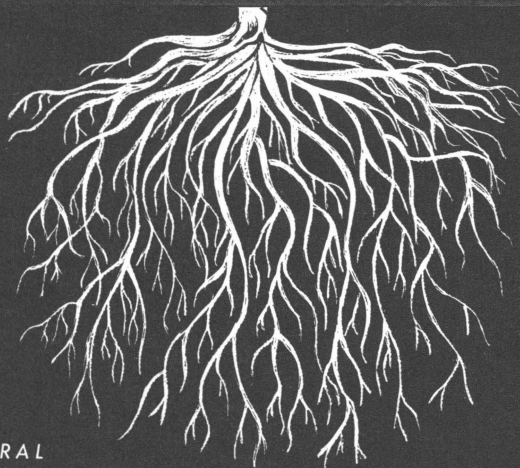


growing vegetable transplants



TEXAS
AGRICULTURAL
EXTENSION SERVICE

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Growing Vegetables Transplants

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Texas vegetable growers can increase their income by thousands of dollars each year if they will use better quality transplants. Healthy, stocky, disease-free transplants are essential for maximum yield and quality of certain crops. Growing good transplants is an art, requiring special skills and knowledge. Careful attention to details is necessary.

Plant Growing Structures

Many serious problems arise from the use of poor transplants. Poor transplants frequently result from inadequate plant-growing structures.

The low-cost plastic greenhouse is superior in many respects to hotbeds and coldframes. The temperature and ventilation can be controlled more easily, accurately and economically. Since growers can work inside a plastic greenhouse, caring for transplants is easier and more convenient. See MP-341, *Plastic Greenhouses for Growing Vegetables*, for details on construction.

Soil for Plant Growing

A fertile, well-drained soil that will not crust and pack is ideal for growing vegetable plants. A mixture of one-third good top soil (clay or clay loam preferred), a third peat moss and a third perlite (horticultural grade) makes excellent plant-growing soil. Well-rotted cow manure, leaf mold or other well-composted organic matter can substitute for peat moss and perlite. Avoid the addition of a large amount of chemical fertilizer to the soil because it may cause severe injury to seedlings. See Table 1 for rates to use.

The soil mixture may be steamed or chemically sterilized to kill weed seeds, soil insects and diseases. Follow the directions of the manufacturer carefully when fumigating the soil with chemicals. However, sterilization is not necessary if clean, disease-free soil is used.

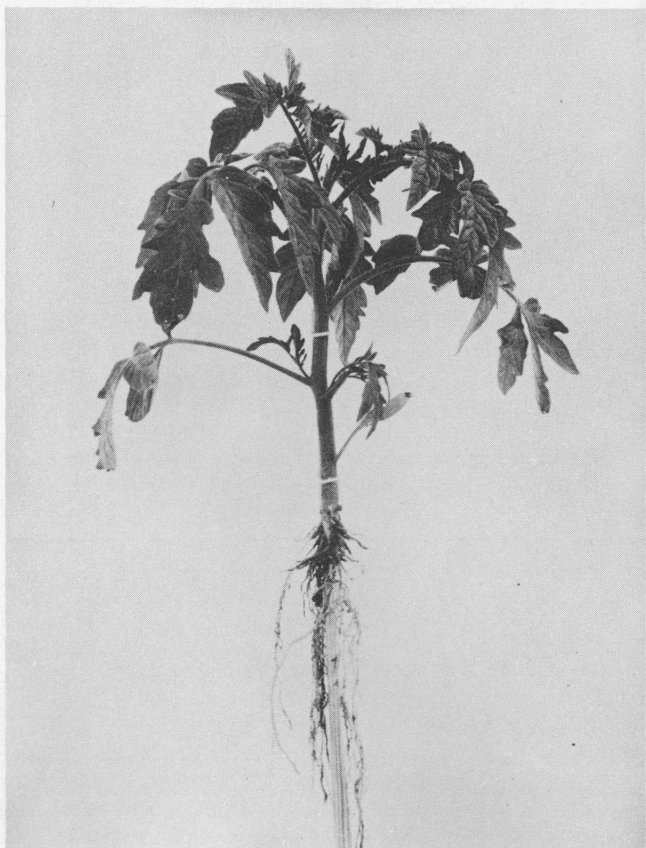
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Table 1. Rates to apply chemical fertilizers to greenhouse soil mixtures.

