GARDEN

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MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

Grow Your Own Vegetables—

There are many good reasons for growing a vegetable garden in Mississippi. A garden offers the opportunity to enjoy vegetables at their freshest. Sometimes only minutes elapse between harvest, preparation, and eating. On the other hand, most fresh vegetables available at the grocery store travel about 1,800 miles between producer and consumer, and this travel often occurs over a period of several days. There's a lot to be said for "homegrown" freshness.

Vegetable gardens are traditional in Mississippi. When the state was more rural, most of the family's food was grown at home. Today, vegetable gardens are often thought of as a form of family recreation. Many older Mississippians grow gardens that are much too large for their own use just to have fresh vegetables for family, friends, and others who are unable to garden.

Here is what some of today's Mississippi gardeners have to say about their gardens and why they garden:

"We have enough for our family, plus some to share; what more could you ask?"

"There's no way to keep count of the people who stop to visit my garden and talk awhile since it is on the side of a field road that leads to a catfish pond. I was so proud when I was told it was the prettiest garden they had seen. I have filled three freezers and canned more than 300 jars of vegetables."

"I have always had a love for gardening. I have helped in caring for the family garden ever since I was large enough to help plant and work in a garden."

"I enjoy giving vegetables to the elderly, shut-ins, neighbors, and friends."

"I enjoy people visiting my garden. Some come just to enjoy seeing it, others to learn better ways to garden."

"I have gardened over 50 years and still do my own work. The hard work and good food keep me healthy. I save some money, but I receive other benefits that are greater and that cannot be bought."

"We give more vegetables away than we keep. We have a large family, five children, 13 grandchildren, and six great-grandchildren, so you see we really enjoy a garden."

"There is a great difference in cooking fresh food from that which has been picked for several days. Watching your food grow gives you something to look forward to each week."

Decide What You Want to Plant

Select vegetables and the amount to plant by looking forward to harvest and how you will use the vegetables. There's no sense in planting something that won't be used.

When selecting vegetables to grow, consider your available garden space. Some vegetables take a lot of garden space for a long time, while others are planted and harvested in a short time period, producing a lot in a little space. Melons, pumpkins, vining types of squash, and sweet potatoes are in the garden for a long time, yet the harvest period is relatively short. Okra, tomatoes, peppers, eggplant, and pole beans are also in the garden a long time, but these produce a continuous supply of food.

Sweet corn is one of those vegetables you just have to plant despite how much space it takes (expect to harvest one ear per plant) because it is so good.

Vegetables to consider for small gardens (because of the space they need and the amount they produce) are bush snap and lima beans; leafy greens like lettuce, spinach, mustard, and turnips; green onions; tomatoes; sweet peppers; and eggplant. As space permits, add broccoli, cabbage, hot peppers, okra, summer squash, southern peas, and pole beans. Cucumbers, which normally take a lot of ground space, can be trellised.

Irish and sweet potatoes are productive for the amount of garden space required but present a storage problem when harvested.

Plant varieties recommended for growing in Mississippi. Don't continue to use old vegetable varieties when there are new varieties available that resist disease and give higher yields and quality. For example, fusarium wilt is still a major disease problem on tomatoes in some Mississippi gardens where the older varieties are planted. All recommended tomato varieties are resistant to this disease.

The amount of sunlight the garden receives can help you determine which vegetables to grow. Ideally, the garden site should receive full sun all day. This is not always possible, especially when the garden is located on a small residential lot where shade trees block the sun for part of the day.

Where there is no full sun space, plant vegetables in various spots around the house. All vegetables grown for their fruits or seeds, such as corn, tomatoes, squash, cucumbers, eggplant, peppers, beans, and peas, should have the sunniest spots.

Vegetables grown for their leaves or roots, such as beets, cabbage, lettuce, mustard, chard, spinach, and turnips, can grow in partial shade but do better in direct sunlight.

Decide What Size Garden You Need

To determine what size garden you need, consider your family size, the amount of vegetables you need, and whether you will preserve or use the vegetables fresh.

Most important in determining garden size are the gardener's physical ability, available time and equipment, and genuine interest in gardening. Even though the rewards of gardening are great, the work is hard.

It is better to start small and build on success than to become discouraged and abandon the garden because it was too large or too much work. See the Planting Guide on page 7.

Choose a Great Location for Your Garden

The ideal garden site is close to the house but out in the open where it receives full sun and is not shaded by trees or buildings. Choose a place that is near a water supply and has loose, fertile, well-drained soil.

