COOPERATIVE EXTENSION
University of Kentucky
College of Agriculture, Food and Environment

Growing Transplants

ID-128 Home Vegetable Gardening in Kentucky

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(pages 8-10)

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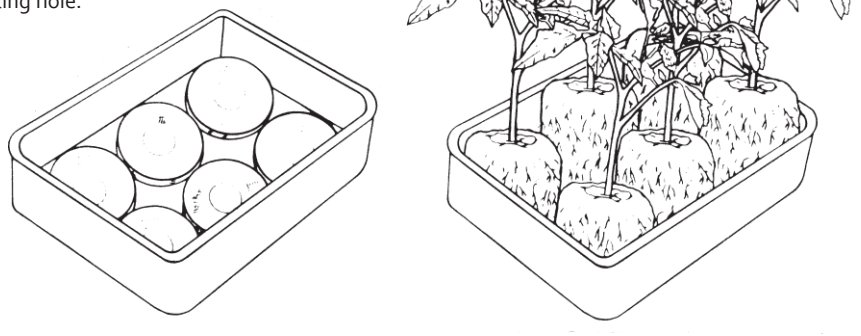
Planting

General Considerations

Buying Seed

Buy fresh, high quality seed from a local seed store, garden center or mail order seed catalog for your vegetable garden. Using seed from the previous year's plants is generally not recommended for the beginning gardener since such seed may not germinate well or may not breed true. You can refrigerate commercial seed in a glass jar with something to dry it (for instance, powdered milk). The seed can then be used later.

Figure 5. Compressed peat pellets make plant growing easy. After you add water to the compressed pellet, it will expand up to seven times its original size. Place seed into the open end for germination. The pellet can be placed directly into the planting hole.



Planting

The soil should be moist at planting time but not overly wet. To test for moisture content, squeeze together a handful of soil. If it crumbles readily rather than sticking together, proceed with planting. Drop vegetable seed into furrows in continuous rows. To make straight rows, drive stakes at each end of the garden and pull a string taut between them. Then draw a hoe or rake handle along the string to make a shallow 1/2-inch furrow for fine seed. Use the corner of the hoe blade to make a deeper 1-inch furrow for larger seed. Measure the distances between rows with a yardstick.

Empty seeds into your hand and drop them from between your fingers. Mix dry, pulverized soil or sand with very small seeds to make even distribution easier. Plant the seed more thickly than needed in case some do not germinate. Cover the seeds and firm the soil lightly over them using the bottom of a hoe blade.

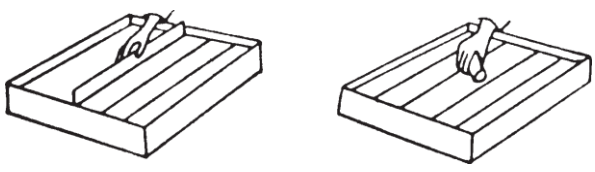
Some seeds, like carrot and parsley, take a long time to germinate—often three to four weeks. If the seeds dry out during germination the seedlings will die, so be sure to keep these rows moistened. You can also put a board or a strip of plastic or burlap over the row to give the seedlings a warm, moist greenhouse environment. Remove this cover just after the seedlings emerge.

Thinning

After germination, you'll need to thin the seedlings to correct their spacing. When your plants have two or three leaves, pull up the weakest ones or pinch off the tops, leaving the rest of the plants spaced correctly (see Table 4).

The soil should be moist when you thin so you do not injure the remaining plants in the process. Do not wait for the plants to become overcrowded before thinning. With some vegetables, thinning can be at harvest. Beet and turnip thinnings make excellent greens. Radishes, onions and lettuce can be left to thin until some are big enough to eat.

Figure 4. A large tray can be sectioned into rows using a ruler or similar sharp-edged instrument. Once seeds are sown in the "furrows," cover the seeds with a growing medium using a blunt instrument or your hand.



Transplants

Why Grow Your Own Transplants?

Having the varieties you want when you want to plant them—that's the great advantage of growing your own transplants.

The flip side of that coin is quality. If you can't provide good growing conditions, particularly plenty of bright light for growing seedlings, the quality of your homegrown plants may not be all you desire.

The big advantage of growing transplants yourself is the wide choice of varieties available in seed. People who produce transplants commercially tend to concentrate on a few popular varieties of each crop. Seed catalogs offer a much wider selection.

