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SP291-A-Growing Vegetable Transplants for Home Gardens

The University of Tennessee Agricultural Extension Service

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Growing Vegetable Transplants For Home Gardens

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Introduction

Some of the most frequently grown and productive vegetables are commonly set into the garden as transplants. These include tomatoes, peppers, eggplant, headlettuce, cabbage, cauliflower, broccoli and brussels sprouts. Other vegetables that are sometimes set as transplants include kohlrabi, cantaloupe, watermelon, summer squash, okra and cucumbers.

There are several advantages to using transplants rather than direct seeding. Even more advantages can be realized from producing your own transplants.

Transplants allow you to replace early-harvested vegetables immediately and to produce another crop quickly. Yield losses from poor germination are eliminated. Producing your own transplants allows control of factors such as cultivar, plant size and container material and size. The chances of introducing insects or diseases into the garden are reduced. There is also assurance of transplant availability if they are home grown.

Seed

High quality transplants can be produced only from high quality, living, disease-free seed. Seed packets should state the year the seed is intended for planting. If seed is not intended for the current year, it may not germinate well, and seedling vigor may be reduced. Store seed in a cool, dry location to keep it alive and healthy as long as possible. Partially emptied seed packets may be resealed with tape, placed in a glass or plastic container, closed with a tight-fitting lid and refrigerated. Some refrigerated seed will keep for several years.

You can test stored seed before planting it. Roll a few seed in a paper towel, moisten the towel and place it in a container with a tight-fitting lid. Both plastic containers and glass jars work well. Place the container at room temperature for a week or 10 days, then count the number of seed that have germinated. The paper towel must remain wet the entire period. To determine the actual germination percentage, divide the number of seed that sprouted by the total number of seed tested and multiply by 100. If, for example, you tested 20 seed and 15 sprouted, then the germination percentage is 15 divided by 20 times 100, or 75 percent.

Commercial seed is grown to insure trueness to type and to reduce the chances it will contain diseases. The parent plants are inspected frequently for off-types or diseases. Insects are carefully con-

trolled. Sprinkler irrigation and growing areas having high humidity may be avoided. Commercial seed is harvested, processed, packaged and stored to insure good germination as well. Frequently, it will be treated to reduce potential insect or disease losses. Purchasing seed from commercial dealers is generally superior to saving your own.

Seed from hybrid plants should never be saved, as it will not produce uniform plants which are true to type. It is also hazardous to save seed of vine crops and other vegetables pollinated by insects, since these vegetables often are pollinated from different varieties of the vegetable. If so, the seed will be a cross of the two parents and may produce plants unlike either parent.

Media

Germination and growing media must support plants, provide nutrients and allow infiltration of oxygen and water. It must be sterile or at least free from disease-causing organisms. It is best to purchase a high quality, sterilized, germinating media, but it is possible to make your own. If you make your own, use one-third peat, one-third sand and one-third rich, finely textured, loamy soil. To sterilize your mixture, heat it in an oven to 180 degrees for 30 minutes. This will require moistening the mixture, placing it in a shallow pan and using a thermometer.

Containers

Sterile media will rapidly become infested with disease organisms unless the growing containers are also sterile. Purchase new containers each year or sterilize old containers by washing them in a solution of nine parts water and one part household bleach. Be sure to wear rubber gloves and not to inhale the fumes. Triple rinse the containers in water and allow them to dry before filling them, as bleach residue will also kill seed and seedlings.

Many things can be used as containers for growing transplants. Containers must be fibrous or have holes in the bottom so water can drain out. Transplants must be easily removable with a minimum of damage to their root systems. Tomatoes do best with containers 2 1/4 inches across or larger. Some vegetable transplants can be produced in 1 1/4 inch containers, but larger containers generally produce stronger transplants. Numerous types and sizes of containers are available at garden centers.

Seeding

Seed vegetables so that they will be ready to set into the garden at the recommended planting dates (See Extension factsheets SP 291G, O and P). Use Table 1, "Details of Transplant Production," to determine appropriate seeding dates.

Table 1. Details of Transplant Production

Vegetable	Approximate Growing Time (wks).	Germination Temperature (degrees F.)	Growing Temperature (degreesF.)	Conditions for Hardening
A. Cool-Season				
Broccoli	5 to 7	70	60 to 65	50 to 55 F for 10 days
Cabbage	5 to 7	70	60 to 65	50 to 55 F for 10 days
Cauliflower	5 to 7	70	60 to 65	50 to 55 F for 10 days
Head Lettuce	5 to 7	70	60 to 65	Lower temperature and moisture
B. Warm-Season				
Cucumber	2 to 3	75	65 to 75	Reduce moisture
Cantaloupe	2 to 3	75	65 to 75	Reduce moisture
Eggplant	6 to 8	75	70 to 75	Reduce temperature and moisture
Pepper	7 to 9	75	60 to 70	Reduce temperature and moisture
Squash	2 to 3	75	65 to 75	Reduce moisture
Tomato	5 to 7	75	60 to 70	Reduce temperature and moisture
Watermelon	2 to 3	80	65 to 75	Reduce moisture

Most vegetables may be seeded one or two seeds to a small cell pack or in rows in a seedflat. If they are seeded in flats, they will need to be transplanted into individual containers about five to 10 days after they emerge, depending on the crop.

