

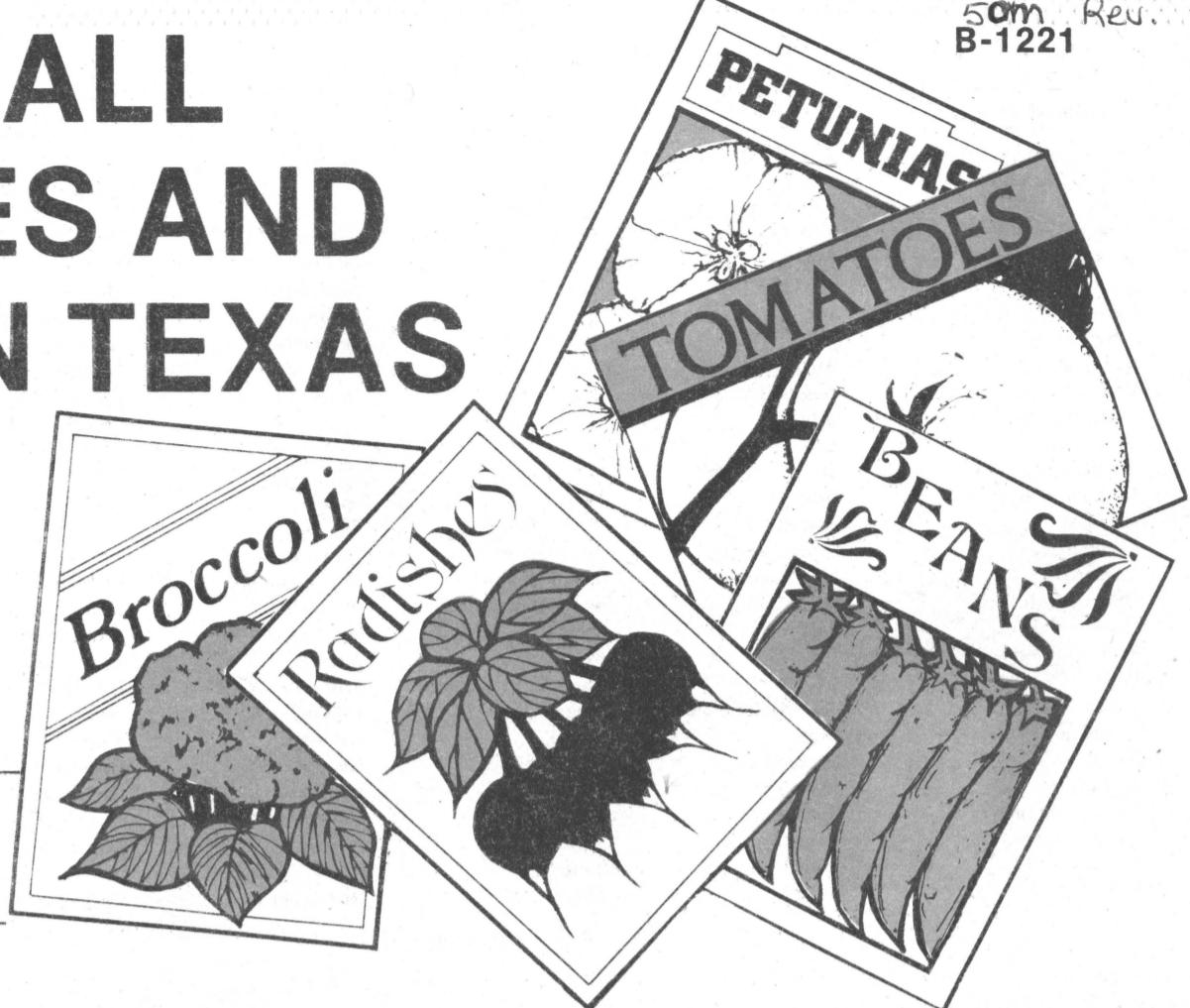
# GROWING FALL VEGETABLES AND ANNUALS IN TEXAS

The Texas A&M University System



Zerle L. Carpenter, Director  
College Station

People Helping People



## KNOW WHEN TO PLANT

To estimate when planting should begin, you must know the average first frost date in your area. The map indicates the average first frost dates of the various gardening regions in Texas. In Region II, the first killing frost usually occurs between November 1 and No-

vember 16; however, if you live in Region IV, the first frost may not occur until mid-December. Also the first frost date within a particular region's range of projected frost dates is not solely dependent on the southern proximity of your location since elevation,

air movement and environmental abnormalities also exert an influence. The best source of reliable information for your specific area is the county Extension agent or veteran gardener. No one can predict precisely when the first frost will occur.

Remember, the dates given on the map are "average" first frost dates for each region. "Average" means that frost can occur earlier, but hopefully it will be much later.

After using figure 1 and local information to determine the average first frost for your area,

you can now refer to the Direct Seeding Chart to determine planting dates. The dates given indicate the last date that vegetables should be seeded into the garden area. When planting after the indicated date, you are taking a chance of losing a frost-susceptible vegetable to an early cold snap, or at least reducing the length of harvest. Even those crops rated as frost resistant can be injured or killed by cold temperatures. Planting frost-resistant crops on or before the indicated date insures that production will occur before se-

vere plant damage occurs or that the plant will be in the proper stage of maturity to withstand winter temperatures. For instance, one can harvest fall planted Brussels sprouts, carrots, collards, garlic, parsley and spinach until the following spring in some areas.

The Direct Seeding Chart also lists those fall vegetables that perform best when transplanted. The dates indicated are the last date that transplanting should occur if maximum yields and high quality are expected.

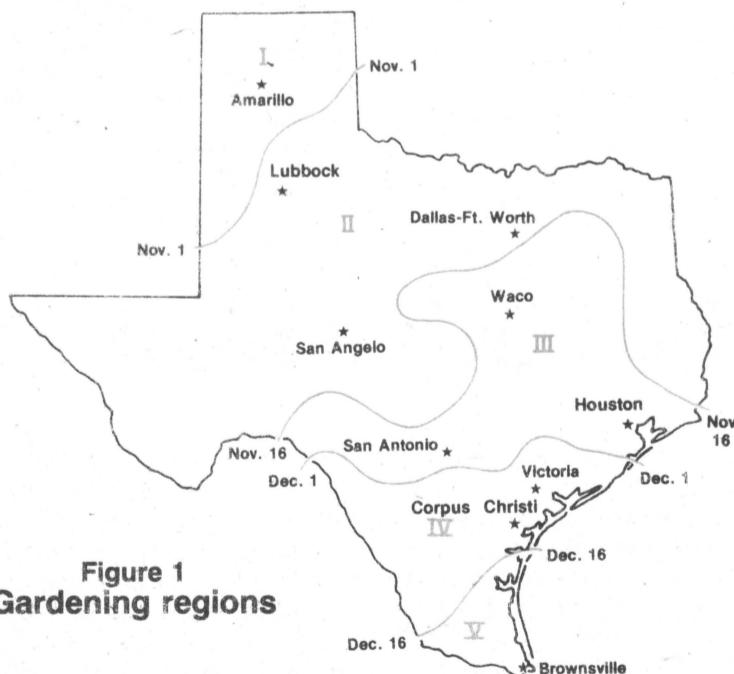


Figure 1  
Gardening regions

## TIME TO DECIDE

In most areas of Texas, gardening can continue the year round. It is always a tough decision to decide whether to terminate spring-planted vegetables or to carry them through until the first frost. In northern areas of Texas many spring-planted crops such as tomatoes, eggplants and peppers can be grown until the first killing frost, provided the plants remain healthy. In southern areas of the state, home gardeners should begin

fall gardens anew rather than trying to carry spring-planted crops through the summer. During early fall, also plant flowering annuals which bloom in late fall, withstand winter temperatures and bloom again next spring. This means preparing the soil and getting transplants started as soon as possible. Most gardeners overlook the fact that the best time to plant many flowers and vegetables is during the late summer and early fall months.

## Success Takes Planning

Planning is important in a spring garden, but it is a necessity in a fall garden if maximum productivity is to be achieved.

Fall vegetable crops are categorized as long-term and short-term crops. Duration of these crops depends upon when the first killing frost occurs and the cold tolerance of the vegetables.

Plant long-term, frost-tolerant vegetables together. Frost-tolerant vegetables include beets, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, chard, collards, garlic, kale, lettuce, mustard, onions, parsley, spinach and turnips. As mentioned earlier, all flowering annuals recommended for fall planting are frost-tolerant.

Plant short-term, frost-susceptible vegetables together so that they can be removed after being killed by frost. Frost protection and the planting of a cereal rye cover

crop are facilitated if such a grouping system is used. Frost-susceptible vegetables include beans, cantaloupes, corn, cucumbers, eggplants, okra, peas, peppers, Irish potatoes, sweet potatoes,

squash, tomatoes and watermelons.

The following table indicates the relative maturity rate, average height (in feet) and frost sensitivity of the crop of various garden vegetables:

VEGETABLE MATURITY RATE HEIGHT IN FEET  
AND FROST SENSITIVITY

Quick (30 to 60 days)		
Beets (1½) FT*	Mustard (1½) FT	Summer squash (3) FS
Bush beans (1½) FS**	Radishes (½) FT	Turnips (1½) FT
Leaf lettuce (1) FT	Spinach (1) FT	Turnip greens (1½) FT
Moderate (60 to 80 days)		
Broccoli (3) FT	Corn (6) FS	Okra (6) FS
Cabbage, Chinese (1½) FT	Green onions (1½) FT	Parsley (½) FT
Carrots (1) FT	Kohlrabi (1½) FT	Peppers (3) FS
Cucumbers (1) FS	Lima beans, bush (1½) FS	Tomatoes, cherry (4) FS
Slow (80 days or more)		
Brussels sprouts (2) FT	Cauliflower (3) FT	Pumpkins (2) FS
Bulb onions (1½) FT	Eggplant (3) FS	Sweet potatoes (2) FS
Cabbage (1½) FT	Garlic (1) FT	Tomatoes (4) FS
Cantaloupes (1) FS	Irish potatoes (2) FS	Watermelon (1) FS
		Winter squash (1) FS

\*FS Indicates frost-susceptible crops which will be killed or injured by temperatures below 32° F.

\*\*FT Indicates frost-tolerant crops which can withstand temperatures below 32° F.

## Contents

Know When to Plant .....	1
Success Takes Planning .....	1
Time to Decide .....	1
Direct Seeding Chart .....	2
Soil Preparation and Fertilization .....	2
Variety Selection Important.....	3
Bulbs Add Color .....	3
Get Seeds Up in the Heat.....	3
Fall and Spring Flowering Annuals .....	3
Adequate Moisture a Must .....	4
Don't Bug Me!.....	4
Disease Prevention .....	5
Pesticides: Read the Label .....	5
Problems Encountered in a Fall Garden .....	5
Things You Always Wanted to Know About Gardening .....	6-7
Care Can Kill .....	8
Store Extra Seeds for Future Use .....	8
Harvest for Highest Quality.....	8
Preserving Your Vegetables .....	9
Emergency Procedure .....	9
Planting Guide.....	9
Try Gardening in Containers.....	10
Compost Pile Valuable .....	10
Optimum Temperature and Humidity for Storing Fresh Vegetables .....	10
Garden Problem Guide .....	11
Buying Bulk Seed .....	11
Help Us Help You! .....	11
Planning for Next Year .....	12



## Acknowledgment

This publication was compiled by Dr. Jerry Parsons, area Extension vegetable specialist, and Dr. Sam Cotner, Extension horticulturist. The Texas A&M University System. Others contributing information include Dr. Jerral Johnson, Extension plant pathologist; Everett Janne, Extension landscape horticulturist; Dr. J.W. Stewart, area Extension entomologist; Dr. Roland Roberts, area Extension vegetable specialist; and Shirley Johnson, Bexar County Extension agent, The Texas A&M University System.