If you plant the seeds at the appropriate time and the seedlings grow well for you, you can have transplants that are just the right size for planting in the garden at just the right time. You can have cool-weather crops like broccoli and kohlrabi to plant early in the spring and again in midsummer for a fall crop. And you can have warm-weather crops like tomatoes for planting after the danger of frost is past.

Materials

You can successfully grow vegetable transplants indoors or outdoors if you use a suitable growing structure. While a greenhouse is not essential, being able to control temperature, light, moisture and ventilation is crucial. Day temperatures should be between 60° to 65°F for warm-season crops. Keep the soil moist but not soggy.

You can buy all the materials you need for starting transplants under different brand names from local garden supply centers or through seed and garden supply catalogs. Plant starting kits containing all the necessary equipment are also available. Some have the seed already planted; you only need to add water and put them in a suitable growing area.

Fertilize the plants when the second true leaves appear. Use a liquid fertilizer, such as 20-20-20 or liquid fish emulsion, at rates recommended on the package. Fertilize again in another week or two.

Pots made of peat are good for growing transplants, because plant roots can easily grow through the sides. Do not remove the peat pot when you transplant, and it will gradually decompose. Keeping the plants in the same container reduces transplant shock and helps produce crops a few days earlier than scheduled. You can use egg cartons and paper cups, but be sure to punch holes in the bottoms for good water drainage. Also, cut away these containers before transplanting. Put individual pots in plastic, metal or wooden trays for growing and for convenience when you water and handle them.

Growing Transplants Indoors

For indoor growing, sow seeds in a plant tray containing an artificial growing medium of peat moss and perlite available at garden centers. Adding compost to the potting media at up to 25% of total volume can reduce the need for fertilizers later and potentially encourage seed germination. Enclose the seeded trays in a plastic bag and keep them at room temperature until seedlings begin to emerge. Then, remove the plastic and transfer the trays to suitable growing areas.

The average windowsill is one location for growing plants, but it usually does not get enough light. So, you have to use artificial light to supplement. Use cool white fluorescent lamps alone, a mixture of cool white and warm white fluorescent lamps, or a mixture of cool white and plant growth fluorescent lamps. Locate the lamps 5 to 10 inches from the foliage and operate them 12 to 18 hours/day. Be sure to keep seedlings cool enough (60° to 65°F) for strong, sturdy growth after they germinate.

Plants should be "hardened off" about two weeks before planting them in the garden. That is, you toughen the plants so that they can withstand the outside environment. To do so, begin exposing them to lower temperatures. One way is to take your transplants outside in the daytime and bring them in at night. However, don't let them get caught in a frost. Reduce your watering and fertilizing of transplants to help "hardening off" about one week before transplanting. Do not let them dry out and wilt, however.

Table 4. Use this vegetable planting guide to plant vegetables the right way.

Vegetable	Number of Transplants or Seeds per Foot	Distance Between: Plants When Thinned or Transplanted (in)	Distance Between: Rows (in)	Planting Depth (in)
Asparagus	1 crown	18	30	6-8
Beans, bush, lima	6-8 seeds	4-5	30	1-1 ½
Beans, bush, snap	8 seeds	2-3	30	1-1 ½
Beets	10 seeds	2-3	18	¼-½
Broccoli	1 transplant	14-18	30	
Brussels sprouts	1 transplant per 2 ft	24	36	
Cabbage	1 transplant	9-18	30	
Carrots	15-20 seeds	2-3	18	¼
Cauliflower	1 transplant	16-18	30	
Celery	2 transplants	6-8	30	
Chard	8-10 seeds	6-8	30	¼-½
Chinese cabbage	4-6 seeds	12-15	24-30	¼-½
Collards	8-10 seeds	2-4	24	¼-½
Cucumbers	4-5 seeds	24-36	30	½-1
Eggplant	1 transplant	18	30	
Endive	4-6 seeds	9-12	18-30	½
Garlic, from cloves	1 clove	6	12-18	1 ½
Horseradish	1 root	18	30	2
Kale	4-6 seeds	8-12	24-30	¼-½
Kohlrabi	6-8 seeds	3-6	18-30	¼-½
Leeks	10-15 seeds	3-4	20	½
Lettuce, head	1 transplant	12-18	20	¼
Lettuce, leaf	20-30 seeds	½	8-12	¼
Muskmelons	2-3 seeds	24-36	60	½-¾
Mustard	20 seeds	3	18	¼
New Zealand spinach	4-6 seeds	12	30	½
Okra	3 seeds	12	30	1
Onions, from seed	10-15 seeds	4	12-18	¼-½
Onions	3-6 sets	4	12-18	1-2
Parsley	10-15 seeds	4-6	12-18	¼-½
Parsnips	12 seeds	2-3	18	½-¾
Peas	15 seeds	Do not thin	30-48	1
Peppers	1 transplant	14-18	30-36	
Potatoes	1 seed piece	10-12	36	3-5
Pumpkins	1-2 seeds	4 ft	8-12 ft	1
Radishes, spring	10-15 seeds	2-3	12	¼
Radishes, winter	10-15 seeds	2-4	12	¼
Rhubarb	1 crown per 2 ft	36	4-5 ft	
Rutabaga	4-6 seeds	6-8	18-30	½
Southern pea	3-4 seeds	2-3	30	
Spinach	6 seeds	4-6	12-18	¼
Squash, summer	2-3 seeds in hill	24	48	1
Squash, winter	1-2 seeds	48	6-8 ft	1
Sweet corn	2 seeds	8-10	30	1-2
Sweet potatoes	1 slip	15	36	
Tomatoes	1 transplant per 2 ft	24	36	
Turnips (roots)	6-8 seeds	3-4	12-15	½
Turnips (greens)	10-12 seeds	2-3	12-15	½
Watermelons	2-3 seeds in hill	6-8 ft	72	1

