



## **KEY FACTORS CONSIDERED IMPORTANT BY SUCCESSFUL VEGETABLE GROWERS**

By

**Drs. Jerry M. Parsons, Roland E. Roberts and Larry A. Stein  
Extension Horticulturists  
Texas AgriLife Extension Service**

Gardeners are always interested about "what's new" in vegetable varieties. Every spring folks want to try a new variety hoping it will produce more and maybe taste better. Horticulturists for the Texas AgriLife Extension Service always try to stay one jump ahead when it comes to new, improved varieties. Our goal is to only recommend a variety which is significantly better in some attribute such as yield or quality or flavor. Hundreds of vegetable cultivars are offered for sale by major seed companies in the United States of America. Texas AgriLife Extension horticulturists comprise the only group capable of testing new varieties in different locations throughout the state to see which ones are best adapted. Lately, consolidation of many seed companies into only a few huge companies which emphasize corporate profits over service to the public makes variety testing by the Extension Service even more important. Seed of the tomato varieties: Spring Giant, Big Set, Bingo (97), Whirlaway (97), Merced, Surefire and President (96) are no longer produced and seed supplies will be exhausted in the year designated beside each variety. Seed of the superior varieties Bell Tower bell pepper and Summer Sweet 860 bell pepper -- tested and recommended by the Extension Service -- are unavailable or in short supply because of seed production problems. These problems are pervasive in flowering ornamentals as well. To address that situation, Extension horticulturists conduct seasonal (spring, summer, fall and winter) trials to determine which available ornamental and vegetable varieties are the best producers for all Texans.

When a superior variety is at once recognized by Extension Horticulturists, their real challenge begins. We have to relate to gardeners how and why this variety is superior to previously grown varieties. Then, hopefully, the nursery industry will have sufficient faith in the recommendation to produce plants which satisfy the consumer demand created by media promotions. The official vehicle created by the Texas AgriLife Extension to make this process work is named CEMAP (Coordinated Educational Marketing Assistance Program). CEMAP initiated the great horticultural promotions for Texas bluebonnets, Mari-Mums (marigolds for fall beauty and nematode control), firebush (*Hamelia patens*), satsuma mandarin orange, and Chinese pistache. See:

[http://www.plantanswers.com/superstar\\_listing.htm](http://www.plantanswers.com/superstar_listing.htm)

### **Proven Tomato Varieties**

The Texas AgriLife Extension Vegetable Recommendation list and sources can be found at:

<http://aggie-horticulture.tamu.edu/PLANTanswers/vegvar.html>

Seed of the Texas SuperStar tomatoes named 'Tomato444' and 'SunPride' can be found in the list as BHN444 and SunPride . The trial data for all tested tomatoes can be found at: <http://aggie-horticulture.tamu.edu/plantanswers/publications/publications.html>

under ***Variety Trials.*** Gardeners should use Celebrity, SunPride and/or Tomato444 for seed-you-can-find home garden tomatoes. If gardeners will look around the Internet, they may also be able to find seed of Amelia and SunLeaper which have also performed well.

## **TO GET THE HIGHEST YIELDS OF THESE RECOMMENDED VARIETIES:**

### **1. ESTABLISH & MAINTAIN HIGHLY FERTILE SOIL**

The ideal soil for most vegetable production is very high in organic matter.

If your soil is not high in organic matter apply compost or manure. Before planting, apply well decomposed compost at the rate of 40 to 60 pounds per 100 square feet of garden in addition to the fertilizer nutrients you decide to apply—3 pounds of a slow-release fertilizer per 100 square feet of planting area is recommended in spring and fall.

In addition to the compost recommended above, manure can be used instead of dry fertilizer. Manures vary widely in nutrient concentration and salt content, so take care to not apply too much. Compared to chemically formulated fertilizers, use of manures is a less precise method of fertilization because sources of manures vary greatly in nutrient and soluble salt content. A safe application of sheep, rabbit, or cow manure is a rate of no more than 50 pounds per 100 square feet (10 tons per acre). Mix it well into the top 8 to 12 inches of soil by tilling or spading. If dried manure is used, do not apply more than the amount recommended on the bag.