Few gardeners are fortunate enough to have the ideal garden site or soil. This does not mean growing a successful garden is impossible. If you select the right vegetables and carefully manage the soil, some vegetables can be produced in almost any location.

Select a site free of serious weed problems. Nutsedge, torpedograss, bermudagrass, cocklebur, and morningglory are just a few of the weeds that are difficult to control in a garden.

Fence the garden site to keep out children and animals. A two-strand, low-voltage electric fence may be the only way to keep small animals like rabbits and raccoons out of the garden.

Remove low tree limbs that hang over the garden and give animals access.

Garden Plan

Design your garden to meet your needs. Careful planning reduces work and can make the garden more productive. Planting seeds and plants at random frequently results in waste and disappointment.

Consider the selected method of cultivation in designing your garden. Where the work is done with a tractor, long rows are practical; but when cultivation is by hand, short rows give a sense of accomplishment as work on each is completed.

Consider the slope of the land; run rows at right angles to the slope, especially on sandy-textured soils that tend to wash and erode. Where the land is uneven, contour the rows.

Rows for vegetables with small plants (carrots, onions, radishes, and others) can be closer together for hand cultivation than for power equipment. Planting double rows or a broad band on a bed can increase the yield from a small garden plot. Closely spaced rows and vegetable plants help shade out weeds, but the close spacing makes weeding difficult when plants are small.

Closely spaced plants reduce water loss from the soil surface by protecting the surface from drying winds and hot sun. The reduced air movement, however, may increase chances for diseases.

Plant perennial vegetables like asparagus where they won't interfere with yearly land preparation. Plant season-long vegetables like tomatoes, okra, peppers, and eggplant together where they won't interfere with short-term vegetables and replanting. Plant corn, okra, pole beans, tomatoes, and other tall vegetables on the north side of the garden so they won't shade or interfere with the growth of shorter vegetables.

Sweet corn produces fuller ears when planted in a block of rows than in a long single row because of better pollination. When possible, group vegetables according to their lime and fertilizer needs, and treat accordingly. Southern peas, lima beans, snap beans, and peanuts do not require as much nitrogen fertilizer as some other vegetables.

Sample Garden Plan

20 x 50 feet
1,000 square feet—Row 1 is located 12 inches from the edge of the garden, and all rows are 36 inches apart. Rows are 20 feet long.

	Spring Planting		Summer Planting		Fall Planting	
Row	Vegetable	Planting Date	Vegetable	Planting Date	Vegetable	Planting Date
1	Onions (plants)	Feb.-March	Bush Lima Beans	June-July	Spinach	Sept.-Oct.
2	Cabbage (plants)	Feb.-March	Bush Lima Beans	June-July	Beets/Chard	Sept.-Oct.
3	English Peas	Jan.-Feb.	Cucumbers	May-June	Mustard	Sept.-Oct.
4	English Peas	Jan.-Feb.	(leave unplanted)		Cabbage	Aug.-Sept.
5	Lettuce	Feb.-March	Summer Squash	May-June	Cauliflower	Aug.-Sept.
6	Beets/Chard	Feb.-March	(leave unplanted)		Turnips	Sept.
7	Mustard/Turnips	Feb.-March	Southern Peas	May-June	Carrots	Sept.
8	Broccoli (plants)	Feb.-March	Southern Peas	May-June	Lettuce	Sept.
9	Bush Snap Beans	March-April	(leave unplanted)		Broccoli	Aug.-Sept.
10	Bush Snap Beans	March-April	(leave unplanted)		Broccoli	Aug.-Sept.
11	Bell Peppers/ Eggplant (plants)	April-May				
12	Tomatoes (plants)	April-May				
13	(leave unplanted)		(leave unplanted)		Cucumbers	Aug.
14	Sweet Corn	March-April	(leave unplanted)		Bush Snap Beans	Aug.
15	Sweet Corn	March-April	(leave unplanted)		Bush Snap Beans	Aug.
16	Sweet Corn	March-April	Tomatoes (plants)	July-Aug.		
17	Okra	April-May			Collards	Oct.

Successive Planting, Long Season Can Reduce Garden Size

Gardening in Mississippi provides the opportunity to have something in the garden almost every month of the year.

The long growing season combined with successive plantings (growing more than one vegetable in the same space during the year) enables gardeners to reduce the size of their gardens.