Cantaloupe and other vine crops are grown only in fibrous containers or other containers which roots can grow through. They must be seeded directly in these containers and set into the garden without removing them from the containers. They are seeded in containers no more than three weeks before transplanting to reduce transplanting shock. Pint or quart mesh berry baskets work well as containers for two or three plants of a vine crop.

Plant seed at a depth equal to two to four times its diameter. Some seed, such as lettuce, requires light for germination. Plant seed requiring light for germination very shallowly and cover the container to retain moisture until the seed begins to emerge. Seed packets should have planting instructions printed on them.

Growing Conditions

Vegetables vary in their optimum temperature for germination and growth and in the time required to produce a quality transplant. This information is summarized in Table 1, "Details of Transplant Production." Most homeowners will find maintaining proper conditions for transplant production in the home to be extremely difficult. Vegetable seed generally germinate best at a higher temperature than their optimum growing temperature and grow best with day temperatures about 10 degrees above night temperatures.

The big problem with growing transplants in the home, however, is light intensity. Even a bright, south-facing window is not bright enough for a long enough time to grow a good quality transplant. Homeowners must develop a special place or at least make a special effort to provide optimum conditions to produce quality vegetable transplants.

Growing Areas and Structures

The best structure for growing transplants is, of course, a greenhouse. Hobby greenhouses are discussed in PB 1068, "Hobby Greenhouses in Tennessee," available at county Extension offices.

Figure 1 illustrates a hotbed which may also be used to produce good quality transplants. A hotbed is essentially a box with a transparent top and a provision for adding heat. The sides may be concrete, wood or even plastic.

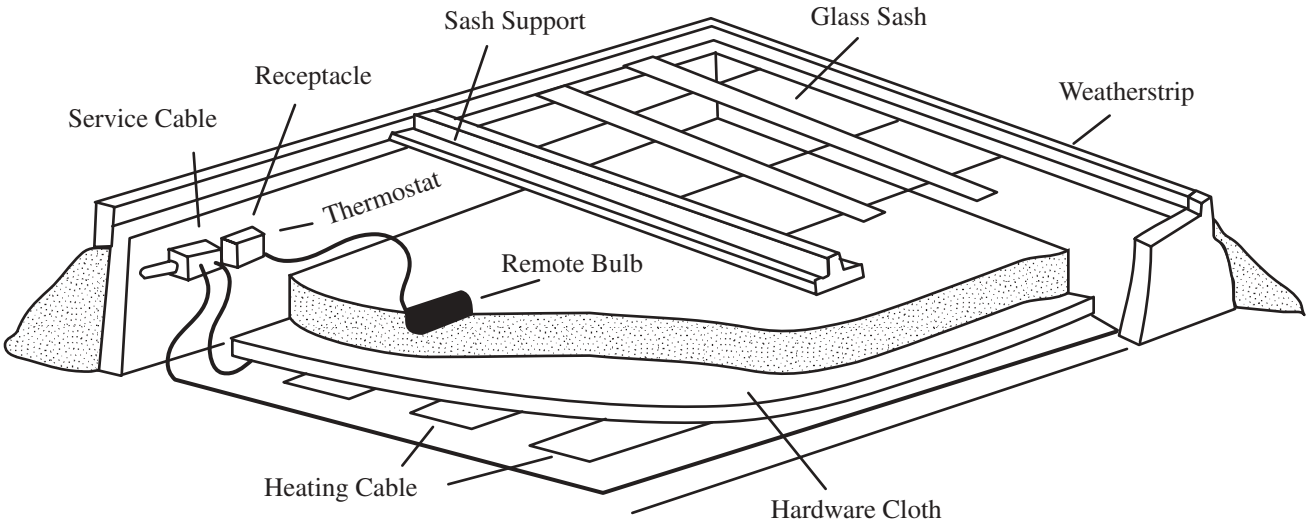

Figure 1. A typical hotbed for growing transplants.

Tops are usually plastic or glass. Heat is usually provided by a heating cable connected to a thermostat and protected by wire mesh above. Fermenting manure can also be used as a heat source. Growing media may be placed directly in the hotbed or in containers placed in the bed.