Side dress tomato and pepper plants with nitrogen every two to three weeks, starting when the first fruit are still tiny. Apply one pound of the slow-release fertilizer formulation per 100 linear feet of planting bed. Then, immediately irrigate with one inch of water.

### **2. TRANSPLANT 5- TO 6-WEEK OLD PLANTS GROWN IN 4- TO 5-INCH POTS**

Plants of tomato varieties older than 5 to 6 weeks and plants grown in pots less than 4 to 5 inches diameter have been shown to be less productive in carefully conducted research. So buy plants no more than 4 to 5 weeks old in 4 to 5-inch pots. Space plants to allow full access from all sides of the plant during culture and harvest. Plant spacings of 4 feet to 6 feet in rows 6 to 8 feet apart for caged tomato production of vigorous determinate-plant cultivars or for mulched ground culture work well. Smaller determinate-plant tomato cultivars such as Surefire are more productive planted two feet apart in the row. Pepper transplants, 7 to 8 weeks old in 2-inch to 3-inch pots or cell packs are best. In the garden, peppers perform well spaced 12 to 18 inches apart in rows 36 to 40 inches apart.

One of the most important techniques for successfully growing a bumper crop of tomatoes and peppers is to use a starter solution at transplanting time to ensure adequate fertility during early growth of the plants. Purchase starter solutions at local garden centers or make them at home by

mixing 2 level tablespoons of super phosphate in a gallon of water. Specially formulated commercial starter solutions are generally preferable to home mixes because they are usually higher in phosphates and are completely water soluble. After following label directions for mixing the starter solution, pour about a cup or so in each transplant hole or pour the solution in the soil as part of the initial watering.

Set the transplant directly in the center of the hole and fill with soil. If the tomato transplant is leggy and tall, lay the stem portion of the plant on its side rather than digging a hole deeper to accommodate the taller plant. Setting tomato transplants too deep, especially in heavy clay soils, often slows early growth, resulting in later maturity and fewer tomatoes. Setting pepper transplants too deep causes the stem to rot (not root!) and the plant dies. If your soil is sandy, deep planting generally does not cause a problem.

### **3. BUILD AND USE PLASTIC/GROW-WEB WRAPPED CAGES FOR LOW TEMPERATURE PROTECTION, WIND, HAIL, INSECTS DISEASE CONTROL**

Tomatoes and peppers are subtropical plants and benefit from early season protection. Use concrete reinforcing wire to form a cage that is 18 to 24 inches in diameter and 5 feet in height. Wrap cages with Grow-Web Spunweb products (Also sold as Plant Guard, Plant Shield and En-Sulate) can be found in local nurseries or mail-ordered directly from the manufacturers. One address is: Indeco Products Incorporated, P.O. Box 865, San Marcos, Texas 78666 Telephone: 512-396-5814 or 1-888-246-3326 Email: [indecoprod@centuryinter.net](mailto:indecoprod@centuryinter.net). or on the web at: <http://www.indecoproducts.com/> Clamp Grow-Web to the wire with clothespins to keep it in place. The Grow-Web wrapped cage will slow wind, keep air and soil warmer around the plant, prevent entry into cage by virus-carrying insects, and let in plenty of light. An additional wrap of clear polyethylene film increases the temperature inside the cage during day by 20 to 30 degrees F. and at night by 3 to 5 degrees F. if the cage top is covered with the plastic.. Remove plastic from over the cage top during the day to prevent overheating (temps. inside cage over 90 degrees F. hurt the plant) . Cut vent holes in plastic at cage base to permit cooling (chimney effect) during warm days. Remove plastic when cage diameter is filled with foliage. When leaves touch Grow-Web, unwrap and drape it over and around the cage to continue repelling insects while liberating the plant to grow and set fruit. If nuisance pests such as deer or birds persist, the Grow-Web can be left on until harvest begins.

