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## EC72-1226 Growing Vegetable Transplants

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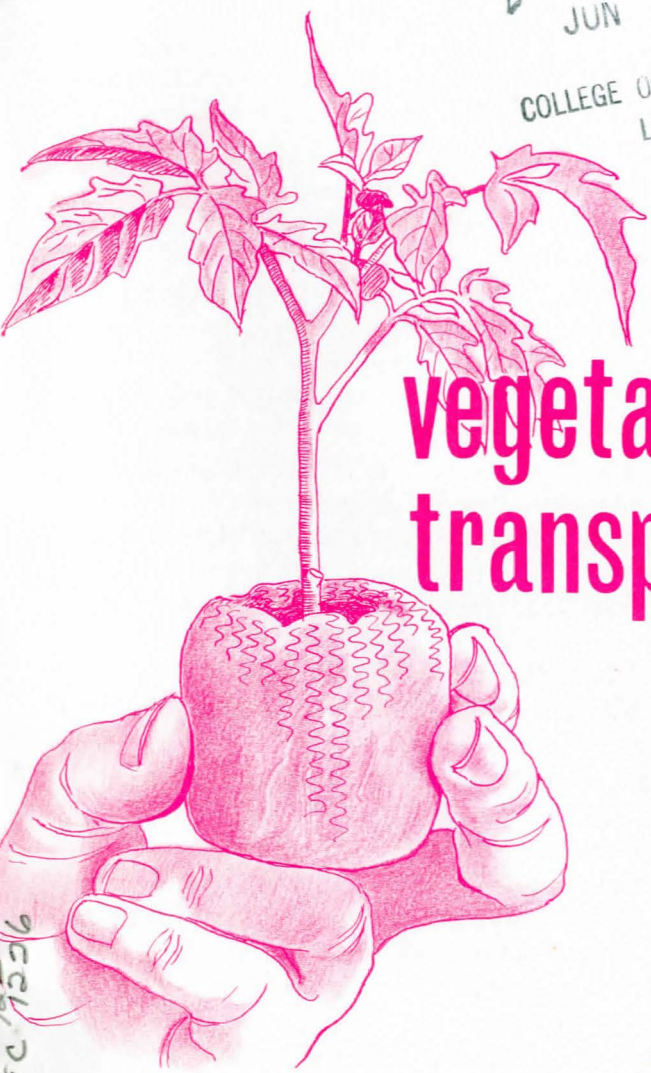
# GROWING



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# vegetable transplants



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Extension Service  
University of Nebraska-Lincoln College of Agriculture Cooperating with the  
U. S. Department of Agriculture and the College of Home Economics  
E. F. Frolik, Dean J. L. Adams, Director

# GROWING

## Vegetable Transplants

By R. E. Neild  
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When properly grown, vegetable transplants usually will produce earlier crops than when planted directly in the garden as seed. Good healthy transplants are available at garden supply centers, nurseries, florists and other retail outlets throughout Nebraska.

Soft tall spindly plants, hard short stunted plants, those with pale green or yellowish colored leaves, and those showing signs of disease or insects will not bear as well and are not desirable.

Garden plants bearing fruit at planting time will not do well unless fruit is removed when plants are first set in the garden. It is also unlikely that this fruit will grow very large or be of good quality.

Some reasons for using home grown transplants are:

1. Plants of hybrids and special varieties may not otherwise be available.
2. Plants may be scheduled at the best or most convenient time for planting.
3. Special containers such as peat pots may be used.
4. Plants may be held in a good condition longer if weather delays work in the garden.
5. Maximum number of plants may be obtained from costly hybrid seed.
6. Certain crops such as seedless or small seeded watermelon are best started in the garden as transplants.
7. Growing transplants is an enjoyable interesting hobby. With a modest investment and as skill is acquired, growing transplants can become a profitable seasonal business.

This circular provides information for the hobbyist and master gardener on plant growing structures, soil and growing media, containers, seeding, and management practices for growing strong healthy vegetable transplants.

## Plant Growing Structures

Temperature usually is too constant and high (especially at night), light inadequate and humidity too low in most homes for producing strong healthy vegetable plants. Special arrangements can be made, however, for starting certain crops under artificial light in unheated basements or in other rooms where temperature may be kept cooler, preferably 50-65° F at night.

Special tubes for emitting more of the red light wavelengths important to plants are available for fluorescent light fixtures. These lights should be suspended above a growing bench and kept within 12 inches of the plant tops. Cabbage, broccoli, cauliflower, lettuce, beets, Swiss chard, chives, onions and parsley demand less light than other vegetables and are more easily grown in such conditions. Tomatoes, eggplant, cucumbers, peppers, cantaloupe and watermelon require more light and are grown with more difficulty.

A small hotbed heated with electric cable is the most inexpensive structure for the home gardener to build for growing transplants. A 6 by 3 foot hotbed can hold about 600 plants allowing a minimum spacing of 4 square inches per plant. This should be enough to meet the requirements for vegetable and annual flower transplants for a fairly large garden and yard. Detailed instructions for constructing and operating such a hotbed are given in U. S. Department of Agriculture Leaflet 445, "Electric Heating of Hotbeds" available by writing the U. S. Printing Office, Washington, D. C.