As soon as one vegetable is harvested, clear the space and prepare to plant another vegetable. Empty row space produces nothing and provides a place for weeds to grow, while a small garden intensively planted and managed can be very productive.

For example, follow a spring planting of English peas with a late spring planting of cucumbers; then replant the space with fall bush snap beans, leafy greens, or late southern peas.

Another example is to follow early sweet corn with winter squash and pumpkins in early July. Spring Irish potatoes can be followed by lima beans or southern peas, which are followed by fall greens.

Practice crop rotation (planting nonrelated plants in the same location in successive plantings) where garden space permits. Crop rotation is a good practice to follow when you use the same garden site for several years because it helps prevent the buildup of diseases in the garden soil.

When growing only for fresh use, make small successive plantings of vegetables like snap beans, sweet corn, lettuce, radishes, leafy greens, and southern peas. Planting at 2-week intervals provides continuous fresh vegetables.

Plant only as much as your family can eat before the next planting begins to produce. If you plan to can and freeze as well as use fresh vegetables, plant more vegetables at one time to provide enough at harvest for preserving.

Expected yields are given for the different vegetables in the Planting Guide on page 7. Keep in mind that the yields given for some vegetables (tomatoes, peppers, okra, pole beans, and eggplant, for example) are for multiple harvests over a period of time.

Vegetables with extended harvest periods require only one planting during the season. However, with tomatoes, peppers, and eggplant, a second planting made in midsummer provides good quality vegetables for harvest in fall.

A second planting of okra, about 6 weeks after the first planting, has some benefit for late-season harvest, but you can get the same benefit by cutting the first planting back to a height of 3 to 4 feet in late summer.

Plant your garden according to a detailed plan on paper. A finished garden plan shows these things:

- which vegetables to grow
- number of different plantings of each vegetable
- time and location of each planting
- distance each row is to be planted from one end of the garden.

Related Vegetable Groups

Tomato	Snap Bean	Cucumber	Cabbage
Eggplant	Lima Bean	Squash	Broccoli
Irish Potato	Peanut	Pumpkin	Turnip
Pepper	Southern Pea	Muskmelon	Mustard
		Watermelon	Collard

Spring Planting
onions, cabbage, lettuce, corn, tomatoes, peppers, eggplant

Summer Planting
lima beans, squash, cucumbers, peas, okra

Fall Planting
spinach, mustard, turnips, cauliflower, carrots, broccoli, beets

Garden Soil

The ideal garden soil is deep, loose, fertile, and well-drained (internally as well as on the surface), has plenty of organic matter, and is free of weeds and diseases. Such soils are difficult to find, but with proper preparation and management, less-than-ideal soils can be productive.

Water moves quickly through an internally well-drained soil and never completely shuts off air movement. Drainage is important because roots cannot develop, live, and function without a constant supply of oxygen. Clay soils dry slowly after a rain because the spaces in them are small and water moves through them slowly. Sandy soils, on the other hand, have many spaces and dry out quickly.

Clay and sandy soils can be partially changed to substitute for a rich loam by adding organic matter. Increasing the organic matter content of a clay soil improves the tilth, makes it easier to work, and improves the internal drainage. Adding organic matter to a sandy soil increases its water-holding capacity and improves its fertility.

The garden soil affects the way vegetable plants grow and look. When soils are cold, wet, crusty, or cloddy, seedlings are slow to emerge and some may not survive. Root rot diseases may take a heavy toll on seedlings, especially beans. Other soil-related plant symptoms are short plants, slow growth, poor color, and shallow and malformed roots. Soil symptoms of poor structure are crusts, hard soil layers below the surface, standing water, and erosion.

Increase the soil's organic matter content by adding manure, composted leaves, sawdust, bark, or peatmoss; or by turning under plant residues like sweet corn stalks after harvest, and green manure crops (soybeans, rye, southern pea plants, and others). Plant residues should be free of diseases if they are to be added to the garden soil. Cover crops, such as clovers and vetch, planted in the fall prevent soil erosion and leaching of plant nutrients. They also provide organic matter and nitrogen when turned under in spring.

Manures vary in their content of fertilizing nutrients. The amount of straw, age, exposure to the elements, and degree of composting change their composition. Be careful not to over-fertilize when applying chicken litter to garden soil. Use no more than 200 pounds per 1,000 square feet of garden space. Animal manure is lower in nutrient content than poultry manure and can be applied at the rate of 250 to 300 pounds per 1,000 square feet.

