for seed germination
- Adequate light for seedling growth
- A period of plant adjustment to outdoor conditions

## Selecting seeds

For best germination purchase new seeds every year. Leftover seeds (those purchased in previous years) often germinate poorly. The success with seeds harvested from plants in the garden depends on the plant species. “Old-fashioned” flowers that typically reseed in the garden are more likely to germinate and grow well.

For best selection, buy seeds early in the year from a reliable company. Seeds can be purchased from garden centers, mail order catalogs, or on the Web. Check seed packets or plant descriptions for facts about size, color, disease resistance, and site preferences. When choosing vegetables, you may want to refer to [Suggested Vegetable Varieties for the Home Garden](#) (PM 607); it is available from local ISU Extension offices and on the Internet.

Many vegetable seed companies treat their seeds with a fungicide to prevent the seeds from rotting in cold, wet soils. Seeds that have been treated are labeled as such and are often brilliantly colored. Be sure to wash your hands thoroughly after handling treated seeds.

## Potting mixes

A medium for starting seeds should be porous and free from disease organisms. Specially prepared soilless mixes, such as Jiffy Mix or Redi-earth, are available at garden centers.

A good soil mix can be prepared at home using equal parts of garden loam, sphagnum peat moss, and perlite. To guard against diseases, such as damping-off, homemade mixtures should be pasteurized before use. Lightly moisten the soil mix, place in a shallow baking pan, and bake in the oven at 180°F for 30 minutes. An easy way to determine when the soil mix is done is to place a piece of raw potato in the center of the soil and bake until the potato is cooked. Be prepared for a strong odor from the baking soil.

Vermiculite is a mica-like substance that works well for germination, as long as it does not get water soaked. Because it is a “soilless” medium, vermiculite does not have to be pasteurized.

## Containers for sowing seeds

Containers for starting seeds should be clean, sturdy, and fit into the space available for growing plants in the home. Having the proper container helps get seedlings off to a good start and may save work in later stages of plant development.

**Wood flats, plastic trays, clay and plastic pots**—Plants that are easy to transplant are usually started by sowing seed in flats or trays. After germination, the seedlings are transplanted into individual containers, trays, or flats. To avoid introducing damping-off organisms, previously used containers should be cleaned before reusing. Wash the containers thoroughly in soapy water to remove all dried soil and debris. A disinfectant solution of 1 part chlorine bleach to 9 parts water can be used as a rinse. Let the containers dry before adding growing medium. Fill the container to within ½ to 1 inch of the top and firm lightly. Thoroughly water the medium.

Flats also can be used to hold individual plant containers, or seedlings can be transplanted into flats at recommended plant spacing.

**Peat pots**—These popular pots are made from peat and may be purchased individually or in strips or blocks. Peat pots are porous, which provides excellent drainage and air movement. After filling the pots with potting mix, seeds can be sown into them. Seedlings also can be transplanted into them. Peat pots generally last 2 to 2½ months without crumbling or deteriorating, yet the plant roots penetrate the pot walls. For best results, peat pots should be placed tightly together in the flat to prevent rapid drying of the containers and soil. The complete pot and plant can be set in the garden.

**Compressed peat pellets**—When placed in water, these thick disks swell to form a cylindrical container filled with peat moss. Seeds are usually sown directly into the moistened pellets. It's also possible to transplant seedlings into them. Pellets should be placed tightly together in trays or flats so that they are easily watered, held upright, and less likely to dry out. Plants grown in peat pellets are planted, container and all, into the garden.

**Paper pots**—Economical pots can be made from newspaper strips that are wrapped around frames to form a pot about 2½ inches in height and 2 inches in diameter. Paper pots are filled with soil mix and plants can be direct-seeded or transplanted into them. Paper pots become weak and break down after 5 to 7 weeks. Because the paper disintegrates, the pot and plant can be planted directly into the garden. Wooden potmaker frames are available from several garden supply and seed companies.

**Soil blocks**—Gardeners can make their own seed-starting cubes, eliminating the need for containers or pots. Soil cubes are made by pressing a soil block maker frame into moist, specially formulated potting soil mix that contains garden soil, peat, humus or compost, and sand. A spring-loaded handle pushes the soil cube out of the frame onto a seed flat. Seeds are sown directly into the soil cube. The cubes must be watered gently and not allowed to dry out. Plant roots grow into surrounding cubes because there is no container. For easy transplanting, cut down between the cubes with a sharp knife the evening before the plants are transplanted into the garden. Soil block makers in various sizes are available from garden supply dealers.

### When to plant

Vegetables and flowers vary in the amount of time required for growth before transplanting. Refer to the guidelines on page 4.