The avid gardener or those beginning or involved in commercial vegetable production may wish to build a large and more convenient plastic-covered plant growing structure. Such a structure provides protection for the worker as well as for plants and when lighted permits working at night.

Several types may be built. One, constructed from ribs of 1/4" x 4" x 8' plywood formed into a Gothic arch, is gaining favor as a low cost plastic covered structure. U. S. Department of Agriculture Miscellaneous Publication No. 957 gives details for building an 8 1/2' by 12' Gothic arch plastic-covered structure that is simple to construct. Depending upon cost and quality, plastic covering this greenhouse may last from three months to three years. These plans are also available at the U. S. Printing Office, Washington, D. C.

More permanent and expensive plastic- and glass-covered greenhouses are commercially available.

**Table 1. Groups of vegetables according to ease of transplanting.**

<i>Easy to transplant</i>	<i>Require special care</i>	<i>Not successfully planted unless growing in special containers</i>
Beet	Carrot	Bean
Broccoli	Eggplant	Corn
Cabbage	Onion	Cantaloupe
Cauliflower	Pepper	Cucumber
Chard		Peas
Lettuce		Turnip
Tomato		Watermelon

### **Response of Different Vegetables to Transplanting**

Some vegetables survive transplanting quite easily, some require special care, others survive transplanting only if grown and transplanted in decomposable pots or containers allowing removal of plant without disturbing the roots.

Vegetables having a relatively slow rate of growth as seedlings, those having dense fibrous root systems and those whose older roots retain ability to absorb water are more easily transplanted. A grouping of vegetables according to ease of transplanting is given in Table 1.

### **Seed Germinating and Plant Growing Media**

Since vegetable seeds are sown rather thickly in rows and shortly after germination are transferred to flats where they grow to transplanting size, the media for germinating seeds can differ from that used to grow transplants.

The media for germinating vegetable seeds should be sterile and free of weeds, relatively fine and uniform, well-aerated and well-drained yet have good water retention.

Since few garden soils have these properties unless specially treated, vermiculite, perlite, and sand and peat should be used. Vermiculite is lightweight expanded mica. Perlite is lightweight expanded volcanic rock. Both are sterile, well-aerated and water retentive. Horticulture grades used separately or mixed are a good media for starting seeds. They are loose and allow well-rooted seedlings to be easily removed with little damage. Straight sand holds

little water and, therefore, should be mixed with fine shredded peat.

A mixture of two parts soil, one part sand and one part peat is a widely used soil mixture for growing transplants. If the soil is high in clay or silt, one part soil, one part sand and one part peat is best. If a light textured soil is used, reduce the sand and add more peat.

A synthetic soil mix developed by Cornell University is an excellent lightweight media that can be mixed from materials usually free from diseases and weeds. Two bushels of this media can be made by mixing one bushel of shredded peat, one bushel of vermiculite or perlite, three tablespoons of ground dolomitic limestone, one tablespoon of 20% superphosphate and 3/4 cup of 5-10-5 fertilizer.

The fertility level of this mixture is sufficient to meet the needs of most plants for 4-6 weeks. If plants become pale green several weeks after growing in flats of this mixture feed with 4 tablespoons of 10-10-10 or equivalent fertilizer per gallon of water.

Materials for this mixture are inclined to be dusty and are easier to work if kept damp. The mixture can be stored up to six months and still give good results.

### **Sowing, Germination, and Transferring Seedlings**

**Time of sowing.** Time of sowing seed for growing transplants depends on their frost tolerance and the time required to reach transplanting size.

Cool season crops such as cabbage tolerate temperatures several degrees below freezing for short periods of time while warm season crops such as watermelon may be destroyed at 32° F.

Slow growing onions require 8-10 weeks to reach transplanting size while cucumbers may be ready in three weeks. Plants growing under more favorable conditions require a shorter time to grow. Table 2 data show the number of weeks from sowing to transplanting and earliest date for transplanting different vegetables in east, central, and western Nebraska.

Use these data to determine sowing date. Some people feel that earlier harvest can be obtained by using older transplants than those shown in Table 2. It is more usual, however, for older transplants to grow tall and spindly after being set out and to result in delayed harvest, poorer quality and lower yield.

**Sowing.** Plant cucumbers, muskmelon, watermelon and easily disturbed seedlings in peat pots, expanded peat pellets or other

**Table 2. Time to grow transplants and earliest spring planting dates.**

	<i>Weeks sowing to transplanting</i>	<i>Nebraska earliest planting date</i>		
		<i>East</i>	<i>Central</i>	<i>West</i>
Lettuce	5-7	4/15	4/20	4/25
Onion	8-10	4/15	4/20	4/25
Cabbage, Broccoli				
Cauliflower	5-7	4/10	4/15	4/30
Tomato	4-7	5/1	5/5	5/15
Pepper, Eggplant	6-8	5/1	5/5	5/15
Cucumber, Cantaloupe	3-4	5/5	5/10	5/20
Watermelon	5-7	5/5	5/10	5/20

containers where they will grow and later be planted in the garden. Place these individual containers in flats. Water or soak the containers, then plant seeds 1/2 to 1 inch deep. Fill in spaces around the peat pots or pellets with sand. This will help hold them firm in the flat until transferred to the garden and will help keep the outside of these containers moist.