### DIRECT SEEDING CHART\*

Vegetables	Region I	Region II	Region III	Region IV	Region V
Beans, snap bush	July 15	August 1	September 1	September 10	October 1
Beans, Lima bush	July 15	July 25	August 20	September 1	September 15
Beets	August 15	September 1	October 15	November 1	December 15
Broccoli	July 15	August 1	September 1	October 1	November 1
Brussels sprouts	July 15	August 1	September 1	October 1	November 1
Cabbage	July 15	August 1	September 1	October 1	November 1
Carrots	July 15	August 15	November 10	November 20	December 15
Cauliflower	July 15	July 1	September 1	October 1	November 1
Chard, Swiss	August 1	August 15	October 1	October 20	December 15
Collards	August 1	August 15	October 10	October 20	December 15
Corn, sweet	July 1	August 10	August 20	September 10	September 20
Cucumber	July 15	August 1	September 1	September 10	October 1
Eggplant	July 1	June 15	July 1	July 10	August 1
Garlic (cloves)	July	August	October	November	December
Kohlrabi	August 15	September 1	September 10	October 1	November 1
Lettuce (leaf)	September 1	September 15	October 10	November 1	December 1
Mustard	September 1	October 1	November 1	December 1	December 15
Onion (seed)	not recommended	not recommended	November 1	December 1	December 15
Parsley	September 15	October 1	November 1	December 1	December 15
Peas, southern	June 15	July 1	August 1	September 1	September 1
Pepper	June 1	June 15	July 1	July 15	August 1
Potato	not recommended	August 1	September 1	October 1	not recommended
Pumpkin	June 1	July 1	August 1	August 10	September 1
Radish	September 1	October 1	November 25	December 1	December 15
Spinach	August 15	September 1	November 15	December 1	December 15
Squash, summer	August 1	August 15	September 10	October 1	October 10
Squash, winter	June 15	July 1	August 10	September 1	September 10
Tomato	June 1	June 15	July 1	July 10	August 1
Turnip	September 1	October 15	November 1	December 1	December 15

### TRANSPLANTING\*

Vegetables	Region I	Region II	Region III	Region IV	Region V
Tomato, eggplant, peppers	June 25	July 10	July 25	August 10	September 1
Broccoli, cauliflower, Brussels sprouts, cabbage	August 1	August 20	September 20	October 20	November 20
Annual Flowers (transplant only)					
Alyssum	August-October	September-November	September-December	October-December	October-December
Asters	not recommended	September-December	September-December	October-December	October-December
Calendula	not recommended	September-December	September-December	October-December	October-December
Cornflower	August-September	not recommended	not recommended	not recommended	not recommended
Dianthus (Pinks)**	August-October	September-December	September-December	October-December	October-December
Flowering cabbage and kale	August-September	October-November	October-December	October-December	October-December
Pansies**	August-October	October-November	October-December	October-December	October-December
Petunias	not recommended	not recommended	September-November	October-December	October-December
Phlox	not recommended	September-November	September-December	October-December	October-December
Shasta daisies**	August-September	August-October	August-November	October-December	October-December
Snapdragons**	August-September	September-November	September-November	October-December	October-December
Stock	not recommended	September-December	September-December	October-December	October-December
Viola**	August-October	October-November	October-December	October-December	October-December

\*Dates indicated are the last optimum dates that seeding or transplanting should occur if maximum yields and high quality are expected.

\*\*In Panhandle, mulch or plant in protected area.

# Soil Preparation and Fertilization

If you made a mistake by not properly preparing your garden soil last spring, now is the time to correct it. This should be done *before* establishing the fall garden, because soil problems encountered during the spring growing season can be expected in the fall also.

Adding liberal amounts of organic matter to all types of garden soils is a highly recommended practice. Hay, compost, rotted grass clippings or leaves applied to the garden surface 2 to 3 inches deep and tilled or worked into the soil greatly improves sands or clays.

Heavy clay soils, which are sticky when wet and hard as a brick when dry, are much easier to cultivate if a washed, coarse sand is added. Use a washed-type sand to insure calcium carbonate removal, which makes alkaline soils

even more alkaline. Add 3 inches of sand to the garden surface if the soil is to be tilled to a 10-inch depth.

Gypsum (calcium sulfate) added to a "sticky" soil makes it more workable. Gypsum is a neutral product which does not increase or decrease the soil's alkalinity. Not only is it a good soil conditioner but it also furnishes certain amounts of calcium, which may prevent such minor element disorders as blossom-end-rot of tomatoes and cabbage leaf tip burn.

In many areas of East Texas acid soils are common and often can be a problem. Add lime to these soils to bring the soil pH up to a satisfactory range. Generally, about 1/2 to 1 pound of lime per 100 square feet of garden area worked into the soil along with fertilizer will correct most acidity problems. Use the lower rate if

your soil is sandy. Wood ashes also are alkaline and can be used in small amounts to raise the soil pH.

Never add lime or wood ashes to alkaline soils. Add 5 pounds of sulfur per 100 square feet annually to provide a temporary pH reduction. Use iron sulfate or a chelated iron product in the soil to prevent plant yellowing (iron chlorosis) caused by lack of iron.

Also add fertilizer for the fall crop because spring fertilization has washed out of the soil

or been used for plant growth. Use a balanced fertilizer such as 10-10-5, 15-10-10 or 16-20-0 at a rate of 2 pounds per 100 square feet. If manures are used, 20 to 50 pounds per 100 square feet should be adequate. Incorporate fresh manure into the soil several weeks before planting.

Thoroughly pulverize soils at least 10 inches deep. Mix the above ingredients into the garden area and add nematicide if necessary. A properly prepared soil insures a successful fall flower and vegetable garden rather than a disappointing failure.

Additional amounts of fertilizer are needed later in the season to insure optimum plant growth and production. Add 1 1/2 ounces (3 tablespoons) of ammonium sulfate per 10 feet of row to cucumbers, cantaloupes, eggplants, okra, peas

and beans, peppers, squash and tomatoes after the first fruits are set, after the first harvest and every 3 to 4 weeks thereafter.

Broccoli, cabbage, cauliflower, collards, kale, lettuce, mustard, spinach and turnip greens require 1 1/2 to 2 ounces (4 tablespoons) of ammonium sulfate per 10 feet of row 2 weeks after transplanting or 4 weeks after sowing seed.

Flowering annuals require 2 ounces (4 tablespoons) of ammonium sulfate every 4 to 8 weeks for the life of the plants. Sandy soils need more frequent fertilization than heavy clay soil.

Crops such as beets, carrots, potatoes, radishes, turnips and watermelons usually do not need additional fertilization. Excessive amounts of nitrogen reduce yields or lower quality or both.



## BULBS ADD COLOR

Nothing is as exciting as the sudden appearance of the first flowers of spring — glistening white snowdrops and golden spurs of crocus, trumpeting yellow daffodils, fragrant hyacinths and spectacular tulips. All grow beautifully if given proper care.

Flower bulbs have chilling requirements which must be met before they come to life, develop roots and eventually bloom. In warmer areas of Texas, it is necessary to create a cold period artificially. The vegetable drawer in the refrigerator provides an excellent place for this treatment.

Tulips, hyacinths, crocus, daffodils — in fact almost all hardy bulbs — should be precooled at 40° to 45°. Tulips require 6 to 8 weeks while the others can get by with 4 weeks, although 6 is better. Hyacinths and some daffodil varieties may not have to be precooled, but why take a chance when the precooling almost guarantees good results.

Precooled bulbs are advertised frequently, but unless they are kept in cold storage, the normal garden shop temperatures usually nullify the precooling effect if they are not sold immediately.

Without cooling, flower quality usually is poor and stems are extremely short. A word of caution, though — do not allow bulbs to freeze while in cold storage.

Bulbs can remain in their original package provided they have air holes for circulation. Make sure all packages are marked clearly.

As a general rule plant when the soil begins to cool. Be sure to purchase bulbs early in the season to insure an adequate precooling period. Delaying planting too long without precooling results in reduced quality because bulbs need to develop an extensive root system in the ground before flowering begins.

Careful soil preparation rewards gardeners with much higher quality flowers. Digging individual holes for single bulbs is discouraged. Much better root growth is obtained by digging and preparing the entire bed area. If at all possible, prepare the soil to a depth of 10 to 12 inches. Roots of most bulbs form below the bulb; therefore, it is important to prepare the soil several inches below the bulb.

Remember that bulbs of the same type planted at the same depth emerge at the same time and thus flower uniformly. Plant about 1 to 2 inches deep with the "nose" pointing up.

Throughly water the bed immediately after planting bulbs. Be sure there is plenty of water available to the plants during the flowering period.

## Variety Selection Important

Proper variety selection and timing are two essential keys to successful fall vegetable gardening. Select varieties which produce quality vegetables, are disease resistant, mature within a reasonable time and are adapted to fall growing conditions.

Because timely maturity of vegetables planted in a fall gar-

den is so important, use only certain kinds of crops. This is especially true when considering frost-susceptible crops.

Grow bush snap beans rather than pole beans which require longer maturity periods. Select determinate, short-growing tomato varieties with short maturity periods rather than indeterminate,

**Bean, bush** — Contender, Topcrop, Greencrop, Blue Lake, Tendercrop

**Bean, Lima bush** — Jackson Wonder, Henderson Bush, Fordhook 242

**Beets** — Detroit Dark Red, Green Top Bunching, Asgrow Wonder

**Broccoli** — Waltham 29, Green Comet

**Brussels sprouts** — Jade Cross, Catskill

**Cabbage** — Early Round Dutch, Greenback, Golden Acre, (red) Red Acre, (savoy) Drumhead, (hybrid) Round-up, Superette, Rio Verde, Gourmet

**Cabbage, Chinese** — Michihli

**Carrot** — Imperator, Danvers 126, Nantes, Red Core Chantenay

**Cauliflower** — Snowball, Snowcrown

**Chard** — Lucullus

**Collard** — Georgia

**Corn, sweet** — Calumet, Bonanza, Merit, Golden Security, Buttersweet; (white) Silver Queen, Country Gentleman

**Cucumber** — (pickling) National Pickling, Victory, Crispy, Salty; (slicers) Palomar, Ashley, Poinsett, Straight 8, Cherokee

**Eggplant** — Florida Market, Black Beauty, Highbush

**Garlic** — Texas White

**Kale** — Vates, Dwarf Blue Curled

**Lettuce** — (head) Great Lakes strains, Valverde; (leaf) Black Seeded Simpson, Salad Bowl, Ruby, Oakleaf, (butterhead) Summer Bibb, Tendercrisp; Buttercrunch, (romaine) Valmaine

**Mustard** — Tender Green, Florida Broadleaf

**Onion** — (bulbing) Granex (yellow and white), Eclipse, Grano 502; (green) Beltsville Bunching, Crystal Wax, Ringmaster

**Parsley** — Moss Curled, Evergreen

**Peas, southern** — Blackeye No. 5, Brown Sugar Crowder, Burgundy, Champion, Cream 40, Knuckle Purple Hull, Mississippi Silver

**Pepper, sweet** — Yolo Wonder, Keystone Giant, Rio 66

**Pepper, hot** — Long Red or Thin Cayenne, Hungarian Wax, Jalapeno

**Potato, Irish** — (white) Kennebec; (red) Red Lasoda, Pontiac; (russet) Norgold

**Radish** — Cherry Belle, Early Scarlet, Globe, White Icicle; (winter) Black Spanish, White Chinese

**Rutabaga** — American Purple Top

**Spinach** — Early Hybrid 7, Dixie Savoy, Bloomsdale; (summer production) New Zealand, Malabar

**Squash** — Early Prolific Straightneck, Hyrific, Dixie Hybrid Crookneck, White Bush Scallop, Zucco, Zucchini; (winter) Acorn, Butternut

**Tomato** — (large fruited) Spring Giant, Better Boy, Bonus, Big Set; (small fruited) Small Fry

**Turnip** — Purple Top White Globe, Just Right; (greens) Seven Top, Crawford

SELECTION OF FLOWERING ANNUALS IS DEPENDENT ON COLOR DESIRED RATHER THAN ADAPTION OF VARIETIES.

## GET SEEDS UP IN THE HEAT

One of the problems faced by so many home gardeners when starting a fall or summer garden is getting those so-called "winter" vegetable seeds to come up when planted during the heat of summer. Many popular, cold-hardy vegetables such as lettuce, carrots, broccoli and others germinate poorly when the soil temperature is high. So, the home gardener is faced with a real problem of trying to get seeds to germinate and grow during harsh, unfavorable conditions.

One direct way to avoid this problem is to set out transplants. Transplant vegetables such as tomatoes, peppers and eggplants to insure production before frost occurs. Cold-tolerant crops such as broccoli and cauliflower can be transplanted or seeded directly into the garden area. Broccoli and cauliflower transplants insure early production and properly spaced plants.