## Seeding

Refer to the seed package directions for spacing and depth recommendations. Generally, larger seeds are planted deeper and farther apart than smaller seeds. If using flats, make the rows about 2 inches apart. For larger seeds, make the rows no deeper than ½ inch and cover with a light layer of the soil mix. Small seeds, such as petunia, may need no covering. If using peat pots, peat pellets, or paper pots, plant 2 or 3 seeds per container. Place containers close together in a flat or tray.

Label containers with plastic or wooden markers to avoid confusion. Labels and stakes can be purchased from garden supply centers, or made by cutting strips from plastic milk jugs or other plastic containers.

After sowing, water with a soft spray. Then cover the containers with clear plastic wrap or clear plastic domes. Do not moisten the soil again until the seeds sprout. Germination time varies; refer to the tables on page 4 for guidelines.

Set the containers in a bright location but out of direct sunlight. If placed in direct sunlight, the heat buildup under the plastic may kill emerging seedlings. Cool soil temperatures often delay or prevent germination of some seeds. Bottom heat can be supplied by placing containers on top of a refrigerator until the seeds sprout. Heating cables and mats are available from garden supply sources.

Remove the plastic covering as soon as germination occurs. Place the seedlings under fluorescent lights or in a sunny window.

### Transplanting and thinning seedlings

When seeds are sown in flats or trays, the seedlings must be transplanted to individual containers or thinned soon after the second pair of leaves (the “true” leaves) appear. Refer to page 4 for spacing guidelines.

Peat pots, peat pellets, paper pots, or plastic pots can be used for containers. Disposable beverage cups or plastic food containers (such as yogurt containers) also can be used if drainage holes are placed in the bottoms. When transplanting, dig up the small plants with a knife or spatula. Replanting is most easily done when the soil is slightly dry. Separate the seedlings, avoiding damage to their roots. Handle the seedlings by their leaves, not their stems. Poke a hole in the potting mix in the flat or individual containers and plant the seedling. The young seedlings can be transplanted slightly deeper than they were growing in the flat. Firm the soil around the seedling and water gently.

If seeds were sown directly into peat containers, it is necessary to thin to one seedling per pot. To do this, use a razor blade to cut all but the most vigorous plant off at the soil line. Don't pull excess seedlings—you could damage the root system of the one that remains.

### Pinching

Removing the growing tip by “pinching” encourages side branching in most annual flowers. Vegetable seedlings should not be pinched.



### Seedling care

Healthy growth depends on light, water, fertilizer, and temperature.

**Light**—Without adequate light, young seedlings quickly become tall and spindly. For best results, grow seedlings under artificial lights. Forty-watt fluorescent cool white and warm white tubes—or extended spectrum “grow lamps”—can be used. Regardless of type, lights should be placed no more than 6 to 8 inches above the seedlings. A 12-hour, light-dark cycle provides an adequate light period for most seedlings. If artificial lighting isn't available, place seedlings in a sunny window.

**Water and fertilizer**—Seedlings need a consistent moisture supply, but don't keep the soil waterlogged. Watering with a soluble fertilizer encourages steady growth. Follow fertilizer label directions for application amounts and frequency. When watering, add water carefully to avoid washing the seedlings out of the soil.

**Temperature**—Plants grow more rapidly with even, warm temperatures. Growth of most transplants slows appreciably at temperatures of 50°F or lower. Growing temperatures should be approximately 10 degrees warmer during the day than at night (see guide on page 4).

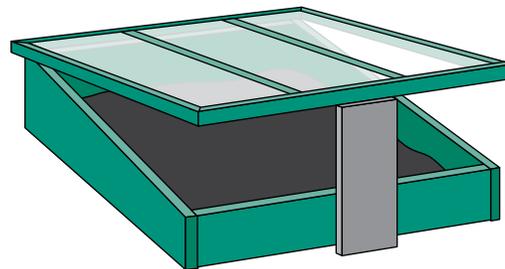
### Moving seedlings to the garden

Refer to guidelines on page 4 for when to transplant seedlings to the outdoor garden.

**“Hardening” transplants**—Gradually introducing seedlings to outdoor growing conditions increases their food reserves, reduces the severity of transplant shock, and increases the chance of survival in the garden. This process is called hardening. About 7 to 10 days before setting plants in the ground, place the seedlings in a shady, protected location outdoors. Over the next several days, gradually expose the

seedlings to longer periods of sunlight. Also, allow the plants to dry slightly between waterings. During the hardening process, move the seedlings indoors if the forecast calls for temperatures below 40°F.

**Cold frames or hotbeds**—A cold frame is another method for starting transplants. It also provides an ideal transition between indoors and the garden because the plants are protected from sudden drops in temperature and gradually harden off. In principle, a cold frame is simply a small greenhouse. Structurally, it is an unheated frame or glass-covered box, heated only by the sun.