Overuse of manures can add so much salt to the soil that plant growth is harmed. Most organic materials release some nutrients quickly and the rest over a period of time. (See Organic Gardening, page 5.) Even though adding organic matter improves soil fertility, manures and plant residues are not balanced fertilizers, and soils require additional fertilizer. Test soil every third year to be sure.

Raised Beds Help Problem Areas

Raised beds can help where gardening space is limited, the site is low and collects water, or the soil drains poorly. Raised beds are planting areas where the soil is several inches higher than that of the natural grade. This is accomplished by adding soil to the growing area, or by adding and mixing into the native soil amendments such as compost, sand, composted sawdust, or bark.

Where the native soil is adequate, raised beds can be made by removing several inches of soil from the bed area, filling the excavation with organic matter like manure or old hay, and mixing the soil with the added organic matter. It is also possible to pull soil from the walkways between beds and place it on the beds, filling the walkways with mulch materials like pine needles.

Raised beds can be framed with wood, bricks, or cement blocks, or they can be left unframed. Framing adds to the appearance, and depending on the materials used, may provide seating.

Ideally, raised beds should be no wider than 4 feet (so you can easily reach the center from either side) and no longer than 25 feet unless cross-overs are provided. Beds 4 feet wide and 25 feet long contain 100 square feet and make calculations for rates of application of fertilizer and granular materials easier. Beds accessible from only one side should be narrower than 4 feet. All framed beds should be of the same width so that covering materials (shade frames, sash for cold frames) fit all beds, making rotation easy.

Raised-bed soil that has been improved by adding organic matter and sand often enables excellent root crops like carrots, onions, and parsnips to grow, even though they would not grow in the native soil. Select vegetables that produce a lot for the space they occupy. Trellis vining crops like cucumbers, pole beans, Malabar spinach, and melons. Support melon fruit in slings.

Raised beds require more water than ground-level beds, but when the alternative is no garden at all, it's worth the extra effort.

Raised beds are planting areas where the soil is several inches higher than that of the natural grade.

Here are some additional advantages of raised-bed gardening:

- Raised beds produce more vegetables per unit of garden space because space is not wasted with walkways between every row.
- Soil in raised beds dries and warms more quickly in spring, which permits earlier planting of spring vegetables.
- Soil does not compact because soil in beds is not walked on.
- Closely spaced plants in raised beds shade out weeds and reduce weed problems and the need for frequent cultivation.

Raised bed gardening, however, does have disadvantages. Some of these are listed below:

- Closer spacing of plants can reduce air flow and increase disease problems.
- Yields from individual closely spaced plants may be lower than from widely spaced plants (total production from the closely spaced plants is often higher).
- Raised beds require more frequent watering because of improved drainage.
- Raised beds may require more frequent fertilization because of the leaching resulting from frequent watering and excellent drainage.
- Raised beds with permanent sides make it difficult to relocate the garden.
- Raised beds can be expensive to establish.

Compost Improves Soil Structure

Compost is partially decomposed plant material mixed with soil. Since compost is rich in organic matter, use it to improve soil structure, tilth, fertility, and water- and nutrient-holding capacity. Compost can be mixed directly into the garden soil or used as a mulching material that is mixed with the soil after the growing season.

The biggest benefit from compost is its value as a soil conditioner. Compost increases the water-holding capacity of soil, reducing the frequency you need to water. Adding compost improves sandy and clay soils. Plant growth nutrients in compost include nitrogen, phosphorus, and potassium. They are mostly in an organic form, and they release slowly and are less subject to leaching.

Compost is something you normally make rather than purchase, but composted bark and composted manure are frequently sold as soil conditioners.

Make compost from vegetable and other plant materials from normal yard chores, leaves, and grass clippings, or hauled-in materials like sawdust, straw, or hay.