Seed most vegetables, not mentioned above, directly into the soil. It is important to

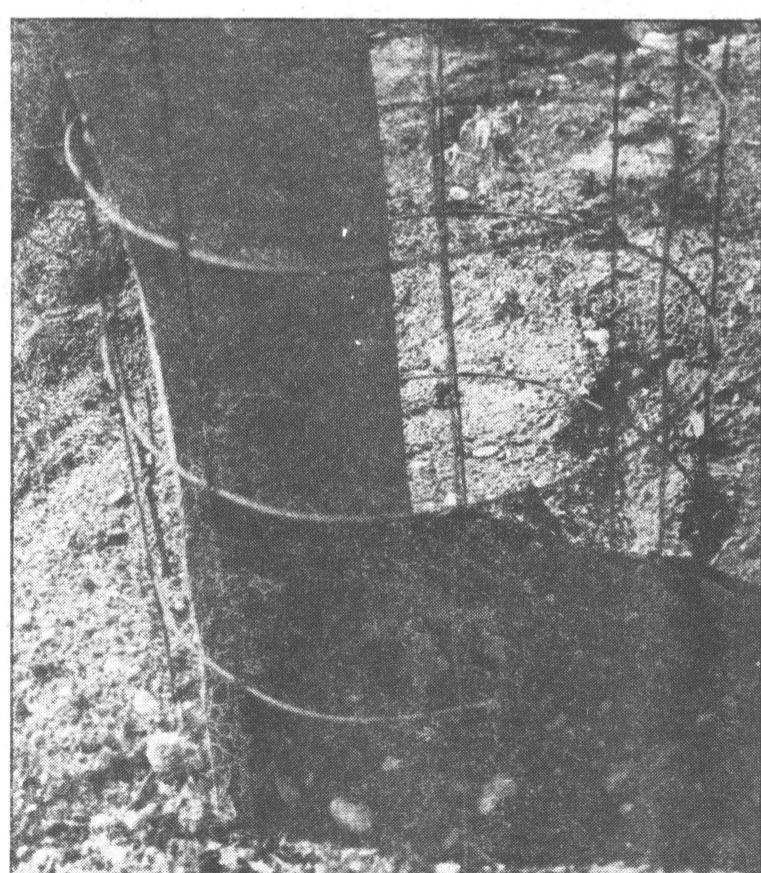
provide a better environment for seeds to germinate and grow into healthy, vigorous seedlings. In most areas of Texas, bed the soil before planting. This is especially true for fall gardens in areas where excessive rain occurs during the fall gardening season. After the garden has been bedded and the rows marked off, use a hoe handle or stick to make a seed furrow. The seed furrow varies in depth but usually is  $\frac{3}{4}$  to 1 inch deep.

Next comes a very important step. After the seed furrow has been made, use a watering can or water hose to apply water directly into the seed furrow. Apply sufficient water to wet the loosened soil to a depth of 2 or 3 inches.

Always plant more seeds than needed. After the water has soaked in, scatter the seeds evenly along the furrow. After planting, do not cover the seeds with garden soil; use a material such as compost, potting soil, peat moss or vermiculite for a covering. By using such a medium, a better environment is provided for seeds to germinate and grow. This eliminates problems associated with soil crusting and poor aeration. Use a light colored material for a cooler seeding area. With a material like compost, seeding depth is still

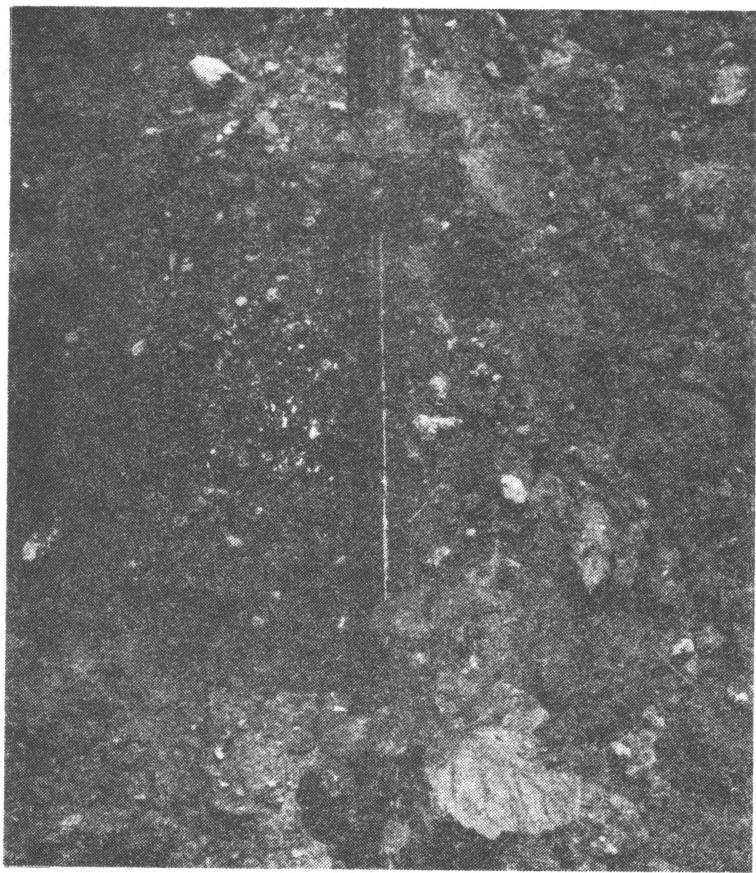
important but not critical. Small seeds planted a little too deep will still come up. In a few days, depending on the crop planted, seeds should germinate and begin to emerge. At this time do not allow the soil to dry out; apply additional water as needed.

Once plants have emerged, consider applying a protective shade or cover on the west side of the row to shield plants from intensive summer sun. When plants are an inch or two tall, thin them to the proper spacing.



Shade young plants from the heat of Texas summers.

FALL AND SPRING FLOWERING ANNUALS				
Plant	Height (inches)	Spread (inches)	Exposure	Comments
Alyssum	4-8	12-24	Sun	Fragrant
Asters				
Calendula	10-24	10-24	Sun	Attractive cut flowers
Kale, flowering cabbage, flowering	12	12	Sun	Ornamental foliage, very hardy, edible
Pansy	10	15	Sun	Hardy, wide color range, single color beds most showy
Petunia	8-12	12-24	Sun	
Phlox	6-12	12-15	Sun	
Pinks (Dianthus)	10	12	Sun	Single carnation, bright colors, hardy
Shasta daisy				
Snapdragon	6-36	6-24	Sun	Many varieties and colors
Stock	12-30	12-24	Sun	Spike flowers, good cut flowers
Viola	10	12	Sun	Wide color range



A "drip" or "trickle" irrigation system is an economical way to water a garden.

# Adequate Moisture a Must

A major problem confronting the fall vegetable gardener is dryness. Soils become dry from lack of water during mid-summer when decreased production, lack of interest and vacation activities cause many gardens to be neglected.

Seedlings and transplants of flowers and vegetables can withstand hot temperatures, but they cannot tolerate lack of sufficient soil moisture. Before garden areas are planted, water until the soil is moist to a 10-inch depth. This preirrigation insures proper seed germination and transplant survival.

Once a garden site has been preirrigated and plants are established and growing, adequate soil moisture must be available on a daily basis to insure plant survival during

the hot days of summer. Three techniques can be used to water a garden — sprinkle, flood or drip irrigation.

Sprinkling involves using a lawn sprinkler and watering until the soil is soaked completely. If sprinkle irrigation is used on fall gardens, allow adequate time for water penetration before another location is watered.

Generally, sprinkle an area for at least 1 hour to insure a deep soaking and consequently deep root penetration and de-



velopment. Use this type of thorough watering about once a week to provide adequate soil moisture for young plants.

Another technique utilized by many gardeners is flood or furrow irrigation. This involves making rows or mounds of soil on which to plant. Rows are spaced at least 30 inches apart and must be firmed to encourage water movement to the top part of the row so that moisture reaches the roots of young plants. Ditches or furrows between these rows are "flooded" or filled with water, the soil absorbs the moisture and the plant roots growing in the rows have direct contact with the water. Deep soaking occurs and the technique encourages a well developed root system.

Both systems have certain disadvantages, the most obvious being water waste. Both systems involve wetting the entire garden rather than just the area where plants are growing. The sprinkle system has the added disadvantage of wetting the plant foliage which can cause foliage burn or encourage plant diseases.

A third system of continually supplying water directly to the plant root system in amounts needed to provide maximum growth is referred to as trickle or drip irrigation. Drip irrigation is a system that applies a small amount of water to the plant's root system.

Water drops on the soil surface without disturbing the soil structure so that water moves downward easily. This system encourages "deep" watering and thorough root development. The continuous water supply provided by a drip system prevents rather than corrects moisture stress of plants. This is extremely important in fall gardens because of hot temperatures and potential stress situations that cause slower plant establishment and growth.

A continuous moisture supply which prevents plant stress increases yields and decreases physiological disorders such as blossom-end-rot on tomatoes and squash. By confining the moisture to the plant's root zone, a dramatic saving in water is possible. Weed growth is discouraged by lack of water — only root zones of desired plants receive adequate water. Nutrients are not washed from the soil by excessive watering. Since only part of the garden soil is wet, the garden is accessible at all times. However, this system involves additional equipment and installation.

Vegetables and flowers need adequate moisture during hot temperatures.

Watering is an important factor in producing a fall garden. Proper watering makes the difference between success or failure.

## DON'T BUG ME!

Controlling insect and mite pests often is necessary in the home flower and vegetable garden. Selecting the proper insecticide and using it wisely are essential for good control. Steps in dealing with insects include:

- Identify the pest.
- Determine the amount of injury.
- Decide if and what sort of control is needed.

### Cultural Control of Garden Pests

Cultural practices play an important role in reducing many insect problems in home gardens. The following practices will aid in controlling insect pests:

- Maintain a clean, closely mowed area adjacent to the garden or flower bed.
- Dispose of any trash, boards or old plant debris in the area.
- Keep soil at maximum fertility level and well watered.
- If only a few plants are involved, hand pick larger insects and crush insect egg masses.
- Remove all plant debris following final harvest.

### Chemical Control of Garden Pests

Insecticides are a valuable tool for the home gardener if used properly. All of them are poisonous and must be handled, used and stored safely. Do not allow children to apply or have access to pesticides. Store them in a locked area and *always* read and follow all directions on the container. *Always* store pesticides in their original container; *never* keep them in pop bottles or similar containers.

**Dust** — Dusts will control chewing and sucking insects. Apply dusts when the wind is calm and force the dust through the foliage to reach both sides of the leaves.

**Sprays** — Sprays are prepared by mixing liquid concentrates or wettable powders with water. Compressed air sprayers, trombone slide sprayers and garden hose attachment sprayers can be used successfully. If wettable powders are used, agitate the solution while spraying to mix the insecticide.

### Garden Pests and Control Measures

**Leafminers** — The adult leafminer is a fly, but the damaging stage is a  $\frac{1}{8}$  inch long yellow worm that makes long, slender, winding tunnels in leaves. Since there can be several generations each year, this insect pest can reduce plant vitality through foliage damage. *Control*: Apply diazinon to the foliage of vegetable plants.

**White grubs** — White grubs live in the soil and are larvae of May beetles or June bugs. They are dirty white with brown heads and are  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches long when full grown. They can severely damage underground plant parts with their feeding activity. *Control*: If planting vegetables in soils that have been growing grass or sod, treat with Spectracide® granules.

**Spider mites** — Spider mites are tiny, spider-like plant chiggers that feed on undersides of leaves of many garden vegetables and flowers. Most mites are about  $\frac{1}{32}$  inch long and

live and feed in a web they produce on the leaves. They reproduce rapidly and can damage plants in a short time. Inspect plants frequently by examining the underside of leaves with a magnifying glass. *Damage and control*: Leaves appear "stippled" or dotted with yellow, and webbing usually is present on the underside of leaves. Spray plants with Kelthane® with 1 to 2 teaspoons of liquid soap added to the mixture. Repeat spray every 4 days for four consecutive sprays. Sulfur also controls mites but do not apply to vine crops such as squash, cucumbers and cantaloupes.

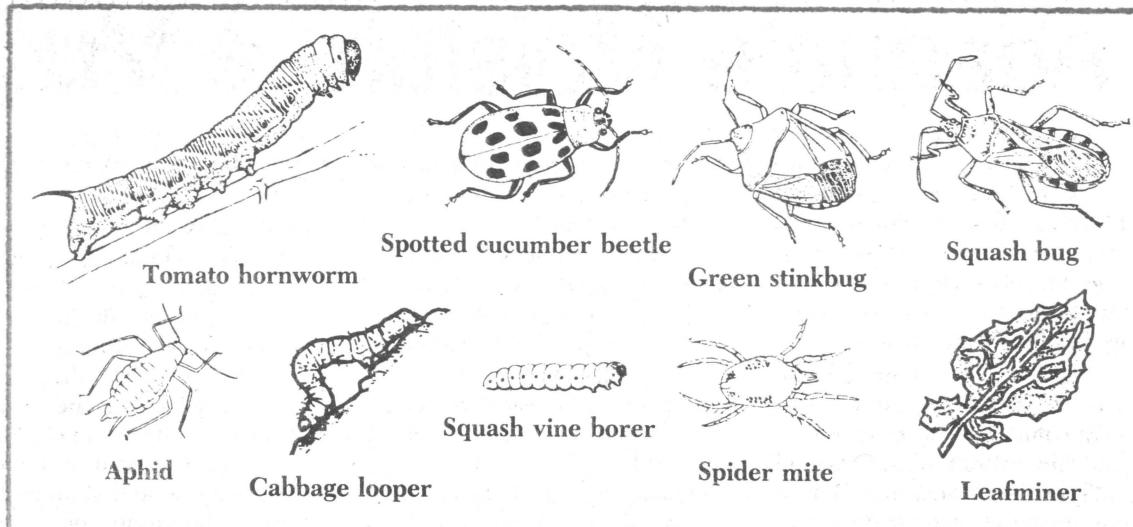
**Aphids** — Aphids (plant lice) suck sap from many vegetable plants and usually are found on the underside of leaves and on young stems. Aphids are generally yellow to yellow-green and less than  $\frac{1}{8}$  inch long. They may be winged but most are wingless. Leaves become dotted with yellow spots and may curl or become distorted. Aphids transmit plant diseases. *Control*: Treat with malathion or diazinon.