Either stake-and-tie or cage all tomatoes. Staking-and-tying produces larger early tomatoes but less overall fruit than caging. When staking tomatoes, put the stake in shortly after transplanting to lessen root damage. A 6-foot stake set 10 inches deep in the soil works well. As the plant grows taller, tie it loosely to the stake every 12 inches with pieces of rag, twine or soft material.

Prune staked tomatoes to produce a more orderly vine. Remove small shoots which grow out of the point where each leaf joins the main stem. Remove shoots by bending them sideways until they snap. Never cut suckers off because of the possibility of transmitting disease organisms from one plant to the next. For the two main vines, remove all but one shoot arising just above the first cluster of blooms. It will develop into a second branch. Be careful when suckering tomato varieties such as Surefire which has a determinate growth habit. If the wrong growing top is removed from these normally short-in-stature plants, they will be stunted and less productive. Indeterminate

tomato types are better adapted to staking. If semi-determinate types such as Merced, Heatwave and SunMaster are to be pruned, remove only the first 4-6 suckers to insure good top foliage cover of the fruit. Semi-determinate tomato varieties which are to be pruned MUST receive continuous fertilization throughout the growing season or foliage will be too sparse resulting in sunburned fruit.

Few, if any, tomato or pepper varieties will set fruit during cool, cloudy weather. Even some of the heat - setting types drop blooms in cloudy weather conditions. These tomato blooms leave such a distinct stem when they fall from the bloom cluster that many gardeners think the blooms have been eaten off by insects. Artificial blossom-setting hormones, sold as Blossom-Set, are helpful in setting or holding some of these blooms by "fooling " the bloom into believing it has been pollinated. Most of this poor fruit set caused by cloudy weather conditions directly relates to incomplete pollination of the blooms. Tomato and pepper flowers are wind or mechanically pollinated, so gardeners don't have to worry about bee populations.

**4. APPLY AND MAINTAIN DEEP LAYER OF MULCH WHICH CONSERVES SOIL MOISTURE MAINTAINS OPTIMUM SOIL TEMPERATURE ENCOURAGES EXTENSIVE ROOT SYSTEM** - For a complete understanding of Mulches and How They Work, visit the Internet site: <http://aggie-horticulture.tamu.edu/PLANTanswers/drought/mulches.html>

The optimum root zone temperature for tomato and pepper is 75 degrees F. Apply and maintain four to six inches depth of clean wheat straw, or grass clippings, starting as soon as the soil temperature has reached 70 degrees F. Mulch outward at least four to six feet from stem (center) of plant. This will conserve soil moisture, maintain near optimum root zone temperature, allow roots to grow in soil right to the surface, and prevent weed growth. The plant mulched in this manner will be much more productive. Any fruit which touch dry mulch will not rot as they do when resting on moist soil.

Mulch, mulch, mulch -- mulching can not be overemphasized for tomato and pepper health, both in commercial fresh market and home garden plantings. Mulching has been strongly emphasized in horticulture education for generations as an important technique for promoting plant health. Good sources of mulch include clean wheat straw, rye straw, alfalfa, vetch, crimson clover, sorghum, haygrazer and lawn clippings which have been allowed to heat to over 140 degrees F. for 24 to 48 hours in plastic bags.

#### **5. KEEP SOIL MOISTURE NEAR OPTIMUM**

The tomato and pepper plants are water spenders. They can not be conditioned to thrive on limited soil moisture. Consequences of soil moisture deficit are aborted blossoms, blossom end rot, radial fruit cracking, small fruit and lower yield, also insufficient leaf growth and sunburn of fruit directly exposed to strong sunlight.

Tomato and pepper roots will not grow in dry soil to find moist soil. Maintain optimum soil moisture from the center of the plant outward at least three to four feet to encourage maximum root development which will result in optimum plant health and highest possible fruit quality and yield.