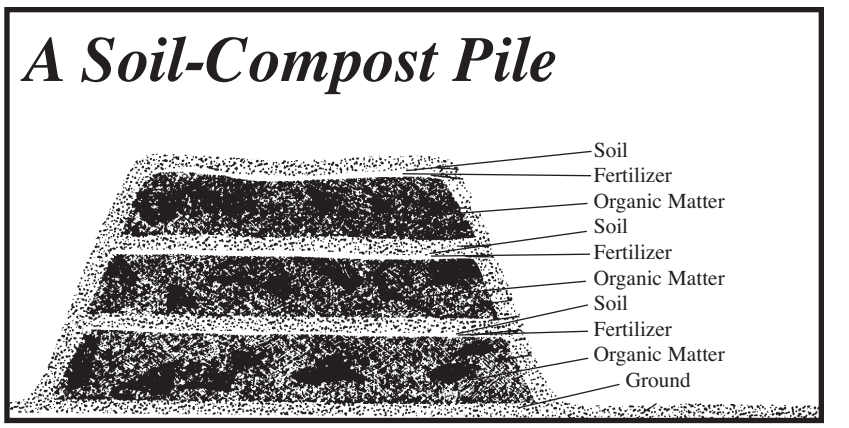
Construct a pile of alternating layers of organic waste material and soil. Keep the pile moist and add a mixed fertilizer to speed the composting process.

Build your compost pile in some out-of-sight location. It can be built on open ground or in a bin made of cinder block, rough boards, or wire fence. The sides of the bin should not be air- or water-tight. Spread a layer of organic matter about 6 inches deep and add 1 cup of a mixed fertilizer, 6-8-8, to each 10 square feet of surface. Then add 1 inch of soil and enough water to moisten but not soak the pile. Repeat this process until the pile is 4 to 5 feet high.

Make the top of the pile concave to catch rainwater. Under normal conditions, turn the pile in 2 or 3 weeks and again in 5 weeks.

Heat helps decomposition, so if the compost pile is made in the fall, decomposition will be slow until spring and summer. Moist, green plant materials and fresh manure decompose much faster than dry, brown materials and can produce a considerable amount of heat.

See **Extension Publication 1782 Composting for the Mississippi Gardener** for more information.



Containers Give Options for Gardening in Small Spaces

Container gardening is available to anybody in Mississippi who has sunlight and a source of water. Containers are vessels that will stand upright, keep growing media from washing away, and allow water to leave the vessel from the bottom. Small pots and cans that hold a quart or more can grow herbs, radishes, lettuce, strawberries, and other small plants. Tomatoes, peppers, squash, eggplant, and other large plants need a container that will hold 5 gallons or more. Old ice chests, bathtubs, barrels, and other large containers can support several plants.

Containers should be filled with a high organic-matter mix. Blend compost, peat moss, or other organic material with sand. The sand helps with drainage and provides weight for stability. Organic or man-made fertilizers supply needed nutrients. Water is the most limiting factor in container gardening because plant roots are restricted. Container gardens often need to be watered twice on hot summer days.

Test Soil to Find Its pH Value

The soil reaction, or measure of acidity or alkalinity, is based on a scale of 1 to 14 and is referred to as pH. A pH of 7.0 is neutral. Any values below 7.0 are acid, and any values above 7.0 are alkaline.

The ideal pH values for vegetable garden soils are 6.0 to 6.5. Vegetable plants do not grow well in acid soils with a pH of 4.5 to 5.5 or in alkaline soils with a pH above 7.5. Soil testing is the only way to know the pH of your garden soil. Contact your county Extension office for a container and instructions for taking a soil sample. There is a $6 fee for a complete analysis (pH plus nutrient analysis with lime and fertilizer recommendations) on each sample. The lime recommendation is the single most important piece of information on a soil test report.

In areas with high rainfall like Mississippi, soils are generally acid. However, there are exceptions (particularly in the Delta and Blackland Prairie) that prove the need for soil testing. Of the garden soils analyzed at Mississippi State University's Soil Testing Laboratory from 1999 to 2004, 49 percent had a pH of 5.9 or below and needed lime. Twenty-six percent were in the range of 6.0 to 7.0.

The pH of the soil tells you if the soil needs lime. Where it is needed, limestone is the most effective and inexpensive aid available for soil improvement. The soil's calcium and magnesium levels tell you what form of limestone—dolomitic (magnesium and calcium) or calcitic (calcium)—to apply. An acid soil that tested medium low to very low in magnesium should be limed with dolomitic (high magnesium) lime. An acid soil high in magnesium can be limed with either calcitic limestone or dolomitic limestone.

Acid soil results in poor plant growth, partly because of poor root growth. This means greater susceptibility to drought stress and less efficient use of soil nutrients. Plants growing in acid soil may show deficiency symptoms of several plant nutrients.