**Stinkbugs** — Stinkbugs may be red and black, gray or dark brown. The long slender beak is inserted into the plant to suck sap from leaves and stems. Stinkbugs do little damage to okra but can severely harm squash, tomatoes, potatoes and cabbage when several bugs are present on each plant. Large numbers produce wilting and dieback on tender shoots such as potatoes. *Control*: Apply malathion or Sevin® when adults are first seen on potatoes, squash and cabbage. If possible, hand pick and destroy stinkbugs.

**Flea beetles** — Flea beetles attack beans, peas, cabbage, eggplants, tomatoes, greens and numerous other crops. Some are striped, others black, green or brown. These beetles have strong back legs and can jump like a flea. The casual observer may not see flea beetles as they are  $\frac{1}{16}$  inch and  $\frac{1}{8}$  inch in length. Flea beetles chew small round holes in leaves and can damage plants when abundant. *Control*: Treat with Sevin® or malathion when holes begin to appear in leaves and beetles are present.

**Cucumber beetles** — Cucumber beetles may be striped but usually are yellow with black spots. They are about  $\frac{1}{4}$  inch long and feed on almost all garden vegetables. Larvae (immature stage) feed on the roots. Beetles feed on stems and young leaves after seedling emerges. They also feed on blooms and fruit such as cucumbers, squash and melons. *Control*: Apply Sevin® or malathion when beetles are damaging plants.

**Worms or caterpillars** — Worms (caterpillars) come in a variety of colors and shapes but all damage plants by eating holes in leaves. They feed on tomatoes, cabbage, broccoli, cauliflower, greens and most garden vegetables. Entire plants may be eaten by these caterpillars if they occur in large numbers. *Control*: Control by using Dipel®, Thuricide®, Bio-Spray®, Biotrol® or Biological Worm Killer®. These materials contain the bacteria (*Bacillus thuringiensis*) that kills only caterpillars and will not harm beneficial insects. Make sure to add 1 to 2 teaspoons of liquid soap per gallon of spray mixture. The soap allows the mixture to spread on the leaf's surface. Good coverage of upper and lower leaf surfaces is necessary for best control.



## DISEASE PREVENTION

If plant diseases are to be controlled, take preventive steps early. Since early disease development on plants often is invisible to the naked eye, prevention rather than control is necessary. A preventive spray program keeps you ahead of problems and helps insure success. Once disease symptoms occur on flowers, leaves, stems or fruits, fungicide applications will not eliminate the existing problems but will protect the surrounding plant parts from disease.

To provide continuous fruit and foliage protection, apply fungicide several times. For most fungicides and bactericides the protective period is 7 to 14 days. During periods of scattered showers and heavy dews, follow a 7-day interval between sprays and for dry periods follow a 14-day schedule. The fungicide maneb is effective against a large number of fungi associated with diseases in the fall. Fungicides such as Captan®, zineb and benomyl also are effective against certain diseases. Check the label for the exact harvest interval after application and diseases most effectively controlled.

If soilborne fungi are a problem in flower beds, use the fungicide Captan® as a pre-plant treatment for fall transplants of flowering annuals. Work it into the top 3 to 4 inches of soil before planting at a rate of 3 to 6 ounces for every 1,000 linear feet of planting bed. This treatment provides fungicidal protection to the young transplant during the first 1 to 2 weeks of life. A preplant treatment using Captan® is good insurance for fall flowering beds.

Nematodes are small, microscopic, worm-like animals that live in the soil and feed on the roots of developing plants. Their damage is observed as decayed spots on the roots, stubby roots, enlarged root tips, sparse root systems or galls on the roots. Although several types of nematodes are found in vegetable and flower gardens, the root knot nematode, which causes galls or swellings on plant roots, is the most damaging. Plants infested

with root knot nematodes usually are stunted, yellow in color and often die prematurely.

Nematode control is based on resistant varieties, soil fumigation and cultural practices. Whenever possible, use resistant varieties in nematode-infested soil. Tomato varieties having resistance to root knot nematodes include Big Set, Bonus and the cherry tomato Small Fry.

Some cultural practices help reduce losses to nematodes. Rotations involving corn, onions and garlic reduce nematode numbers as these crops are resistant.

A cover crop such as cereal rye grown during the winter months helps reduce nematodes. Do not use common rye grass as it may become a weed problem. After the first killing frost, plant the cereal rye in the garden area previously occupied by cold-susceptible vegetables. Rye roots act as a trap crop for nematodes in the soil. A trap crop is one in which the nematodes enter the roots but due to physiology of the roots, nematodes cannot undergo further development and are killed. When the cover crop is worked into the soil 1 month before planting the spring garden, the organic content is increased and an organic acid is produced, which also is toxic to nematodes.

Use of Vapam® in flower beds and gardens is the only effective chemical treatment currently recommended by the Texas Agricultural Extension Service for controlling nematodes. Apply Vapam® with a hose-on sprayer using 1 quart per 100 square feet of garden space. After applying Vapam® to the surface immediately wash the chemical into the soil by applying  $\frac{1}{2}$  inch of water to the garden area.

Apply the water twice during the next 48 hours. Leave the soil undisturbed for 7 days before tilling. Wait an additional 2 weeks to plant the garden. If the Vapam® is applied during high temperatures and low humidity, additional watering during the first 48-hour period after treating increases the chemical's effectiveness and

prevents excessive loss to the atmosphere. The soil temperature should be below 90° F. when treating.

Vapam® is effective for only one growing season and the garden may need treating again next year. Nematode control with chemicals is based on reducing the number at the start of the season. They will, however, increase during the season if susceptible crops are grown in the garden.

The best nematode control is to keep them from being introduced into the garden. Avoid bringing in topsoil infected with nematodes. Avoid adding organic matter to the garden that might contain nematodes. Peanut hulls are a good source of nematodes and should be avoided.

## PESTICIDES: Read the Label

When buying a pesticide and again before using it, be sure to read the label carefully. A pesticide label contains a considerable amount of beneficial information. It identifies the pest for which the material is effective. Use the pesticide to control only those pests listed.

Rate of material to use is also given. Follow this rate, for if you exceed the recommended rate and problems occur, the company is no longer responsible. Also, you waste material and stand a chance of polluting an area with a chemical.

The pesticide label also lists the interval to use in applying the materials. This may vary with materials but generally it is between 3 and 21 days.

How soon can you eat a crop after a material has been applied? That information is also found on the label. On many labels, special precautions are given such as washing fruit or not spraying past a certain development stage. Follow these warnings closely.

## Problems Encountered in a Fall Garden

the cause may have occurred weeks before the condition becomes obvious.

What can be done about blossom-end-rot? Anything that maintains uniform soil moisture helps. A garden located in a well-drained soil helps prevent this disease associated with soggy or overwet soil. A good mulching program also reduces water loss from the soil and makes it more available to the plant during dry periods. A uniform and consistent watering program is vitally important also.

Should affected fruits be removed from the plant? The consensus among Texas horticulturists is to remove the fruit allowing for first-quality fruit to develop rather than letting affected fruit mature. Locate the garden in a well-drained area, use a good mulching program and maintain sufficient and adequate soil moisture for good growth.

Getting fruit to stay or set on the plant is sometimes a serious problem for fall gardeners. Again, hot weather is the culprit.

The concept of fall gardening is to plant during hot weather and produce during cool fall conditions. This system is much more favorable than the spring concept of planting in cold conditions and harvesting in hot weather. Fall gardening has the added advantage of a longer harvest of higher-quality vegetables during October, November and December.

Yet, hot fall weather causes problems when many fast-maturing vegetable varieties, recommended for fall planting, are blooming. Tomatoes drop blooms if temperatures are above 90° F. during the day or 72° F. at night. Blossom-setting hormones will not "stick" blooms during hot weather.

Cucumbers also may react strangely during hot days. Hot weather causes poor fruit pollination. Poor pollination of cucumbers results in small, misshapen fruit which should be removed. An unusually long, hot summer may cause bitterness in the first-harvested fruit from eggplants and cucumbers, also.

Regardless of the unusual, non-productive symptoms exhibited by plants early in the fall, they will stabilize and become productive when cooler temperatures occur.



High day and nighttime temperatures can prevent tomato blooms from setting fruit.

# THINGS YOU ALWAYS WANTED

**Q:** My broccoli is magnificent this fall but some plants are rotting after I remove the main head. The stem has a hole in it that retains water and causes rotting. What can I do?

**A:** The hole in the stem obviously cannot be corrected now. It is caused by a boron deficiency corrected by the addition of  $\frac{1}{2}$  pound per 1,000 square feet of a boron product such as Twenty Mule Team Borax®. Since boron is a minor element, add only small amounts. Boron toxicity occurs if too much is added so use only what is required for your gardening area.

**Q:** I planted sweet potatoes when recommended but now I don't know when to harvest them?

**A:** Whenever you are ready! The sweet potato is a root so when it enlarges to an edible size it can be harvested. Harvest roots before soil temperatures drop below 45° F. Damage occurs if growing or harvested roots are exposed to temperatures below 45° F. Dig roots, cure in 85° F. temperature for 7 to 10 days and store at temperatures above 50° F. If you find small, white worms (larvae) crawling inside sweet potatoes, they have been contaminated by the sweet potato weevil (the plague of Texas production) and should be destroyed.

**Q:** Undoubtedly, I have had the most beautiful Green Comet broccoli and Snow Crown cauliflower this fall ever produced in Texas. I wish you could have seen it. I have harvested the center heads of the broccoli and am anxiously awaiting the side shoot production. My problem is small, green worms that continually eat holes in the leaves. I have used Sevin (carbaryl) with no effect to these pests.

**A:** Both of these varieties are magnificent and the broccoli side shoot production will be just as gratifying. The best and most effective products for the green worms (cabbage loopers) are the organically approved *Bacillus thuringiensis* types such as Thuricide®, Dipel®, Bio-Spray® and Biological Worm Spray®. Be sure to use a teaspoon of a liquid detergent per gallon of spray to insure adequate wetting of leaf surfaces.

**Q:** We have a small garden with cabbage, broccoli, Brussels sprouts and cauliflower planted. Will they cross pollinate?

**A:** Hopefully they will never bloom! All of the crops you mentioned should be harvested before blooming occurs. Broccoli and cauliflower heads are harvested and eaten in the bud stage. Cabbage and Brussels sprouts bloom only after prolonged periods of cold weather and when plants are old. Seed should not be saved since hybrids, which do not produce reliably from seed, are what you probably purchased.

**Q:** I have heard that pecan leaves "poison" the soil. I have an abundance of pecan leaves and would like to use them for compost. Are pecan leaves harmful?

**A:** Not a single case of pecan leaves damaging a garden spot has been reported. In fact, these leaves have been recommended as a mulch for several years because pecan leaves are fibrous and decompose slowly. Possibly rumors of pecan leaves damaging growing plants arise from the fact that pecan leaves contain tannic acid. When tannic acid reacts with alkaline soil, a neutral organic salt, called calcium tannate, is formed. This compound is not detrimental. Mix other types of organic matter or leaves with pecan leaves rather than making a compost of pure pecan leaves.

**Q:** I have beautiful tomato plants that have started setting fruit; however, the leaves are ugly because of translucent streaks or tunnels all over them. What causes this damage and how can it be avoided?

**A:** The damage is caused by tiny maggots called leaf miners. Eggs are deposited on the bottom of leaves by a tiny wasp-like insect; the eggs hatch and the larvae enter the center of the leaf and begin to eat. Since the larvae are inside the leaf, insecticide control is difficult. Remove and destroy infested foliage to kill the larvae that consequently prevent further damage from maturing insects. Apply diazinon or malathion every 7 to 10 days for four to six consecutive sprays to prevent infestations. Leaf miners seldom reduce yields.

**Q:** I planted fall tomatoes exactly when recommended. Now the same disaster, which killed my spring tomatoes, is attacking my fall transplants. The leaves are turning yellow at the bottom of the plant.

**A:** Yellowing leaves indicate three possible problems — spidermites, suckflies or

fungus. Spidermites and suckflies are found on the bottom of leaves. Suckfly damage is distinguished by prominent black specks on the underside of leaves. Spidermite-damaged leaves do not have black specks but rather a whitish, webby appearance on the underside. Control suckflies by using diazinon or malathion every 7 to 10 days for two consecutive sprays. Spidermites are controlled only if a product containing kelthane or sulfur is used. If fungi rather than insects are involved, use maneb fungicide every 7 to 10 days for three consecutive sprays. Remember to use 2 teaspoons of liquid detergent per gallon of spray material mixed to insure proper spreading and drying of pesticides on the leaf surface.