A hotbed without a heating source is a coldframe. Coldframes are more difficult to grow plants in than hotbeds, especially early in the growing season when it is cool. They may suffice if seeds are not planted too early or if seed are germinated indoors and then the seedlings are moved into the coldframe.

If an outdoor growing frame is unavailable, it is possible to produce transplants indoors if special efforts are made. There are, for example, various fluorescent lights designed especially for plant growth. By suspending one of these lights 4 to 6 inches above young plants and turning the thermostat down 10 degrees at night, fair quality transplants of some vegetables can be produced. It is also possible to use a combination of soft, white fluorescent and incandescent lighting to produce transplants. About 10 percent of the total wattage should be incandescent.

It is just as easy, and perhaps even more effective, to use fluorescent lighting to supplement light from a south-facing window. Begin by building a light box, a box with bottom, back and two ends only. Make it just over 4 feet long and about 18 inches high and wide. Line the inside of the box with aluminum foil to reflect light. Place a fluorescent light containing soft white tubes across the ends of the box. The fluorescent light then becomes the top of the box. Set the box in front of a south-facing window and the fluorescent light will supplement the natural light from the window.

Plug the light into a timer set to come on at dawn and to go off 16 hours later. Set flats of plants on blocks in the lightbox to keep them near the light and remove the blocks as the plants grow.

Vegetable transplants can also be produced using float beds. A float bed consists of a many-celled tray floating in nutrient fortified and heated water. The water may be retained with plastic and the entire structure may be covered to provide protection against the weather and to conserve heat.

Plants are started in seed trays and transferred into "float trays" containing a sterilized growing media when the first true leaves form. A water soluble fertilizer such as 20-20-20 is used at the rate of 1/4 to 1/3 teaspoon of fertilizer per gallon of water. Remove the plants from the float system one week before they are set in the garden to harden them.

Ventilation

Proper care of a coldframe or hotbed is critical if young plants are to survive. Both will heat up very quickly when the sun shines on them. They must be opened at least a bit in the morning so heat can escape or the plants inside will be destroyed. They should be closed in the late afternoon or early evening to retain heat during cold weather.

Watering

Proper watering is extremely critical to transplant production. Seed will not germinate without moisture. Seedlings will die quickly with inadequate moisture. Hotbeds, coldframes and seedling flats can dry out very quickly when exposed to direct sunlight. Vigorous applications of water can also destroy seedlings. Maintain uniform moisture by frequent application of moisture applied as a fine mist. It may be necessary to water two or three times a day under warm, dry or windy conditions. Water frequently enough to keep the media slightly moist until time to harden the plants. Be careful not to overwater, as this can cause rootrot or damping off.

Fertilization

Some artificial medias contain fertilizer. If you begin with one of these, additional fertilization is unlikely to be required. If you make your own media or if your artificial media does not contain fertilizer, it will be necessary to add some. An easy way to do this is to water with a soluble fertilizer at half the recommended strength once a week.

Heat Retention

Other techniques which will increase the chances of producing quality transplants in a coldframe include covering the frames on the coldest nights with an insulating cover, such as a blanket or bags of leaves, and setting the frame on concrete on the south side of a building. This will absorb heat during the day and give it off at night, and will be sheltered from cold winds.