Roots of a healthy tomato or pepper plant with full fruit load will grow outward three to four feet from the stem base in all directions. This is an area around the plant of over 28 square feet for a 3-foot radius circle and over 50 square feet for a circle with a 4-foot radius. One inch of water over 28 square feet (a circle with radius of 3 feet) is about 16 gallons. One inch of water over 50 square feet (a circle with radius of 4 feet) is about 31 gallons. A half inch diameter hose delivers about 3 gallons/minute at 50 to 60 psi. Know the delivery rate of your irrigation system, and run your system long enough to deliver gallonage required.

The soil area inhabited by tomato or pepper roots will require irrigation every 3 to 5 days depending on the temperature and wind. Required volume of water will increase as plants grow larger.

## **6. INSPECT PLANT FOR INSECTS AND DISEASES -- FOR CONTROLLING ANY PEST MENTIONED GARDENERS MAY WANT TO USE THE MINI-INPUT TECHNIQUES**

**LOWER LEAF UNDERSIDE FOR MITES; GROWING TIPS AND UPPER LEAVES FOR APHIDS; LOWER LEAVES FOR EARLY BLIGHT; LOWER LEAVES AND FRUIT CALYX FOR PINWORM**

Gardeners may want to check out the mini-input control techniques outlined at Internet site: <http://aggie-horticulture.tamu.edu/PLANTanswers/publications/miniput.html>. Most insects are detected and controlled using a recommended insecticide. Worms or caterpillars are the most conspicuous to gardeners. Worms (caterpillars) come in a variety of colors and shapes, but all damage plants by eating holes in leaves. They feed on tomatoes as well as most garden vegetables. Entire plants may be eaten by these caterpillars if they occur in large numbers. These are easily controlled using Dipel, Thuricide, Bio-Spray or Biological Worm Killer. These materials contain the bacteria *Bacillus thuringiensis* that kills only caterpillars and does not harm beneficial insects. Good coverage of upper and lower leaf surfaces is necessary for best control.

Pinworm adults (tiny nocturnal moths) love to lay eggs on the bottom leaf lower surface near the plant center. From there they spread upward on the plant acting much like leaf miners and rolling the leaf around them as they build their little cocoon in which to pupate. Timely use of *Bacillus thuringiensis* will control most pinworms.

- Spider mites are the least detectable pest. Spider mites are tiny spiders (plant chiggers) that feed on the leaf undersides of many garden vegetables and flowers. Most mites are about 1/32 inch long and live and feed in a web they produce rapidly. They can damage plants in a short time. Inspect plants frequently by examining the underside of leaves with a magnifying glass. When large populations of mites are present, leaves appear "stippled" or dotted with yellow, and webbing is usually present on the underside of leaves. Spray plants with Kelthane and one teaspoon of liquid soap. Repeat the spray every 4 days for two applications. Sulfur also controls mites but do not apply on squash and other vine crops. Highly refined summer oil can be applied to help control mites.



Control other insects by using insecticides which can be legally used on the appropriate crop. Avoid continuous blanket use of any specific insecticide. Otherwise, insects may become resistant to the insecticide. It is a good idea to alternate labeled insecticides periodically.

Insects can be harmful, but disease can be disastrous. Diseases MUST be prevented since diseased leaves cannot be cured.

There are two main diseases of tomatoes which cause disaster every spring. Early blight (*Alternaria*) and Septoria leaf spot ( For photographs of the effects of these diseases on tomato fruit and leaves, visit the Website:

<http://aggie-horticulture.tamu.edu/tomatoproblemsolver/index.html>) are the culprits. Early blight of tomatoes and peppers is characterized by irregular, brown spots that first appear on older foliage. With age, the spots show concentric rings forming a target pattern. A yellow, diffuse zone is formed around each spot. Although this fungus disease can be observed throughout the year, it is most common during the fruiting period. Peppers are susceptible to bacterial leaf spot, preventable with sprays of Kocide 101 if the weather turns rainy. The more tomatoes and peppers a plant produces, the more susceptible to and disastrous are the effects of an early blight infection. The fungus is favored by high humidity and high temperatures. The ONLY control is PREVENTION which begins when the plant is transplanted. During periods of high humidity, which includes most of the spring, apply a fungicide weekly after tomato fruit is formed. The best fungicide to use is one containing chlorothalonil (Daconil or Fertilome Broad Spectrum Fungicide).