**Q:** My cucumbers produced nice fruit early in the year, but now many of the fruit are small and round rather than long? Why?

**A:** Improper pollination from excessive temperatures or lack of bee activity causes this problem. All seeds of any vegetable have to be fertilized properly by pollen grains if the fruit is to mature properly.

calcium but also improves the tilth of your garden soil.

**Q:** We planted the Big Set, Spring Giant, Bonus and Better Boy tomatoes in our small garden. They are loaded and are the best tomatoes we have ever had; however, there are some with small holes near the stem end of the tomato. When we cut the tomato open, there is a small worm inside. What is it? And what can we do?

**A:** You have been invaded by the tomato pinworm. They usually do not damage all fruit and can be controlled only by a preventive insecticide spray every 7 to 10 days. When the damage is evident, it is too late to do anything about it.

**Q:** We harvested our green tomatoes before the plants were killed by the frost but the fruit are ripening very slowly. When ripened, the tomatoes are more of an orange color than the deep red to which we are accustomed. Is this normal?

**A:** The warmer the room temperature in which tomatoes are stored the faster they ripen. To prolong the enjoyment of your harvested green tomatoes, store some in a cool room and some in

nutritional advantage of organically grown, fertilized vegetables over those grown with chemical fertilizers. The same plant nutrients supplied by chemical fertilizers are derived from organic fertilizer, and these nutrients must be in an ionic form before being absorbed by the roots. With an equal amount of either type fertilizer given to plants, the nutritional composition of the produce is the same. The flavor of garden vegetables is due to freshness and a mature harvest.

**Q:** My okra has done well this year, but many of the pods are curved and odd-shaped. What's my problem?

**A:** Home gardeners are concerned about curved and crooked okra pods. This seemingly difficult-to-explain problem is caused by insect stings, usually from stink bugs. An insect pierces the young, tender pod to suck plant juices. This injury causes the tissues on that side of the pod to stop growing as rapidly as on the uninjured side; thus the okra pod curves and develops abnormally. The solution to this problem, therefore, is good insect control.

**Q:** I planted beans, and after several days they came up but soon died. When I looked at the roots, they were brown and had dried spots on the larger roots.

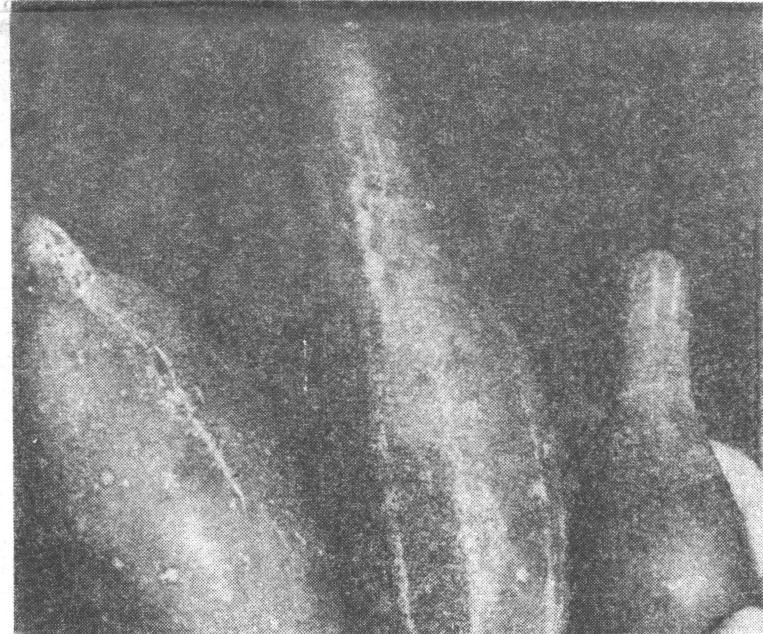
**A:** Your beans are having fungus problems aggravated by extremely hot soil temperatures. To avoid this situation, spray the seed furrow and cover soil with a fungicide (Captan®) before seeding.

**Q:** How about using sawdust as a mulch? I know that extra nitrogen must be added, but should I expect any other problems?

**A:** You are well on your way by knowing that extra nitrogen in small, constant doses is required. If you use pure sawdust, it may cake up and form an impenetrable barrier to water. Water slowly and check depth of penetration after watering.

**Q:** How big do plants have to be before starting a steady routine of spraying?

**A:** One of the main ideas of fall gardening is a "new beginning" and smaller plants, which enable a more complete and effective insect-disease program; however, the smaller plants can be eaten faster or rapidly damaged by infestations, so begin as soon as the plants



Missed pollination caused by poor pollination.

**Q:** I planted tomatoes this fall and many of the fruit have black spots on the bottom. These are dried areas that often ruin the entire tomato. What causes this problem?

**A:** The condition is physiological in origin and caused by fluctuating water. The condition also is aggravated by low calcium levels in the soil. To avoid or reduce such damage, use mulch (leaves, grass clippings, compost) around your plants and work gypsum into the soil before planting. Gypsum not only supplies

a warmer room. The color of the tomato fruit has to do with light. Ripening in a darkened room causes the orange color. The development of an abundance of the pigment lycopene, the same substance that makes carrots yellow, with the absence of red anthocyanins causes a less-than-red appearance. The tomato is still good to eat even though it is yellowish.

**Q:** Is it true that organically grown vegetables are better and more nutritious?

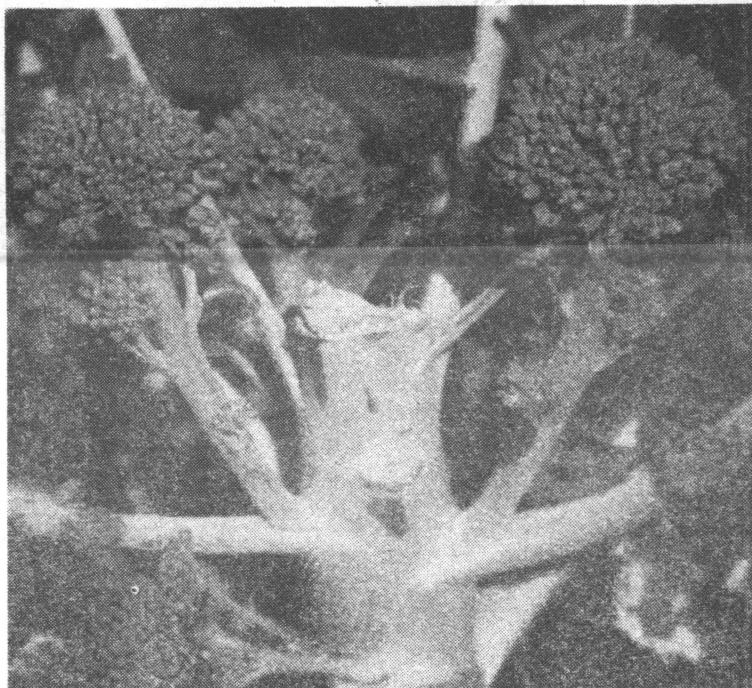
**A:** Contrary to popular belief, research has not shown a

# TO KNOW ABOUT GARDENING

are put into the garden. An ounce of prevention is worth a pound of cure and will produce more pounds of vegetables. Remember, if you had spidermites when you pulled the spring plants out, you will have them when you plant the fall vegetables.

**Q:** I have harvested the first large heads of broccoli from my garden. The secondary sprouts are now producing heads but they are not as large as the first head harvested. Is this normal, or should we fertilize?

**A:** The center head produced by broccoli is always the largest. The secondary sprouts produce heads about the size of a silver dollar. Sidedressing with fertilizer may increase yields and size of these sprout shoots. It takes more of these to make a meal but they will be as tasty as the large center head.



Broccoli will produce side-shoots after the central "head" is harvested.

**Q:** Spring Giant and Big Set tomato varieties are recommended highly for fall planting because they are determinate and fast maturing. What does determinate mean, and can you tell if a tomato is determinate by looking at it?

**A:** "Determinate" means that the plant is small; Spring Giant and Big Set seldom are more than 5 to 6 feet tall. A determinate vine is distinguished by two leaves, a flower or fruiting cluster, two leaves, then a cluster, etc. An indeterminate vine has three or four leaves, then a cluster, three or four leaves, then a cluster, etc.

**Q:** I destroyed the remains of my spring garden as recommended. It removed spidermites, but they are

coming back in small numbers now. What should I do?

**A:** Immediately begin a spray program using the miticide Kelthane or sulfur. Apply spray at 4-day intervals for four consecutive sprays. Spray the bottoms of the leaves using the miticide and 2 teaspoons of a liquid soap per gallon of spray to insure proper coverage.

**Q:** I have planted Spring Giant and Big Set tomatoes. They are blooming profusely. Should I remove these blooms or leave them?

**A:** Leave them by all means! Most blooms will continue to fall off until the average day temperature drops below 81° F. (90° during the day and 72° at night). Nothing (artificial setting sprays included) can be done to prevent this. You want as many blooms as possible when the temperatures do become favorable

year. Use sulfur or maneb to correct or control your situation.

**Q:** I have heard many people talk about washing frost off plant leaves to protect them. Is this a good technique?

**A:** You answer this question. Take a glass, fill it with water and put it in the freezer for several hours; immerse in warm water and you will have the answer. Do not use this experiment with your favorite glass because it will not be usable afterwards. It will shatter exactly as frozen plant cells do when warm water strikes them. The best way to prevent cell damage after a light freeze is to attempt to slow-thaw these cells. Cover plants with a sheet or blanket to shield them from the warming sun's rays, which do the same harm as warm water. This technique also works on certain ornamentals such as petunias.

**Q:** I have the best tomato crop I have ever had, but the large tomatoes are falling off. Even the ones that stay on the vine are jarred off easily. What is the problem?

**A:** Cool fall temperatures cause the abscission zone (where the tomato is attached to the plant) to weaken, and the heavy fruit subsequently falls off. Gather fallen tomatoes as soon as possible, wipe clean and store in a warm place so ripening will occur. These aborted tomatoes will rot if left on the ground.

**Q:** We are harvesting many tomatoes but they are all cracked. I read that fluctuating water causes cracking but we have been soaking weekly and have plants heavily mulched. What could our problem be?

**A:** Tomatoes crack more during the fall growing season than during the spring. Cracks are caused by alternating stress factors of the plant such as dry conditions, slow growth followed by wet conditions and fast growth. Moisture is not the only factor involved. Temperature also plays an important part in regulating plant growth rate and causing cracking.

**Q:** The leaves of my beans are reddish colored and "dusty" when I touch them. What should I do?

**A:** You have rust, which is a fungus disease, that infects bean foliage at this time of

year. Use sulfur or maneb to correct or control your situation.

**Q:** Most of the time my yellow squash is tough or has seed in the middle. What is wrong?

**A:** Squash matures in only 5 to 7 days from flowering in hot weather. The key to high quality is timely harvest, every other day in hot weather. Good, yellow, summersquash are about 1½ to 2 inches in diameter at the base and pale yellow-orange squash with a firm rind is over mature. The plant will stop yielding if over mature fruits are not removed.

**Q:** What about propagating tomatoes for the fall garden from existing vines?

**A:** If necessary, use suckers or layering (cover with soil until roots appear) of existing vine. Do this several weeks before the recommended transplanting date for fall tomatoes, and be sure to use early maturing tomato varieties.

**Q:** How often should okra be harvested and how can one tell when okra is ready to harvest?

**A:** Okra requires frequent harvesting. For peak quality harvest before the pods become tough and stringy. Okra matures rapidly especially in hot weather. Approximately 4 days are required from flowering to harvest maturity. Harvest okra every other day. Pod size varies with variety, but are generally 4 to 6 inches long. Test larger pods by cutting through them with a knife. If pods are difficult to cut, they are tough and not suitable for serving. Remove old pods so plants will continue producing.

**Q:** My fall-planted okra and tomatoes are beautiful now and full of fruit. How

ever, one end of my okra row and a few of my tomato plants are small and sickly. Is this a lack of water?

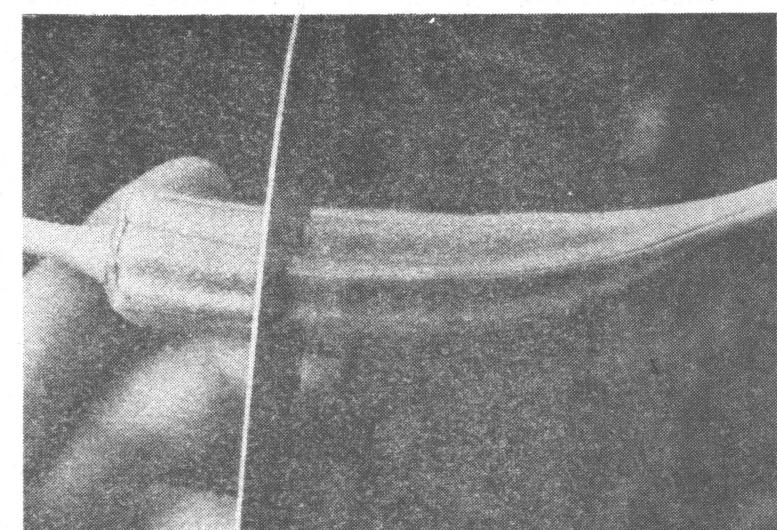
**A:** It may be lack of water but more likely you have nematodes. Check for swellings on the roots of slow growing, nonproductive plants. If you do have nematodes, remove the existing crop and treat with Vapam® for control.