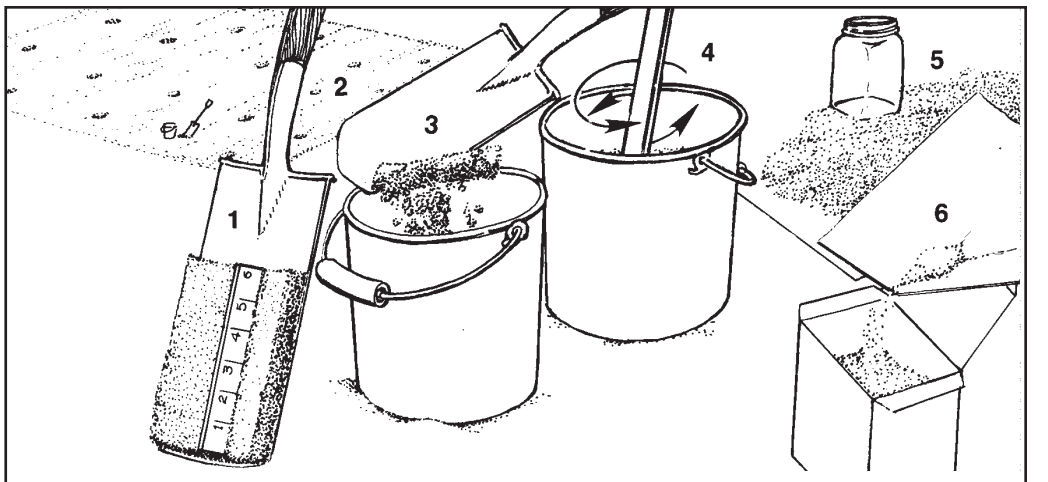
Apply lime well ahead of planting (2 to 3 months) to provide time for it to dissolve and change the soil pH. However, limestone begins to react as soon as it is incorporated and can be applied at any time to increase soil pH levels.

Apply lime evenly over the entire area and work it into the top 4 or 5 inches of soil. Incomplete mixing may make future tests show a need for more lime, which can result in overliming and poor plant growth. Limestone not only raises the soil pH but improves fertility. Lime also improves the structure of clay soils and makes them easier to work.

Liming is not a once-in-a-lifetime event. Since soils limed to the proper pH return to their acid state with time, soil test every three years to determine if additional lime is needed. Sandy soils become acid again faster than clay soils.

Factors causing the soil pH to drop are listed below:

- Using acid-forming fertilizers.
- Leaching of lime from the soil by rain and irrigation water.
- Decomposing of organic matter and release of organic acids.



To get a soil sample for testing: (1) Use a spade or trowel to remove a slice of soil 6 inches deep; (2) Get similar sections from other random places in your garden; (3) Put these samples in a pail; (4) Mix soil thoroughly in the pail; (5) Remove about 1 pint of the well-mixed soil and dry it at room temperature; (6) Place dried soil in container. Do not take samples where fertilizer has been spilled or manure has been piled. Do not include debris such as leaves, sticks, or large stones in your sample. Deliver the soil sample to your county Extension office.

Vegetable Tolerance to Acid Soils

Slightly tolerant (pH 6.8 to 6.0)		Moderately tolerant (pH 6.8 to 5.5)		Very tolerant (pH 6.8 to 5.0)
Asparagus	Spinach	Beans	Lima Beans	Irish Potatoes
Beets	Swiss Chard	Brussels Sprouts	Parsley	Sweet Potatoes
Broccoli		Carrots	Peppers	Watermelons
Cauliflower		Collards	Pumpkins	
Chinese Cabbage		Corn	Radishes	
Lettuce		Cucumbers	Rutabagas	
Muskmelons		Eggplant	Soybeans	
New Zealand Spinach		English Peas	Squash	
Okra		Garlic	Sunflowers	
Onions		Kale	Tomatoes	
Peanuts		Kohlrabi	Turnips	

Discover Your Garden's Fertilizer Needs

The amount of fertilizer to apply depends on the natural fertility of the soil, amount of organic matter, type of fertilizer, and the vegetables being grown. **Get a soil test to determine your garden's fertilizer needs.**

In addition to soil testing, you also must measure your garden to determine the number of square feet it occupies. Garden fertilizer recommendations are based on 1,000 square feet, and an area of 1,000 square feet could measure 25 by 40, 20 by 50, 30 by 33, or other dimensions according to your plot layout.

If your area is smaller than 1,000 square feet, divide the actual area by 1,000; then multiply the decimal figure by the recommended lime and fertilizer rates. For example, if your plot measures 16 by 24, the area contains 384 square feet; 384 divided by 1,000 equals .384; multiply .384 by your recommended fertilizer rate to determine the amount of fertilizer to apply.