**Setting transplants into the garden**—The main goal in transplanting is to avoid root disturbance as much as possible. Little damage occurs with biodegradable pots such as peat or paper pots, but such containers must be planted below the soil surface. Any peat or paper remaining above the soil surface should be removed because it acts as a wick and draws moisture away from the soil around the transplant on windy days.

With flats of young seedlings, use a sharp knife to cut the soil around the plants into blocks the day before you plan to transplant. Water the blocks thoroughly after cutting to stimulate the plant to produce tiny root hairs, thus lessening transplant shock.

Try to transplant late in the afternoon or during a cloudy day. Protect newly set plants with a light shade (like boards set at an angle over the plants) during bright, sunny weather for the first 3 to 5 days. Early plantings may need protection, such as plastic covers or cloches, to avoid damage from frost. When coverings are used, be sure to provide some ventilation so young plants are not cooked by the heat.

**Fertilizing transplants**—For best growth, give each plant 1 or 2 cups of liquid starter fertilizer immediately after setting it in the ground. Prepare a liquid starter fertilizer by adding 2 tablespoons of a complete fertilizer (such as 12-12-12) to each gallon of water. “More” is not better. Fertilizer burn damage can result if too much fertilizer is used.

## Guide to starting transplants

Annual flowers	Days to germination	Best soil temperature for germination	Time to transplanting (weeks)	Notes
Ageratum	5-8	70-75	8-10	Flowers may be blue, pink, or white.
Alyssum	6-10	70-75	6	Excellent or edging.
Celosia	7	70-75	5	Crested (cock's comb) and plumed forms available.
Coleus	7-10	70-75	8-10	Plants also started easily from cuttings.
Geranium	7-10	70-75	10-12	Excellent plants for containers and beds.
Impatiens	7-10	75	8-10	Plants are self-branching and free-blooming.
Marigolds	5	70-75	7	Dwarf (French) and tall (African) cultivars available.
Nicotiana	5-7	70	8-10	Fragrant ornamental species of tobacco.
Petunia	6-10	70-75	8-10	Pinch out tips to encourage branching.
Salvia	6	70-75	8-10	Wide range of flower colors available.

Vegetables	Days to emerge	Best soil temperature for germination (°F)	Growing temperature		Time to transplanting (weeks)	Minimum flat spacing (inches)	Transplant time
			Day (°F)	Night (°F)			
Broccoli	5	70-80	60-70	50-60	5-7	2 x 2	As soon as the soil can be worked without forming clods. Mid-July for fall crops. Second week in April. After danger of frost is past.
Brussels sprouts	5-6	70-80	60-70	50-60	5-7	2 x 2	
Cabbage	4-5	70-80	55-60	50-55	5-7	1 ½ x 1 ½	
Cauliflower	5-6	75-85	60-65	55-60	5-7	2 x 2	
Onion	4-5	75	60-70	45-55	8-10	—	
Lettuce	3-4	75	55-60	50-55	5-7	1 ½ x 1 ½	
Parsley	12	75-85	60-65	55-60	7-9	2 x 2	
Eggplant	6-8	75-85	70-80	65-70	6-8	2 x 2	
Muskmelon	3-4	75-90	70-90	70-80	3-4	3 x 3	
Pepper	7-8	75-85	70-80	60-70	6-8	2 x 2	
Squash	3-5	75-90	70-80	60-70	3-4	3 x 3	
Tomato	6	75-85	70-80	60-65	5-7	2 x 2	
Watermelon	3-4	85-95	75-90	60-70	3-4	3 x 3	

**Note:** The size of the vegetable seedlings at transplant time affects the total yield of the plant. Best results are from relatively small, stocky plants that have only 5 to 7 leaves. As a rule, transplants of fruiting vegetables, such as tomatoes, peppers, and eggplant, that have not yet begun to flower, produce a greater yield and better quality fruit than would be obtained from larger, older transplants.

### For more information

Check these Web sites for more information:

**ISU Extension Distribution Center (online store)**—

[www.extension.iastate.edu/store](http://www.extension.iastate.edu/store)

**ISU Horticulture**—

<http://www.yardandgarden.extension.iastate.edu>

Questions also may be directed to ISU Extension Hortline by calling 515-294-3108 during business hours (10 a.m.–12 noon, 1 p.m.–4:30 p.m. Monday–Friday), or by contacting your local ISU Extension office.

File: Hort and LA 2-9

Originally prepared by Linda Naeve, former extension horticulture associate. Revised by Richard Jauron, extension horticulturist, and Diane Nelson, communication specialist. Illustrations by Jane Lenahan, extension graphic designer.

This institution is an equal opportunity provider. For the full non-discrimination statement or accommodation inquiries, go to [www.extension.iastate.edu/diversity/ext](http://www.extension.iastate.edu/diversity/ext).