Growing Transplants Outdoors

Structures used for growing transplants outdoors may or may not be artificially heated.

The cold frame for housing transplants receives no artificial heat. Use the sun to its greatest advantage by locating these structures on the south side of a building. Cold frames are used for holding or "hardening off" transplants.

The hotbed is a cold frame structure which includes an additional source of heat. Heat may be supplied from fermenting horse manure, electric cable or light bulbs. Transplants are usually grown in pots set over a 2- to 4-inch layer of composted soil or sand. If horse manure is used or if plants are grown in the bed rather than in pots, use a 4-inch layer of compost as a base. If electricity is the heat source, only a few inches of sand are required for a base, and transplants like cabbage, cauliflower, broccoli and lettuce may be sown directly in the composted soil base.

Buying Healthy Transplants— A Good Investment

Sometimes what appears to be a good buy because it's inexpensive may turn out to be a poor investment in transplants. Transplants which were seeded at the right time and were grown at the right temperature, in abundant light and adequate moisture, will be compact, with the distance between leaves very small (Table 5). The stems will be pencil thick and rigid. Leaves will be dark

Table 5. Transplant production data.

Crop	Weeks from Seeding to Transplanting[4]	Average Seedling Date	Seed Depth (in)	Seed Spacing		Soil Temp. (°F) Needed for Seeds to Germinate	Average Days to Emerge	Satisfactory Growth Temp.	
				Seeds/ Inch	Rows Apart (in)			Day (°F)	Night (°F)
Cool Season[1]									
Broccoli[2]	5-7	Feb 5, July 1	¼	8	2	80	4-6	65	60
Brussels Sprouts	5-7	Feb. 5, July 1	¼	8	2	80	4-6	65	60
Cabbage	5-7	Jan. 20, July 1	¼	10	2	85	3-5	55	50
Cauliflower[2]	5-7	Jan. 25, July 1	¼	8	2	80	4-6	65	60
Lettuce	5-7		¼	--	2	75	2-3	60	50
Onion	10-12		¼	--	2	75	4-5	65	55
Warm Season									
Cucumber[3]	3-4	April 1	1	2 seeds per 4" x 4" pot, thinned to 1		95	3-6	75	70
Muskmelon[3]	3-4	April 1	1			90	4-6	75	70
Squash[3]	3-4	April 1	1			95	5-7	75	70
Watermelon[3] (seeded)	4-6	Mar. 25	1			85	4-6	75	70
Watermelon[3] (seedless)	4-6	Mar. 25	1			90	4-6	75	70
Tomato	4-7	Mar. 15	½	10	2	80	7-9	70	60
Eggplant	6-8	Mar. 10	¼	10	3	80	7-9	75	70
Pepper	6-8	Mar. 10	¼	10	2	80	8-10	70	65

[1] Cool-season crops are frost tolerant and can be set in the garden before the last frost. Warm-season crops are susceptible to frost and should not be set until the danger of the last frost is past.
[2] Do not allow broccoli or cauliflower to become deficient in nitrogen or water or exposed to cold temperatures when they are small.
[3] Seed into individual containers (peat) that may be placed directly into the soil, because these crops will not tolerate root disturbance.
[4] Allow an extra two weeks growing time if grown in plant beds.

green, large and upright with no tendency to droop. Transplants that are trying to produce flowers or fruit are not as desirable as those which are strictly vegetative. Plants trying to produce fruit are slow to develop good root systems to support later fruit production.