Sow other vegetables in rows in "seed germinating flats" and later transfer as seedlings into another flat to grow to transplant size. Sow 10 seeds per inch, 1/4-1/2 inch deep. A 12" x 18" flat is large enough to grow about 1,000 seedlings. Keep rows of different varieties or vegetables 2-3 inches apart and mark with a small label showing variety and date of seeding.

Water the flat well after seeding by placing the flat in a large pan of water and allowing it to slowly soak up moisture from below or by using a fine sprinkler that will not wash out the shallow seed or compact the media. Seed germinating flats can be covered with paper or plastic to help keep the media moist but should be observed every day so the cover may be removed when the seedlings first emerge.

As the seedlings become crowded transfer them to the moistened soil mix or media in the plant growing flat. Seedlings should be loosened with the narrow flat label and carefully removed and handled by the leaf. Squeezing the stem can result in serious damage. Media in the growing flat should be level and of uniform depth and compaction to prevent low wet spots favoring "damping-off" diseases.

Water plants thoroughly but only when necessary. Overwatering restricts root growth and tends to make the plant soft and favors "damping-off" diseases. It is best to water in the morning so the foliage and soil surface can be dry before night. Less water is needed during cloudy or rainy weather.

**Temperature requirements for germination and growth.** Controlling temperatures near the optimum ranges for germination and seedling growth is an important factor in producing good healthy transplants. Germination requires higher temperature than seedling growth so temperature should be reduced following emergence. Growth is better and plants are more stocky when the temperature at night is about 10<sup>o</sup> F lower than the optimum daytime temperature.

Optimum temperature ranges from seed germination and in the day and night during seedling growth are given in Table 3. Minimum and maximum temperatures for seed germination are also shown. Germination is poorer and more time is required when temperatures are below or above these optimum ranges. Increasingly poorer results should be expected as germination temperature nears the minimum or maximum limits. Seedlings growing at temperatures much above the optimum day and night ranges may grow too fast and become soft and too tall for good survival. Seedlings much below the optimum range will grow slow and small and are more subject to "damping-off" diseases.

**Table 3. Temperatures for germinating seeds and growing vegetable transplants.**

	Minimum	Optimum Range °F	Maximum	°F	
				Day	Night
Broccoli	40	70-80	100	60-70	50-60
Cabbage	40	70-80	100	60-70	50-60
Cauliflower	40	70-80	100	60-70	50-60
Cucumber	60	70-95	105	70-80	60-70
Eggplant	60	75-85	95	70-80	65-70
Lettuce	35	60-75	85	55-75	45-55
Muskmelon	60	75-95	100	70-80	60-70
Onion	35	65-80	95	60-70	45-55
Pepper	60	75-85	95	65-80	60-70
Tomato	50	75-80	100	60-75	60-65
Watermelon	60	70-95	105	70-80	60-70



## Other Management Practices and Considerations

Ventilation of hotbeds and greenhouses is important in reducing excessive humidity and temperature. Air circulation helps dry foliage and the soil surface and reduces disease problems. Temperatures in enclosed structures will rise rapidly during warm sunny days. During such days care should be taken to open sashes, doors or ventilators and to close them at night.

Most seed from reliable firms has been carefully grown and treated so as to be relatively free of disease. Maintaining proper temperature and careful watering are important in preventing "damping-off", the most serious disease in plant growing. It still may become a problem during cloudy humid conditions. Watering at 5 to 10-day intervals with a fungicide solution of 1 tablespoon of captan or zineb per gallon of water will help in control.

Aphids, mites and white flies are pests that may become troublesome. Transplants growing in the home can be treated with one of the following insecticides:

Malathion 25% wettable powder, 4 level tablespoons to 1 gallon water as a spray.

Malathion 5% dust.

Rotenone 0.75 - 1.0 percent dust.

Pyrethrum 0.8 - 1.0 percent dust.

Many commercially prepared garden dusts containing rotenone or pyrethrum are available in ready-to-use formulations. These can be used on transplants growing in the home.

Never use emulsifiable concentrate insecticides or aerosols on transplants. Severe "burning" may result.

Plants may be hardened to withstand adverse conditions following transplanting by lowering temperature, limiting fertility or withholding water. These steps should be delayed until a few days before transplanting. Overhardening should be avoided, however, particularly with eggplants. Overhardened plants begin growth slowly and may not completely recover. Prolonged exposure of cabbage or broccoli (two weeks or more of 45° F or below) may cause them to form seedstalks instead of heads.