Recommended rate for soil analysis in lb./acre	- or -	Level table-spoons/bu. of soil required	- or -	Oz. required/ 50 sq. ft. of bed
200		1/2		4.5
400		1		9.0
600		1 1/2		13.5
800		2		18.0
1,000		2 1/2		22.5
1,200		3		27.0

Selecting the Seed

The yield from transplants cannot be any better than the inherent potential of the seed. Purchase the best seed available. The cheapest seed may be the most expensive when considering final yield. Be sure to use the recommended variety for your area.



An ideal tomato plant. Note the size of the stem.

Planting the Seed

Vegetable seed may be planted in plant beds, on benches or tables, in small wood or metal hot-house "flats" (boxes), or in ground beds.

The seed should be treated with an insecticide-fungicide chemical to prevent injury from both insects and diseases. Plant the seed to obtain a spacing between plants as suggested in Table 2. The seed may be planted thickly, about 10 seed to a linear inch, and then transplanted in the plant bed or flat when two true leaves are formed. This practice is followed especially with expensive seed, such as hybrids. Watering the soil with "Copper A" fungicide solution immediately after the seed are planted and again after the seedlings have emerged will aid in controlling damping-off. Directions for mixing and applying the Copper A solution appear on the label.

Tomato plants require wide spacings to produce strong, stocky plants. A spacing of 3" × 3" is ideal. A closer spacing of 2" × 2" is preferred by experienced growers since space often is limited, but the plants grown 2" × 2" generally are inferior to plants spaced 3" × 3". In fact, where greenhouse spacing is not limited, the best-quality tomato plants are those grown at a 4" × 4" spacing.

When both cool and warm season vegetables are grown, it may be necessary to partition the greenhouse or construct two greenhouses to obtain the optimum temperature suggestions in Table 2. If all kinds are grown together, the best temperature is 65 to 75 degrees F.

Caring for Transplants

Seedbeds need careful attention from the day they are planted. The soil should be kept moist, but not wet. Keep fresh air in the greenhouse but make every effort to maintain the optimum night and day temperatures. Avoid excessive humidity by ventilating houses thoroughly when weather permits.

Table 2. Certain requirements for growing transplants.

Vegetables	Depth to cover seed (Inches)	Space required for good plants (Inches)	Space for 1,000 plants (Sq. ft.)	Approximate temperature night-day (Degrees F.)
Broccoli	1/3-1/2	2 × 2	30	60-70
Cabbage	1/3-1/2	2 × 2	30	60-70
Cauliflower	1/3-1/2	2 × 2	30	60-70
Eggplant	1/3-1/2	2 × 2	30	70-80
Pepper	1/3-1/2	2 × 2	30	70-80
Tomato	1/3-1/2	3 × 3	100	60-70

Observe the plants closely for insects. See L-255, Texas Guide for Controlling Insects on Vegetable Crops.

Hardening Transplants

Tender, fast-growing plants must be hardened before field setting to withstand the shock of transplanting and the adverse weather conditions such as low and high temperatures and drying winds. Approximately a week to 10 days before field setting, the growth of the plants should be slowed down by (1) gradually reducing the water, (2) lowering the temperature and (3) root pruning by "blocking" the plants with a knife. Avoid letting the plants dry out suddenly with severe wilting. Temperatures should be kept at 50 degrees F. or higher.

Removing Plants From the Plant Bed

Remove plants from the plant bed with as many roots intact as possible. Soak the plant bed before pulling the plants. The plants should be graded and selected as they are pulled. Select only the best plants for field transplanting. At least a third more plants than the required amount should be produced so that inferior plants may be discarded.

Transplants that are not grown in pots or plant bands should be *blocked* about 1 week prior to field setting. The blocking process consists of running a sharp knife through the soil of the flat between the rows of plants lengthwise, and then crosswise. This confines the roots to a block of soil which can be removed with the plant at time of field setting, resulting in less transplanting shock than when bare-rooted plants are set. Transplants grown in pots or bands generally are planted by hand but can be set in the field with certain types of mechanical transplanters.

Watermelon, Cantaloupe and Cucumber Transplants

Plant containers are required for growing cucurbit transplants since the roots cannot be broken or bruised when planting in the field without heavy mortality.

PLANT CONTAINERS: Peat pots have been used with the greatest success for growing watermelon, cantaloupe and cucumber plants. Peat pots are "planted" with the seedling and decompose readily following transplanting. The square, 3-inch pots are preferred.

POTTING SOIL: A mixture of rich top soil and well-rotted manure, leaf mold or peat moss makes good potting soil, or a mixture of one-third clay soil, one-third peat moss and one-third perlite will give good results in growing cucurbit plants. Sterilizing the soil with chemicals or steam heat is advisable.