Another destructive foliage disease of tomatoes is Septoria leaf spot. It may attack at any time; however, it generally causes problems after the fruit begins maturing. In checking plants for this disease, look at the older foliage. The fungus is characterized by circular lesions with gray centers surrounded by dark margins. With age, the spots become covered with tiny, black specks from which spores grow. Lesions are smaller and more numerous than tomato early blight spots. The fruit is rarely affected, but stems and blossoms are attacked. The disease overwinters on old tomato vines and wild relatives of the tomato family. The fungus is most active when temperatures are between 60 degrees and 80 degrees F. and during periods of high humidity. Apply a fungicide containing benomyl. Because benomyl is a systemic fungicide which goes into the plant, it lasts longer and does not have to be applied as often. To provide complete fungus protection from Septoria and early blight during spring periods of high humidity, mix benomyl with the weekly chlorothalonil (Daconil) every other week.

Bacterial leaf spot of peppers causes spots on both foliage and fruit. Small, yellowish green to brown spots develop on the leaves. Under favorable weather conditions, the spots become numerous and sometimes coalesce into large spots. Infected leaves then turn yellow and fall off. The best control is a copper spray such as Kocide 101 or a streptomycin product such as Agri-Strep applied weekly during periods of high humidity and leaf wetness.

**7. HARVEST CAREFULLY AND TIMELY -- PICK TOMATO FRUIT WHEN PINK AT BLOSSOM END; REMOVE CALYX TO PREVENT PUNCTURE; KEEP TOMATO FRUIT AT 75 TO 55 DEGREES F. AND PEPPER FRUIT AT 45 TO 50 DEGREES F.**

Tomato fruit do not ripen on the plant any better than off the plant IF picked when pink color is visible on the blossom end (side facing the ground) and held at room temperature in light or dark.. This is a truth and reality that is hard for many people to believe. Harvesting fruit when fruit are just beginning to turn pink at the blossom end will maximize both quality and yield by getting them out of harm's way. Remove the calyx to prevent puncture and hold the fruit at 55 to 75 degrees F.

Harvest bell peppers when they are 4 to 5 inches long with full, well-formed lobes. Immature peppers are soft, pliable, thin fleshed and pale. Harvest most jalapenos when they are 2 to 2 1/2 inches long; the Grande jalapeno can be 3-4 inches long. Mature jalapenos turn orange or red; this does not mean they are hotter. Store at 45 to 50 degrees F.

**8. MAINTAIN PLANT HEALTH -- PRUNE OUT OLD LEAVES, FRUITING TRUSSES, AND UNPRODUCTIVE STEMS; ROTATE EVERY YEAR (4 YEAR ROTATION BEST); KEEP AREA AROUND PLANTS MULCHED**

By midseason, older leaves at base of caged tomato plants become infected with early blight or infested with pinworm. These leaves are shaded by those above and no longer benefit fruit growth. Basically all nonproductive plant tissue (fruiting trusses, old yellowing or diseased leaves, spindly non-fruiting stems) can be removed from the older (lower) regions of the plant to let in more sunlight.

If possible, long rotation (4 years) will prevent soil borne diseases and nematodes (For more information about nematode control, visit the InterNet sites: <http://aggie-horticulture.tamu.edu/PLANTanswers/earthkind/ekgarden26.html> and <http://aggie-horticulture.tamu.edu/PLANTanswers/fallgarden/nematode.html>) from becoming a problem. Do not plant an area to tomato or any other member of the nightshade family (includes potato, pepper, eggplant, tomato) or okra any more often than once every 4 years.

**THEN ENJOY ALL THAT GOOD, HOME-GROWN EATING!!!!**