Bare root plants will be slower to establish than transplants grown in cell packs or containers. Sometimes, plants are packed in large bundles and shipped great distances. To save space, these plants are clipped before shipping to reduce the amount of top growth. This is a poor practice since it not only induces transplant shock and delays fruiting but spreads disease as well.

When purchasing transplants, be sure to ask whether the plants have been hardened off. If not, it is important to place them in a cool spot and reduce water for a couple of days to acclimate the plants to outside conditions.

Moving Transplants to the Garden

Whether you buy plants or grow your own, the time comes to plant them outside.

Transplanting gives a plant more space to develop, but it will temporarily check growth, not stimulate it. Therefore, for successful transplanting, try to interrupt plant growth as little as possible. In doing so, peat pots give you an advantage, even though they are expensive, because they do not have to be removed. Follow these eight steps when transplanting:

1. Transplant on a shady day in late afternoon or in early evening to prevent wilting.
2. Soak transplants' roots thoroughly an hour or two before setting them in the garden.

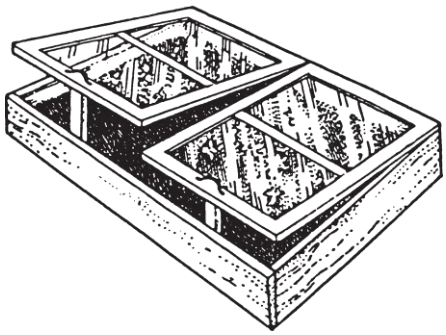


Figure 6. Cold frame. Scrap lumber can be used to build the basic frame. The hinged top can be made from old windows or a frame covered with clear plastic.

3. Handle the plants carefully. Avoid disturbing the roots.
4. Dig a hole large enough to hold the roots. Set the plants to the lowest leaf at recommended spacings. Press soil firmly around the roots.
5. Pour 1 cup of starter solution in the hole around the plant. Starter solutions are high analysis fertilizer solutions for rapid transplant root development. To prepare, mix plant food with 15-30-15, 10-53-17 or 20-20-20 analysis at the rate of 2 Tbs/gallon of water. Any liquid organic fertilizer, like fish emulsion, can also be used as a started solution by following the recommendations on the package.
6. Put more soil around each plant, but leave a slight depression for water to collect. Break off any exposed parts of peat pots so that they will not act as wicks and pull water out of the soil.
7. Shade the plants for a few days after transplanting on a very hot day by putting newspapers or cardboard on their south sides.
8. Water the plants once or twice during the next week.

Figure 9. Average date of last killing frost (36°F) in spring, plus aver- age number of days between last frost in spring and first frost in fall.

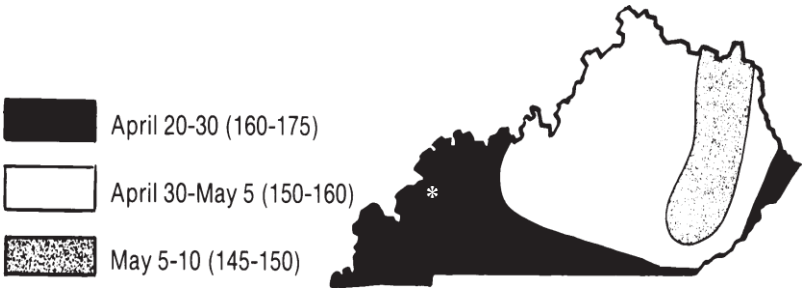


Table 14. Earliest and latest planting dates in the garden in Kentucky. (If producing your own transplants, begin two to 12 weeks earlier than these listed dates. See Table 5.)