SEEDING: After the peat pots are filled to within 1 inch of the top with potting soil, three to four treated seeds should be scattered, not bunched, into each pot. Obtain seed free of anthracnose disease and treated with a seed protectant. The seed should be covered with $\frac{1}{2}$ inch of soil mixture followed by a layer of $\frac{1}{4}$ inch of coarse builder's sand. The surface layer of sand will dry out more readily than soil, which reduces the post-emergence damping-off disease problem. Watering is easier when the pots are not filled completely. Keep the surface sand moist until seedlings emerge. Less frequent watering will be needed thereafter and in the morning only. The pots may be placed on ground beds, but benches are preferred. Fitting the pots close together will prevent rapid evaporation from the sides of the pots.

TEMPERATURE: Watermelon, cantaloupe and cucumber seed germinate readily and grow well at 80 and 90 degrees F. A special effort should be made to keep the temperature in the greenhouse below 100 degrees F.

INSECT CONTROL: Dust or spray young plants weekly to protect them from insects. A few days of protection in the field can be obtained by dusting or spraying the plants immediately before they are removed from the plant bed.



Watermelon plants that are ready to be transplanted in the field.

FIELD TRANSPLANTING: Transplants generally are ready for planting in the field about 3 to 4 weeks after seeding. Water the pots thoroughly and handle the plants carefully to avoid injury to the roots. At least 1 inch of soil should cover the peat pots when they are planted in the field. (If the top of the pot extends above the soil surface, it will serve as a wick and dry out the soil in the pot.) When the field soil is dry, it may be necessary to pour 1 cup of water around each transplant. *Do not delay transplanting more than 4 weeks.* Older plants give poor results.

Sweet Potato Transplants

Sweet potato transplants are grown from selected sweet potato roots. Growers should try to obtain "seed" stock from reliable sweet potato "seed" producers.

Research has shown that highest yields come from *early* planting. Open field beds and coldframes are not suitable for producing *early slips*. Since good sweet potato "seed" are expensive, growers should obtain maximum slip production from each root. Plastic greenhouses are preferred by experienced growers for growing sweet potato plants over other structures.

PLANT BED: A greenhouse bench is preferred to a ground bed since more uniform temperature can be maintained. However, a ground bed is satisfactory if soil-heating cable is used to get needed heat *below* bedded potatoes.

TREATING SWEET POTATO ROOTS: About 10 bushels of sweet potato roots are required to produce plants for planting 1 acre. The roots are treated by soaking in a borax solution (6 pounds of borax dissolved in 6 gallons of hot water, added to 24 gallons of cold water) for 10 minutes.

BEDDING THE ROOTS: Bed the roots in clean soil or sand. Coarse river sand has been satisfactory for growing sweet potato plants. Cover the roots with about 2 inches of the clean soil or sand. Maintain a soil temperature of 80 degrees F. until the plants begin to come up. The air temperature should be as near 75 degrees F. as possible, until the plants are ready to be set into the field.

Keep the soil or sand moist from the time the roots are bedded until the plants are ready to be pulled.

When the plants are ready to be pulled from the bed, hold one hand against the soil or sand and use the other to pull the plant from the sweet potato root.

Pointers For Growing Healthy, Stocky Plants

1. Build a plastic film greenhouse to grow your transplants. They are superior to hotbeds or coldframes and will produce better plants.
2. Use a good soil mixture. Add manure or peat moss and perlite to rich top soil. Sterilize the soil with steam or chemicals.
3. Purchase the *best* seed possible. Cheap seed are expensive in the long run.
4. Plant the seed at the proper depth and leave sufficient space between plants.
5. Maintain the proper soil moisture and temperature while the plants are growing.
6. Harden the plants 1 week to 10 days before setting in the field by blocking, withholding water or lowering the temperature.
7. Remove the plants from the plant bed with as many roots as possible. Avoid injuring the plants or roots.
8. Grow a third more plants than you will need and select only the best plants for field setting. Poor plants reduce profits.
9. Grow hard-to-transplant vegetables such as watermelons, cantaloupes, cucumbers and squash by planting seed in 3" × 3" square peat pots. These pots are planted with the seedling, so that roots are undisturbed and transplanting shock is eliminated.
10. Grow *early* sweet potato slips in a plastic greenhouse to get maximum yields.

Cover Photo

A metal flat of uniform, stocky tomato plants.