**Q:** My tomato fruit have small yellow specks on the surface. When peeled, these specks form a tough spot, which must be cut off before eating the tomatoes. I also have large translucent areas on my tomato fruit. What's going on? Is this a variety flaw?

**A:** Your problem is not of a varietal origin; it is an insect and environmental problem. The yellow speckling, which you are seeing, is caused by the sucking of stinkbugs and/or water fluctuations. The translucent areas are sun scalds. Heat destroys the color pigments of the tomato when exposed to direct, intense sunlight. This damage does not make the tomato inedible.

**Q:** What causes my home garden carrots to be tasteless, woody and often bitter rather than sweet and tender?

**A:** Generally this is associated with environmental conditions during the maturing period. Carrots grow best and develop highest sugars when temperatures are 40° to 80° F. Consequently, the best carrots are ones planted for early winter harvest. Carrots are cold hardy but should be planted so that they mature before nighttime temperatures drop below 20° F. as damage or death can occur. In areas of South Texas plantings can begin in late summer or early fall and continue until about 90 days before temperatures are expected to average 85° F.



Tender okra can be cut easily with a knife.

# CARE CAN KILL

Diseases and insects cause considerable damage to plants, and in many cases, it is necessary to use pesticides. If proper procedures are not followed, the cure can cause as much damage as the problem.

Pesticide damage to plants appears in many ways, but most often occurs as one of the following:

**Burn** — Appears on leaf tips or margins as necrotic areas. The entire leaf surface may appear burned, or the roots can be burned.

**Chlorosis** — Appears as spots, tip or marginal yellowing or even entire leaf yellowing.

**Leaf distortion** — Appears as curling, crinkling or cupping of the leaf.

**Stunting** — Reduction of size of entire plant or certain parts (fruit, flowers, roots) while the rest of the plant appears normal.

**Abnormal growth** — Stimulation of excessive growth on certain parts (aerial roots, suckering) or entire plant.

Usually new growth is most likely to show damage when sprays are applied. The following general rules or guidelines help reduce plant damage from pesticides.

- Do not apply pesticides to stressed plants. Avoid spraying under extremely hot, sunny conditions. When air or plant temperature is approximately 90° F. or higher, damage will likely occur. On bright, sunny days, leaf temperatures may be 5° to 15° higher than the surrounding air, thus increasing the possibility of injury. Avoid temperature extremes, either high or low.

- Do not apply pesticides under conditions that hinder drying. Plants sprayed when cool, humid conditions exist for extended periods remain wet for long periods and increase the possibility of injury. Never spray plants when they need water. Wilted or dry plants are extremely sensitive to spray injury.

- Wettable powders usually are safer to plants than liquid pesticides because they do not contain solvents. The disadvantage of wettable powders is the objectionable residue on the foliage.

- Almost all aerosol pesticide formulations cause plant damage if applied at less than the recommended distance between aerosol nozzle and plant. The recommended distance usually is 18 to 20 inches. In some experiments it was found that almost all aerosols tested damaged

plants when applied at 8 inches.

- Study the label and any available brochures concerning application rates and instructions and plant damage information for a particular pesticide. Do not overdose. Clean out sprayer, hose and nozzles after each use.

Some gardeners mix pesticides with fertilizers and apply both at the same time. This can be a risky practice as a larger quantity of fertilizer solution is needed than a pesticide solution. The safest method is to apply each separately; it takes more time but is safer.

## Store Extra Seeds for Future Use

Although there are optimum storage conditions for different vegetable seeds depending upon various factors, most vegetable seed can be stored satisfactorily in the home refrigerator (40° to 50° F.) for 2 to 5 years.

For home storage of vegetable seeds, package and place seed in an air-tight container such as a coffee can or a glass jar and set in the refrigerator. When putting the seed in the container, see that no moisture is present and that seeds are not damp before storage. If the seed are placed in packets or envelopes other than the ones they came in, always give the variety as well as the seed company or seed source. This is valuable information for future gardens.

Some common garden vegetables and the period of time at which seed of good viability can be stored and still give a good stand with a normal rate of seeding are listed in the following table.

REFRIGERATION STORAGE TIME FOR GARDEN SEED

Seed	Years	Seed	Years
Asparagus	3	Kohlrabi	5
Bean	3	Leek	3
Beet	4	Lettuce	5
Broccoli	5	Muskmelon (cantaloupe)	5
Brussels sprouts	5	Mustard	4
Cabbage	5	New Zealand spinach	5
Carrot	3	Okra	2
Cauliflower	5	Onion	1 to 2
Celeriac	5	Parsley	2
Celery	5	Parsnip	1 to 2
Chard, Swiss	4	Pea	3
Chinese cabbage	5	Pepper	4
Collard	5	Pumpkin	4
Corn	1 to 2	Radish	5
Corn salad	5	Rutabaga	5
Cress, garden	5	Salsify	2
Cress, water	5	Southern pea	3
Cucumber	5	Spinach	5
Dandelion	2	Squash	5
Eggplant	5	Tomato	4
Endive	5	Turnip	5
Fennel	4	Watermelon	5
Kale	5		



A fall garden can be a rewarding and enjoyable family activity.

## Harvest for Highest Quality

Many gardeners do not know when to harvest home-grown vegetables. Proper harvesting at the right stage of growth is essential for good yields of high quality vegetables from the fall garden.

**Bean, snap** — when pods are nearly full size but before seeds begin to show appreciable enlargement.

**Beets, as greens** — when leaves are 4 to 6 inches long; as *tops* and *small beets*, when beets are 1 to 1½ inches in diameter; as *beet roots* only, when roots are 1½ to 3 inches in diameter.

**Broccoli** — when flower heads are firm and fully developed but before individual flowers start opening; cut 6 to 7 inches below flower head.

**Brussels sprouts** — when buds along the stem become solid, and thereafter as higher buds become firm. Remove leaves along stem to hasten maturity.

**Cabbage** — when heads become solid; to prevent splitting of mature heads, twist plants enough to break several roots and thus reduce water uptake from the soil; excessive water uptake causes splitting.

**Carrot** — when roots are ¾ to 1 inch or more in diameter; during cool, dry periods leave carrots in the ground for later harvests.

**Cauliflower** — when curds (heads) are 4 to 8 inches in diameter but still compact, white and smooth; exclude sunlight when curds are 2 to 3 inches across by covering them with an inverted cabbage leaf (this may need replacing once or twice), or by loosely tying the outer cauliflower leaves together above the curd; curds exposed to sunlight rapidly become discolored, rough in appearance and coarse in texture.

**Chard** — thin and use small plants when they become 6 to 8 inches tall; thereafter remove only outer, older leaves when 8 to 10 inches long; new leaves continue to grow for a continuous harvest of young, tender chard.

**Collard** — break off older, lower leaves when they are 8 to 12 inches long; new leaves continue to grow for a continuous harvest.

**Kohlrabi** — when "bulbs" (thickened stems) reach 2 to 3 inches in diameter.

**Lettuce, leaf forms** — when older, outer leaves are 4 to 6 inches long; *heading forms*, when heads are moderately firm and before seed stalks start; take older, outer leaves from either leaf or head lettuce as soon as these leaves are 4 to 6 inches long; new leaves provide a continuous harvest of tender, tasty leaves until excessive cold weather.

**Mustard** — when older, out-

er leaves are 6 to 8 inches long; new leaves provide continuous harvest until leaves are strong in flavor and tough in texture from hot weather.

**Parsley** — when older leaves are 3 to 5 inches long; continue to take older, outer leaves for fresh, tender parsley until heavy frosts in early winter.

**Peas, regular varieties** — when pods are fully developed but still bright green; *edible-podded varieties*, when pods are fully developed but before seeds are more than one-half full size if pods are to be eaten; harvest when seeds are fully developed but still fresh and green if pods are to be discarded.

**Potato** — when tubers are full size and have a firm skin; "new" potato tubers may be dug at any size, but generally are not harvested before the tubers are 1¼ to 1½ inches in diameter.

**Radish** — when root is ¾ to 1½ inches in diameter, thin radishes early to 1 inch between plants to insure rapid, uniform growth and crisp roots.

**Spinach** — when larger leaves are 4 to 6 inches long; pull larger whole plants or harvest older leaves and allow new growth to develop.

**Squash, winter types** — when fruits are full size, the rind is firm and glossy and the bottom of the fruit (portion touching the soil) is cream to orange colored; light frost will not damage mature fruits.

**Sweet potato** — late in the fall but before the first early frost; lift to avoid cuts, bruises and broken roots; cure in a warm well-ventilated place for 2 to 3 weeks and store in a cool, dry place.

**Turnip** — when roots are 1½ to 3 inches in diameter but before heavy frosts in the fall.

# PRESERVING YOUR VEGETABLES

## FREEZING

### Beans — Green Snap

Select only fresh, tender young beans. Wash, cut or snap-off the tips and sort for size. Freeze small beans whole if desired. Cut or break larger beans in blanching basket, lower basket into boiling water and cover. Keep the heat on high and begin counting heating time immediately.

#### Heat in boiling water —

- Small beans — 2 minutes
- Medium beans — 3 minutes
- Large beans — 4 minutes

Plunge basket of heated beans into a large container of ice water or into running cold water. It takes about as long to cool vegetables as to heat them. When beans are cool, remove them from water and drain.

Pack the beans into moisture-vapor-proof containers. Leave  $\frac{1}{2}$  inch head space.

Label container with name of vegetable, locker number, date packaged and maximum recommended storage date. Freeze immediately and store at 0° F. or below.

### Broccoli

Select tight, compact, dark green heads with tender stalks free of woodiness. Wash, peel stalks and trim. If necessary to remove insects, soak for  $\frac{1}{2}$  hour in a solution of 4 teaspoons salt

to 1 gallon cold water. Split lengthwise into pieces so that flowerets are less than  $1\frac{1}{2}$  inches across. Heat in boiling water for 3 minutes. Cool by immersing in ice water for 3 minutes, drain, package and freeze immediately.

### Cabbage

Select fresh picked, solid heads. Trim coarse outer leaves from head. Cut into medium to coarse shreds or thin wedges, or separate head into leaves. Heat in boiling water for  $1\frac{1}{2}$  minutes. Cool, drain, package and freeze immediately.

### Frozen Coleslaw

- 1 medium head of cabbage
- 1 medium onion
- 3 ribs celery
- 3 green peppers
- 3 or 4 carrots

Press out all juice. Add  $\frac{1}{2}$  tablespoon salt. Let stand 1 hour.

#### Bring to boil:

- 1 cup white vinegar
- $\frac{1}{2}$  cup water
- 2 cups sugar
- 1 teaspoon mustard seed
- 1 teaspoon celery seed

Boil 1 minute. Let cool to lukewarm. Add vegetables and freeze in air-tight containers.

### Carrots

Select smooth, tender, mild-flavored carrots. Remove tops, wash and peel. Leave small

carrots whole. Cut others into  $\frac{1}{4}$  inch cubes, thin slices or lengthwise strips.

#### Heat in boiling water —

- Small whole carrots — 5 minutes
- Diced or sliced — 2 minutes
- Lengthwise strips — 2 minutes

Cool, drain, package and freeze immediately.

### Okra

Select young, tender, green pods. Wash and sort according to size. Cut off stems without cutting into seed cells.

#### Heat in boiling water —

- Small pods — 3 minutes
- Large pods — 4 minutes

Cool and drain. Leave whole or slice crosswise. Package and freeze immediately.

### Peas — Blackeye, Southern, Cream — Shelled

Select well-filled pods with tender peas. Wash, shell and sort according to size.

#### Heat in boiling water —

- Small peas — 3 minutes
- Medium peas — 4 minutes

Cool, drain, package and freeze immediately.

### Peppers — Green

Wash, cut out stems, cut in

half and remove seeds. If desired, cut into  $\frac{1}{2}$  inch strips or rings. Pack, leaving no head space, seal and freeze immediately.

*Heated.* Select firm, crisp, thick-walled peppers. Wash and cut into halves or  $\frac{1}{2}$  inch slices. Remove seeds.

#### Heat in boiling water —

- Halves — 3 minutes
- Slices — 2 minutes

Cool, drain, package and freeze immediately.

### Squash

*Summer.* Use young squash with small seeds and tender rind. Wash and cut in  $\frac{1}{2}$  inch slices. Heat in boiling water for 3 minutes. Cool, drain, package and freeze immediately.