	Earliest Safe Planting Date			Latest Safe Planting Date[1]		
Crops	**Western**	**Central**	**Eastern**	**Eastern**	**Central**	**Western**
Asparagus (crowns)	Mar 10	Mar 15	Mar 20	(Spring only)		
Beans (snap)	Apr 10	Apr 25	May 1	July 15	July 25	Aug 1
Beans (lima)	Apr 15	May 1	May 10	June 15	June 20	July 1
Beets	Mar 10	Mar 15	Mar 20	Aug 1	Aug 10	Aug 15
Broccoli (plants)	Mar 30	Apr 5	Apr 10	July 15	Aug 1	Aug 15
B. Sprouts (plants)	Mar 30	Apr 5	Apr 10	July 1	July 15	Aug 1
Cabbage	Mar 15	Mar 25	Apr 1	July 1	July 15	Aug 1
Carrots	Mar 10	Mar 20	Apr 1	July 1	July 15	Aug 1
Cauliflower (plants)	Mar 30	Apr 5	Apr 10	July 15	July 20	Aug 5
Celery	Apr 1	Apr 5	Apr 10	June 15	July 1	July 15
Chard	Mar 15	Mar 20	Apr 1	June 15	July 15	Aug 1
Collards	Mar 1	Mar 10	Mar 15	Aug 15	Aug 20	Aug 30
Sweet Corn	Apr 10	Apr 20	May 1	June 15	July 10	July 20
Cucumbers	Apr 20	May 1	May 10	June 15	July 1	July 15
Eggplant (plants)	May 1	May 10	May 15	June 1	June 15	July 1
Kale	Mar 10	Mar 20	Apr 1	July 15	Aug 1	Aug 15
Kohlrabi	Mar 15	Mar 20	Mar 25	July 15	Aug 1	Aug 15
Lettuce (leaf)	Mar 15	Mar 25	Apr 1	Aug 1	Aug 15	Sept 1
Lettuce (bibb plants)	Mar 15	Mar 25	Apr 1	July 15	Aug 1	Aug 15
Lettuce (head plants)	Mar 15	Mar 25	Apr 1	July 1	July 15	Aug 1
Muskmelons	Apr 20	May 10	May 15	June 15	July 1	July 15
Okra	Apr 20	May 10	May 15	July 1	July 15	Aug 1
Onions (sets)	Mar 1	Mar 10	Mar 15	(Spring only)		
Onions (plants)	Mar 15	Mar 25	Apr 1	June 15	July 1	July 15
Onions (seed)	Mar 10	Mar 20	Apr 1	June 1	June 15	July 1
Parsley	Mar 10	Mar 20	Apr 1	July 15	Aug 1	Aug 15
Parsnips	Mar 10	Mar 20	Apr 1	June 1	June 15	July 1
Peas	Feb 20	Mar 1	Mar 15	(Spring only)		
Peppers (plants)	May 1	May 10	May 20	June 15	July 1	July 15
Irish Potatoes	Mar 15	Mar 15	Mar 20	June 15	July 1	July 15
Sweet Potatoes	May 1	May 10	May 20	June 1	June 10	June 15
Pumpkins	Apr 20	May 5	May 10	June 1	June 15	July 1
Radishes	Mar 1	Mar 10	Mar 15	Sept 1	Sept 15	Oct 1
Rhubarb (crowns)	Mar 1	Mar 10	Mar 15	(Spring only)		
Rutabaga	Mar 1	Mar 10	Mar 15	July 1	July 10	July 15
Southern Peas	Apr 20	May 5	May 10	June 15	July 1	July 15
Snow Peas	Feb 20	Mar 1	Mar 15	July 20	Aug 1	Aug 8
Spinach	Feb 15	Mar 1	Mar 10	Aug 15	Sept 1	Sept 15
Summer Squash	Apr 20	May 10	May 15	July 15	Aug 1	Aug 15
Tomatoes (plants)	Apr 20	May 5	May 15	June 1	June 15	July 1
Turnips	Mar 1	Mar 10	Mar 15	Aug 1	Aug 10	Aug 20
Watermelons	Apr 20	May 5	May 15	June 15	July 1	July 15
Winter Squash	Apr 20	May 10	May 15	June 15	July 1	July 15

[1] Based on average of early maturing varieties. Mid-season and late-maturing varieties need to be planted 15 to 30 days earlier than latest date. Nearly all of the fall-planted garden crops will require irrigation during dry periods. Additional insect controls may be necessary for these tender young plants.