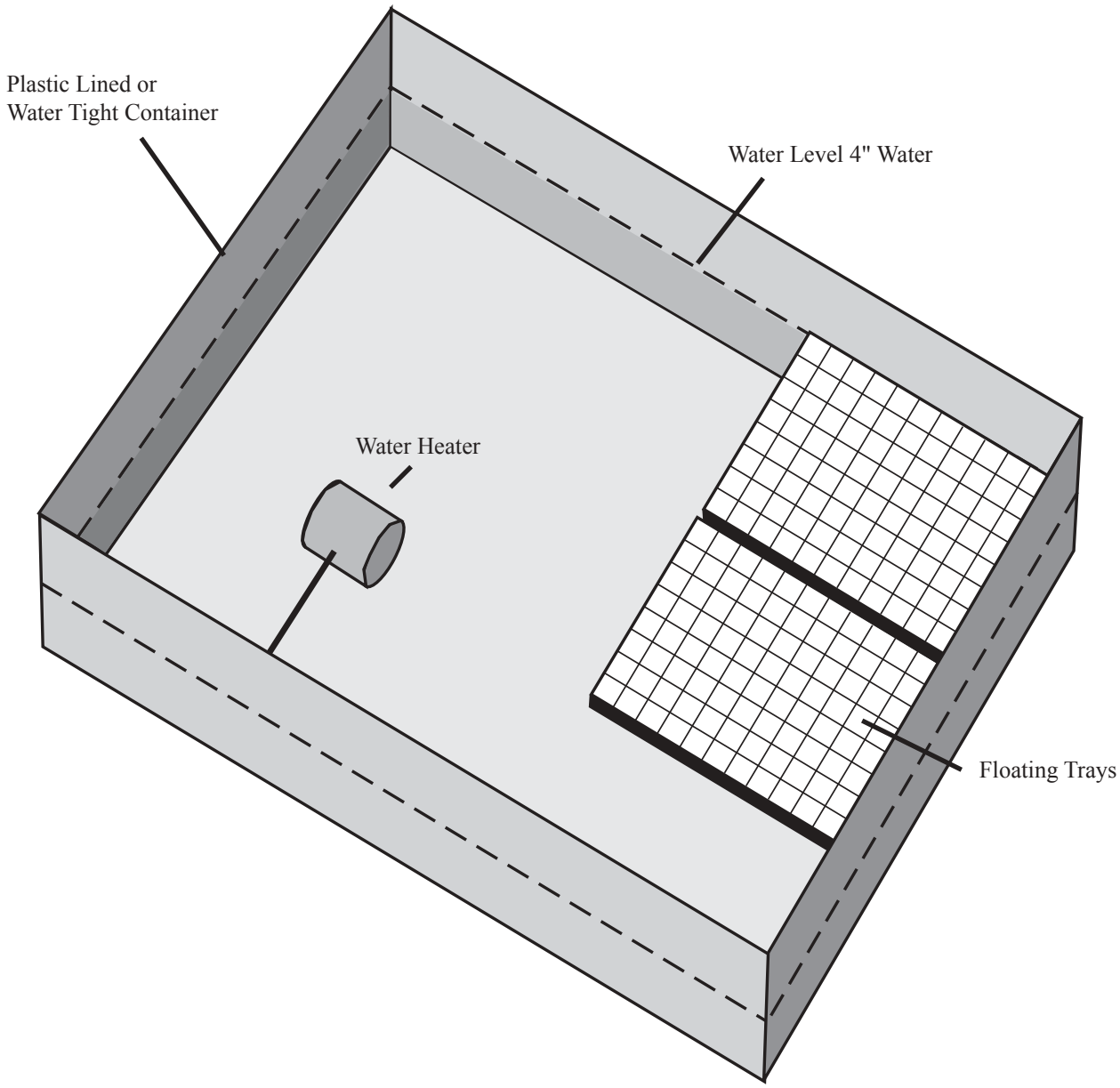

Figure 2. A "Float-Bed" system.

Hardening

Harden transplants to increase their ability to withstand cold temperature, drying wind and hot sunlight after they are set in the garden. Hardening may be accomplished by lowering the growing temperature about 10 degrees for 10 days to two weeks or by allowing plants to wilt slightly before watering. Opening growing structures earlier, wider or setting transplants outside in a protected area during the day may harden them. Hardened plants can be recognized by a slight purple tinge in the leaf veins on the lower side of the leaf. If the entire underside of the leaf is purple, the plant is not only hardened but stunted. Stunting plants should be avoided. Never attempt to harden cantaloupe, watermelon, squash or cucumber plants by exposing them to cold temperatures, because they will be permanently stunted.

Planting Transplants

Transplants should be short and stocky; as wide or wider than they are tall. They should be free of leaf spots, yellowing and dying leaves and insects. Extremely large transplants are more likely to suffer transplanting shock and to grow slowly, bolt or even to die than are transplants of the proper size and age.

Set transplants into the garden on a cloudy day or late in the afternoon. This will allow them to begin recov-

ering from transplanting shock before exposure to the hot sun. Carefully remove transplants from their containers or break groups apart. Try to do minimum damage to the root ball. Set transplants at the depth they previously grew or slightly deeper. Fibrous containers should be wet when planted and should not be removed, but must be set deep enough to cover the rim of the container with a half-inch of soil. This prevents "wicking" or drying out.

A pint to a quart of water applied in the transplanting hole will reduce transplanting shock and increase the survival, yield and earliness of the plants. One tablespoon of a soluble, high-phosphate fertilizer added per gallon of transplant water will also assist the transplant in a quick start. Hotcaps, shingles, milkjugs, newspaper and other protective devices are sometimes used to good effect the first days after transplanting.

The following table, "Troubleshooting," summarizes some the common problems observed in growing transplants and their causes.

Table 2. Troubleshooting

Common Problems	Cause(s)
Tall, straggly seedlings.	Light intensity too low. Nitrogen fertilization too high. Night temperature too high. Plants spaced too close.
Older leaves yellow.	Nitrogen fertilization needed.
Seed doesn't come up.	Seed old or improperly stored. Too wet or too dry. Temperature too low. Seed planted too deep.
Seedlings look pinched at soil line, fall over and die.	**Damping off:** Do not overwater. Grow at proper temperature. Use sterile media and containers. Grow under strong light.
Purple leaves.	Phosphorus deficiency. Temperature too low.

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