*Winter.* Use firm, mature squash. Wash, cut into pieces and remove seeds. Cook until soft in boiling water, pressure cooker or oven. Remove pulp from rind and mash or press through a sieve. Cool by placing pan containing squash in ice water and stir squash occasionally. Package and freeze immediately.

### Tomatoes

*Juice.* Wash and trim firm, vine-ripened tomatoes. Cut in quarters or eighths. Simmer 5

to 10 minutes. Press through a sieve. If desired, add 1 tablespoon salt to each quart of juice for seasoning. Cool and pour into containers. Freeze immediately.

*Stewed.* Remove stem ends, peel and quarter ripe tomatoes. Cover and cook until tender (10 to 20 minutes). Place pan containing tomatoes in cold water to cool. Pack into containers. Seal and freeze immediately.

## PICKLES AND RELISHES

### Dill Pickles

- 3 pounds uncut and washed young okra pods
- 6 small hot red peppers
- Cloves of garlic
- Large heads of dill and stems or  $\frac{1}{2}$  teaspoon dill seed per pint
- 1 quart water
- 1 pint white vinegar
- $\frac{1}{2}$  cup salt

Pack okra in hot pint jars with a pod of pepper, clove of garlic and head of dill or dill seed in each jar.

Make a brine of water, vinegar and salt; heat to boiling. Pour over okra. Close jars. Process in boiling water bath 20 minutes. Start to count processing time as soon as hot jars are placed in actively boiling water. Yield: 6 pints.

PLANTING GUIDE

Vegetables	Seed or plants per 100 feet	Depth of seed planting in inches	Rows	Inches of distance between plants
Asparagus	66 pl, 1 oz	6-8, 1-1½	36-48	18
Beans, snap bush	$\frac{1}{2}$ lb	1-1½	24-36	3-4
Beans, snap pole	$\frac{1}{2}$ lb	1-1½	36-49	4-6
Beans, Lima bush	$\frac{1}{2}$ lb	1-1½	30-36	3-4
Beans, Lima pole	$\frac{1}{4}$ lb	1-1½	36-48	12-18
Beets	1 oz	1	14-24	2
Broccoli	$\frac{1}{4}$ oz	$\frac{1}{2}$	24-36	14-24
Brussels sprouts	$\frac{1}{4}$ oz	$\frac{1}{2}$	24-36	14-24
Cabbage	$\frac{1}{4}$ oz	$\frac{1}{2}$	24-36	14-24
Cabbage, Chinese	$\frac{1}{4}$ oz	$\frac{1}{2}$	18-30	8-12
Carrot	$\frac{1}{2}$ oz	$\frac{1}{2}$	14-24	2
Cauliflower	$\frac{1}{4}$ oz	$\frac{1}{2}$	24-36	14-24
Chard, Swiss	2 oz	1	18-30	6
Collard (kale)	$\frac{1}{4}$ oz	$\frac{1}{2}$	18-36	8-16
Corn, sweet	3-4 oz	1-2	24-36	12-18
Cucumber	$\frac{1}{2}$ oz	$\frac{1}{2}$	48-72	24-48
Eggplant	$\frac{1}{8}$ oz	$\frac{1}{2}$	24-36	18-24
Garlic	1 lb	1-2	14-24	2-4
Kohlrabi	$\frac{1}{4}$ oz	$\frac{1}{2}$	14-24	4-6
Lettuce	$\frac{1}{4}$ oz	$\frac{1}{2}$	14-24	2-3
Muskmelon (cantaloupe)	$\frac{1}{2}$ oz	1	60-96	24-36
Mustard	$\frac{1}{4}$ oz	$\frac{1}{2}$	14-24	6-12
Okra	2 oz	1	36-42	12
Onion (plants)	400-600 pl	1-2	14-24	2-3
Onion (seed)	1 oz	$\frac{1}{2}$	14-24	2-3
Parsley	$\frac{1}{4}$ oz	$\frac{1}{8}$	14-24	2-4
Peas, English	1 lb	2-3	18-36	1
Peas, Southern	$\frac{1}{2}$ lb	2-3	24-36	4-6
Pepper	$\frac{1}{8}$ oz	$\frac{1}{2}$	24-36	18-24
Potato, Irish	6-10 lb	4	30-36	10-15
Potato, sweet	75-100 pl	3-5	36-48	12-16
Pumpkin	$\frac{1}{2}$ oz	1-2	60-96	36-48
Radish	1 oz	$\frac{1}{2}$	14-24	1
Spinach	1 oz	$\frac{1}{2}$	14-24	3-4
Squash, summer	1 oz	1-2	36-60	18-36
Squash, winter	$\frac{1}{2}$ oz	1-2	60-96	24-48
Tomato	50 pl, $\frac{1}{8}$ oz	4-6, $\frac{1}{2}$	24-48	18-36
Turnip, green	$\frac{1}{2}$ oz	$\frac{1}{2}$	14-24	2-3
Turnip, roots	$\frac{1}{2}$ oz	$\frac{1}{2}$	14-24	2-3
Watermelon	1 oz	1-2	72-96	36-72

## Emergency Procedure

In late fall, the weatherman will give the bad news — a Blue Norther, which will freeze all tender vegetation, is on the way. If you followed the planting schedules, your fall garden should have been producing luscious vegetables for over a month.

However, gardeners should prepare to weather the storm! Texas weather is peculiar. Northerns blow through for several days then the weather often clears and warms. The next cold weather may not occur for several weeks. If tender vegetation was protected during the cold snap, you can continue harvesting summer vegetables in winter months.

Only tender, frost-susceptible vegetables need protection. These were listed in the planning section. Hopefully, these were planted together as recommended. Frost-tolerant vegetables can withstand considerable cold.

If tomatoes are supported by cages secured to prevent blow down by high winds, they can be used as miniature greenhouses. Each cage can be covered with a plastic bag and a light bulb placed in each

covered cage. The burning bulb releases enough heat to prevent plant damage from temperatures as low as 25° F. or colder. Remember to anchor these cages because if they blow down on a cold night, all efforts are in vain.

Anchored cages also act as supports for a larger, covered structure. For instance, if a row of caged tomatoes borders each side of two rows of beans or squash, a greenhouse-type structure can be made by draping a large sheet of polyethylene plastic from the base of one row of cages to the base of the opposite row of cages. Anchor loose ends of plastic with soil or rocks.

As little foliage as possible should come in contact with the plastic since the contacted foliage will freeze. After danger of frost is past, only one side of the makeshift greenhouse is rolled back. The other remains secured with soil for a quick cover on the next frost alert.

Maybe you don't want to go to all of this trouble. In that case, be prepared to harvest all frost-susceptible vegetables before the first killing frost.

# TRY GARDENING IN CONTAINERS

Many people living in urban areas would like a garden but feel that lack of space limits gardening activities. Regardless of where you live, usually an enjoyable and productive vegetable garden is possible by using containers. A "micro-garden" or container garden can be an attractive part of the landscape of an urban home or apartment, whether on a windowsill, patio, rooftop, balcony or doorstep.

These container-grown, mobile vegetables can be protected easily from "Blue Norther" cold snaps during fall months by moving them to warmer locations such as a garage. With Texas having its cold weather in short intervals during the fall, a gardener can protect plants during these periods, and growth and vegetable production of container-grown plants enhance this possibility.

What can be grown on a doorstep? Most vegetables grown in typical backyard gardens also grow well in containers under favorable growing conditions. The most important factors for successful container gardening are sufficient sunlight, proper moisture, adequate fertility and, perhaps most important of all, tender loving care.

Most vegetables grow in containers, but some are more suitable than others. Since limited space encourages container gardening, the gardener should grow vegetables which will produce a large quantity of food for the amount of space and time required. Crops for container gardening include tomatoes, peppers, eggplants, squash, leaf lettuce, herbs and green onions. To add color to a patio or windowsill, plant ornamental peppers, red-leaf lettuce, red cabbage or flowering kale.

Various containers are suitable for growing plants, including bushel baskets, drums, gallon cans, wooden boxes, wash-tubs and plastic trash cans. Container size should vary with plants and space available. Plant smaller vegetables in 8- to 10-inch pots and larger crops such as tomatoes, peppers and eggplants in 3- to 5-gallon containers.

Good drainage is important when growing vegetables in containers. A 3- to 5-gallon container should have at least four drainage holes.

After obtaining a container fill it with a commercially prepared potting mix sold at local garden centers. The mix should drain well and contain no soil.

A real advantage of prepared

potting mixtures of "soils" is that they do not contain native soils. When soils are eliminated, problems such as fungus, root rots and nematodes also are eliminated.

Many suitable types of soil mixes are available for growing vegetables in containers. A "synthetic soil" is ideal as it is disease and weed-free, holds moisture and yet is well-drained and lightweight. Make your own by mixing 10 tablespoons of limestone, 5 tablespoons of 0-20-0 (superphosphate) and 1 cup of garden fertilizer such as 15-10-10 or 10-10-5 to 1 bushel each of vermiculite and peat moss.

It is best to transplant healthy plants into containers rather than seeding. Purchase transplants at local nurseries or grow at home. When transplanting, avoid injury to young root systems.

Plants growing in containers require adequate fertility for vigorous growth and high yields. For best results, prepare a nutrient solution and periodically water the plants with it. Many good commercial fertilizer mixes are available for solutions. Always use a water-soluble fertilizer to avoid excessive salt build up in the container. Need for watering with the nutrient solution varies but generally two or three times per week is adequate. As plants mature, more frequent watering may be necessary, perhaps even daily. Use plain home tap water at least once a week to leach out material that accumulates in the soil mix.

Artificial mixes or "soils" are deficient in fertilizer elements so mix slow release fertilizer pellets into potting mixes and supplement periodically with water-soluble fertilizers on a weekly basis. Slow release types are not necessary if water soluble fertilizers are used regularly.

Vegetables grown in containers also are susceptible to attack by insects and diseases. Inspect plants periodically for foliage-feeding insects as well as disease. Timely applications of approved fungicides and insecticides are helpful if insects and diseases become serious problems.

Container grown plants are completely dependent on the grower for correct amounts of water and nutrients. A garden plant can be neglected for several weeks and "Mother Nature's" water and nutrients will carry the plant through but do not neglect the container plant for even a day or the plant will be dead and dried up by harvest time.

OPTIMUM TEMPERATURE AND HUMIDITY FOR STORING FRESH VEGETABLES

Vegetables	Recommended temperature ° F.	Recommended relative humidity, %	Approximate length of storage (months)
Artichoke	34	90-95	1
Artichoke, Jerusalem	34	90-95	2-5
Asparagus	34	90-95	1/3-3/4
Bean	45-50	85-90	1/4-1/3
Bean, lima, unshelled	34	90-95	1/2
Beet, topped	34	90-95	5-6
Broccoli	34	90-95	1/4-1/3
Brussels sprouts	34	90-95	1
Cabbage	34	90-95	3-4
Carrot, topped	34	90-95	4-5
Cauliflower	34	90-95	1/2-3/4
Celery	34	90-95	2-3
Chinese cabbage	34	90-95	2-3
Corn	34	90-95	1/6-1/4
Cucumber	50-55	90-95	1/2-3/4
Eggplant	50-55	85-90	1/3-1/2
Endive or escarole	34	90-95	1/2-3/4
Garlic	34	70-75	6-7
Greens and salads	34	90-95	1/2-3/4
Horseradish	34	90-95	5-6
Kohlrabi	34	90-95	1-2
Leek	34	90-95	2-3
Lettuce, head	34	90-95	1/2-3/4
Muskmelon	45-50	85-90	1/4-1/2
Okra	45-50	85-90	1/4-1/3
Onions, dry	34	70-75	6-7
Pea	34	85-90	1/4-1/2
Pepper, sweet	45-50	85-90	1/4-1/3
Potato	38-40	85-90	5-6
Pumpkin	50-55	70-75	3-6
Radish	34	90-95	1/4-1/3
Rutabaga	34	90-95	2-4
Salsify, topped	34	90-95	2-4
Spinach	34	90-95	1/3-1/2
Squash, summer	50-55	85-95	1/6-1/4
Squash, winter	55-60	70-75	5-6
Sweet potato	58-60	80-85	4-6
Tomato, mature green	55-60	85-90	1/3-1/2
Tomato, ripe	45-55	85-90	1/4-1/3
Turnip	34	90-95	4-5

## COMPOST PILE VALUABLE

Falling leaves during autumn make lawns rather unsightly, so what can one do with leaves and plant material to improve growing conditions for the next season? Have you ever heard of composting?

Compost is a mixture of decomposing and rotting debris that can be used to add fertilizing elements to the soil. It is a process that returns plant and animal matter back to the soil and completes the life cycle. This cycle begins when the seeds are planted. As the small plant grows, it takes nutrients from the soil to make cells and metabolites. The larger the plant gets, the more materials are required. When that plant dies, it decomposes and the "borrowed elements" return to the soil. Thus, the cycle is completed.

The advantage of using organically released fertilizer elements is mainly one of economics. They are free! Gardeners should realize that organically released fertilizer elements do not differ in any way from those fertilizer elements obtainable from other sources. The organic combinations of elements must be reduced to some soluble inorganic forms by plants again. These inorganic forms are also found in commercial fertilizers. With this information, one can read-

ily recognize the fallacy in the claim that vegetables and other food products fertilized with inorganic chemical fertilizers are somehow harmful to human health as compared to those in which the same elements are supplied from composted or other organic materials. The main advantage, other than an economical fertilization technique, is that compost added to the soil improves tilth, fertility and ability to hold moisture. These factors encourage optimum plant growth and maximum yields if proper cultural practices are followed.

Basic items suitable for composting include leaves, grass clippings, animal manures, old plants and kitchen garbage. Do not use meat scraps and fats which attract undesirable creatures and generate odor.

Offensive odors also develop if the compost pile becomes soggy or anaerobic (lack of sufficient oxygen). Adequate aeration not only reduces odor but also hastens the decaying process.

If a compost pile is properly made and maintained, an excellent composted material will be ready for use by early spring or summer of next year. Try the "sandwich" composting effect. Choose a site on level ground if possible and

near a water source since moisture is required. Pile an 8- to 10-inch layer of rough brush or twigs on the bottom of the site. This helps especially if you choose not to turn the compost. (Unturned compost takes about 6 to 8 months to decompose.) On top of the twigs, pile 8 to 10 inches of plant material. Add a light sprinkling of high-nitrogen fertilizer or a "natural" fertilizer such as manure, bone meal or cottonseed meal to this plant material. On top of this plant material, add about an inch of soil and dampen down this first layer. Repeat these layers (omitting the twigs) until the pile is as high as you desire. Try to keep the pile standing; some people build supporting structures rather than trust a free-standing pile.

Remember to turn and moisten the pile occasionally to provide proper aeration and temperature. When the pile begins to "work," it will be hot internally. The compost is ready when it smells earthy and has a brown, rich humus look and feel. When compost is added yearly, the soil becomes fluffy, easy to work, fertile and holds soil moisture better. Don't throw those valuable resources in the trash. Use those leaves to make your garden grow.

## GARDEN PROBLEM GUIDE

Symptoms	Possible cause	Possible cures
Dying young plants	Fertilizer burn	Mix fertilizer thoroughly with soil.
Stunted plants pale to yellow	Disease (damping-off) Low soil fertility	Use treated seed. Soil test for fertilizer recommendations. Add organic matter. Work soil deeper.
	Poor soil drainage Shallow or compacted soil	
	Insects or diseases	Identify and use control measures.
	Nematodes	Use approved chemicals.
	Lack of phosphorus	Add phosphorous fertilizer.
Purplish color	Insects	Identify and use control measures.
Holes in leaves		
	Hail	Be thankful it was not worse.
	Disease	Identify, spray or dust; use resistant varieties.
Spots, molds, darkened areas on leaves and stems	Chemical burn	Use recommended chemical at recommended rate and time.
	Fertilizer burn	Keep fertilizer off plants.
	Dry soil	Irrigate if possible.
Wilting plants	Excessive soil moisture	Avoid over watering.
	Disease	Use resistant varieties if possible.
Weak, spindly plants	Too much shade	Move garden to sunny area.
	Plants too thick	Seed at recommended rate.
	Too much nitrogen	Avoid excessive fertilization.
Failure to set fruit	Improper temperatures	Follow recommended planting time.
	Too much nitrogen	Avoid excessive fertilization.
	Insects	Identify and use control measures.
Tomato leaf curl	Heavy pruning in hot weather	Do not prune; use cages.
Dry brown to black rot on blossom end of tomato	Low soil calcium	Add gypsum.
	Extremely dry soil	Irrigate and mulch.
Abnormal leaves and growth	2,4-D weed killer	Do not use sprayer that has previously applied 2,4-D. Do not allow spray to drift to garden.
	Virus disease	Remove infected plants to prevent spreading. Control insects that transmit.

## Buying Bulk Seed

If you have a large garden, you may prefer to buy seed in bulk quantity rather than in small packets. This is a good idea and can save money. Following is a list of commonly grown vegetables and the approximate number of seeds per ounce.

Vegetable	Approximate number of seeds per ounce
Asparagus	700
Bean, lima, bush	20-70
Beet	1,600
Broccoli	9,000
Brussels sprouts	8,500
Cabbage	8,500
Carrot	23,000
Cauliflower	10,000
Celery	70,000
Chard, Swiss	1,200
Chinese cabbage	9,500
Collard	8,000
Corn	100-200
Cucumber	1,000
Eggplant	6,000
Endive	26,000
Kale	10,000
Kohlrabi	8,000
Leek	11,000
Lettuce	25,000
Muskmelon and other melons	1,200
Mustard	15,000
Okra	500
Onion	9,500
Parsley	18,000
Pea (English)	50-230
Pepper	4,500
Pumpkin	110
Radish	2,000
Rutabaga	12,000
Southern pea	125
Spinach	2,800
Squash, bush	300
Squash, vining	100
Tomato	11,000
Turnip	13,000
Watermelon	225-300

Please tear off and return

(Please do not write in this space)

## HELP US HELP YOU!

Dear Gardener:

Please take a few minutes of your time to complete and mail this questionnaire to:

Extension Horticulture  
Texas Agricultural Extension Service  
303 Plant Sciences Building  
Texas A&M University  
College Station, TX 77843

Your help will provide information needed to determine how the Texas Agricultural Extension Service can better serve the needs of Texas gardeners in the future.

- Which of the following is the main reason you have a garden? (Please check one)
 

<input type="checkbox"/> Savings on groceries	<input type="checkbox"/> Pleasure
<input type="checkbox"/> Freshness of vegetables	<input type="checkbox"/> Exercise
- What size garden do you have? (Please check one)
 

<input type="checkbox"/> Less than 100 square feet (length times width)
<input type="checkbox"/> 100-400 square feet
<input type="checkbox"/> 401-1000 square feet
<input type="checkbox"/> Over 1000 square feet
- How much do you spend each year on vegetable gardening? (Please check one)
 

<input type="checkbox"/> Under \$25	<input type="checkbox"/> \$101-\$250
<input type="checkbox"/> \$25-\$50	<input type="checkbox"/> Over \$250
<input type="checkbox"/> \$51-\$100	
- Where do you obtain most of your gardening information and advice? (Please check one)
 

<input type="checkbox"/> Newspaper	<input type="checkbox"/> Neighbor or friend
<input type="checkbox"/> Nurseries	<input type="checkbox"/> Educational meetings
<input type="checkbox"/> Radio	<input type="checkbox"/> County Extension Agent
<input type="checkbox"/> Television	
- Please check the three main vegetables that you grow in your garden.
 

<input type="checkbox"/> Beans	<input type="checkbox"/> Okra
<input type="checkbox"/> Broccoli	<input type="checkbox"/> Peppers
<input type="checkbox"/> Cabbage	<input type="checkbox"/> Potatoes
<input type="checkbox"/> Cucumbers	<input type="checkbox"/> Squash
<input type="checkbox"/> Lettuce	<input type="checkbox"/> Tomatoes
- Which aspect of vegetable gardening do you need more information about? (Please check one)
 

<input type="checkbox"/> Soil preparation	<input type="checkbox"/> Watering
<input type="checkbox"/> Plant survival	<input type="checkbox"/> Harvesting
<input type="checkbox"/> Insect control	<input type="checkbox"/> Disease control
<input type="checkbox"/> Weed control	
- What is the main insect problem that you encounter in gardening? (Please check one)
 

<input type="checkbox"/> Beetles	<input type="checkbox"/> Soil insects
<input type="checkbox"/> Stinkbugs	<input type="checkbox"/> Spider mites
<input type="checkbox"/> Larvae or worms	
- Have you had nematodes in your garden?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------
- Are you satisfied with the information contained in this fall gardening publication?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------
- Please check three subjects for which you utilized the information in this fall gardening publication.
 

<input type="checkbox"/> Timing of planting	<input type="checkbox"/> Variety selection
<input type="checkbox"/> Nematode control	<input type="checkbox"/> Watering
<input type="checkbox"/> Seeding techniques	<input type="checkbox"/> Insect control
<input type="checkbox"/> Soil preparation	<input type="checkbox"/> Harvesting

11. Date \_\_\_\_\_ County \_\_\_\_\_

# PLANNING FOR NEXT YEAR

Experienced vegetable gardeners know the value of proper crop rotation. They are aware that certain vegetables planted year after year in the same plot decline in productivity. Consider factors that interact to affect the soil's productive potential if you wish to plant many kinds of vegetables in the same garden each year. Important factors to consider in planning a proper crop rotation are: soilborne diseases, nematodes, soil insects, organic matter, toxic chemical residues and levels of essential mineral elements.

Each family of vegetables has unique effects on the soil, and most vegetables within a given family fall prey to the same diseases and insects.

Most vegetables planted in home gardens belong to nine distinctive families. It is important to know that the pea or legume family includes peas and beans of all kinds. Beets, chard and spinach belong to the goosefoot family.

The mustard family has many members: cabbage, collards, Brussels sprouts, kale, cauliflower, broccoli, kohlrabi, rutabaga, turnip, cress, horseradish and radish. Carrots, parsley, celery and parsnip all belong to the parsley family. The nightshade family encompasses potatoes, tomatoes, eggplants and peppers.

The gourd family claims the vinecrops: summer squash, winter squash, pumpkin, watermelon, cantaloupe and

cucumber. Chicory, endive, salsify, dandelion, lettuce, Jerusalem artichoke and globe artichoke are all included in the composite family. The lily family includes onions, garlic, leeks and chives. Sweet corn is a member of the grass family.

In a small garden, rotate families of vegetables where only a few plants of each kind are planted. For example, treat tomatoes, peppers, eggplants and potatoes as a single group in a rotation.

Effectively control common vegetable diseases that survive in soil and attack vegetables by timely rotation coupled with a preventive fungicide program. For example, anthracnose and fusarium root rot fungi build up in beans and peas unless

there is a span of 2 to 3 years between plantings on the same plot. Tomato bacterial canker persists in a viable state for 3 years, once it is introduced into the garden soil. Some vegetable varieties resist or tolerate infection by certain fungi and bacteria. A gardener who knows his soil harbors a harmful organism can often select a resistant variety.

Tomatoes, potatoes and carrots are very susceptible to injury by the root knot nematode and favor the build up of this problem in soils. Corn and other grasses suppress this condition.

Wireworms and white grubs thrive in grass turf, and a new garden plot usually contains many active soil insects. Sweet

corn, watermelons and winter squash are better choices than root or tuber crops for newly tilled soil.

Try to follow a crop that supplies a large amount of organic matter with one that favors decomposition of organic matter. Sweet corn produces much coarse crop refuse. Pumpkins, winter squash and watermelons favor the decay of crop refuse. It is important to precede shallow-rooted crops requiring close cultivation, such as lettuce, beets and other greens with clean-culture crops such as tomatoes, peppers or summer squash, which tend to extend their roots deeply into the soil.



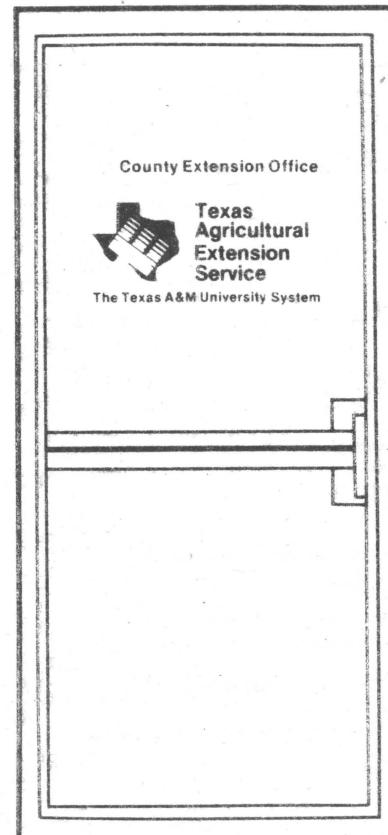
*Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, handicap or national origin.*

Cooperative Extension Work in Agriculture and Home Economics, The Texas A&M University System and the United States Department of Agriculture cooperating. Distributed in furtherance of the Acts of Congress of May 8, 1914, as amended, and June 30, 1914.

50M—8-84, Reprint

HORT 4

Editor: Ann Cole, Extension communications specialist, The Texas A&M University System.



## The place to go when you need to know . . .

. . . about agriculture, home economics, 4-H and youth or community resource development. Drop by or call your county Extension office. You'll find friendly, well-trained agents ready to serve you with up-to-date information, advice and publications. **Your county Extension Office . . . the place to go when you need to know!**



**Texas  
Agricultural  
Extension  
Service**