Vegetable plants require many different nutrient elements for good growth and production, but nitrogen (N), phosphorus (P), and potassium (K) are the three nutrients of concern to most gardeners. Calcium (Ca) and magnesium (Mg) are supplied by limestone. The other required elements are obtained from air, water, and soil.

Mixed fertilizers are normally sold by grade and contain two or three major plant nutrients. The numbers in the grade refer to the percent nitrogen (N), available phosphate (P_2O_5), and available potash (K_2O).

Fertilizer sources of the major plant nutrients are ammonium sulfate (21 percent nitrogen, 21-0-0), a blend of ammonium sulfate and urea (34 percent nitrogen, 34-0-0), nitrate of soda (16 percent N, 16-0-0), calcium nitrate (15.5 percent N, 15.5-0-0, 19 percent calcium), urea (46 percent N), superphosphate (46 percent P_2O_5, 0-46-0), and muriate of potash (60 percent K_2O, 0-0-60). Because many garden soils have been heavily fertilized for years, soil test results often indicate extremely high soil levels of phosphorus and potassium. In these cases, nitrogen is the only fertilizer recommended, since additional phosphorus and potassium are unnecessary.

Where nitrogen is the only fertilizer recommended, the usual recommendation is for 3 pounds of 34-0-0 (3 pints) per 1,000 square feet of garden space prior to planting. Fertilization with unnecessary nutrients can "salt out" the garden and damage plant growth.

Vegetables differ in their fertilizer requirements. Leafy greens like mustard, turnips, collards, cabbage, and spinach are heavy users of nitrogen. Broccoli and sweet corn also require more nitrogen than some other vegetables. While nitrogen is important to the plant growth of fruit and root vegetables, phosphorus and potash are important to the proper development of roots and seeds. Peanuts, southern peas, and beans get nitrogen from the air and do not require heavy nitrogen fertilization. Overfertilizing these vegetables with nitrogen causes excessive growth of leaves at the expense of the fruit.

Apply fertilizer before or at planting. Two methods of application are "in the row" and "broadcast." For most gardeners, the broadcast method is more practical.

To broadcast, spread the recommended amount of fertilizer evenly over the soil surface and then thoroughly mix it into the soil during soil preparation. Heavy feeding vegetables need additional fertilizer (side-dressing) after the plants are well established.

For row application, apply the recommended fertilizer to the row. Mix it thoroughly with the soil so that it will not damage the seed and tender plants.

Fertilizer can be applied in a combination of broadcast and row applications. Broadcast two-thirds of the recommended fertilizer over the entire garden surface and mix it into the soil. Apply the remaining one-third of the fertilizer in furrows 3 inches to either side of the row and slightly below the level of the seeds.

Nitrogen fertilizer applied before or at planting time usually does not supply all the nitrogen needed during the growing season for heavy- and medium-feeding vegetables. Also, irrigation and rain can leach water-soluble nutrients, especially nitrogen, into deeper areas of the soil, out of the reach of the roots of shallow-rooted vegetables.

Apply (side-dress) additional nitrogen fertilizer along the row 4 to 6 inches from the base of the plants when plants are established, being careful to keep all fertilizer off plant leaves.

Measuring Table for Fertilizer, Weight per Pint

Superphosphate	1 lb
Muriate of Potash	1 lb
34-0-0	1 lb
Nitrate of Soda	1¼ lb
Limestone	1¼ lb
Mixed fertilizer 6-8-8, 13-13-13	1 lb

Side-Dress Applications of Nitrogen

(1 pint of 34-0-0 per 100 feet of row, 3⅓ tablespoons per 10 feet of row)

Beans	at 3- to 4-leaf stage
Beets, carrots	4 to 6 weeks after planting
Bell peppers, eggplant, tomatoes	after first fruit set and again at 4- to 6-week intervals
Broccoli, cabbage, cauliflower, Brussels sprouts	3 weeks after transplanting or after danger of late freeze in spring; broccoli again when heads begin to show
Cucumbers, muskmelons, watermelons, winter squash	when vines begin to run
English peas	when plants are 4 to 6 inches tall
Irish potatoes	when sprouts break through soil surface
Leafy greens (mustard, turnips, chard, collards)	when plants are about one-third grown
Lettuce, kohlrabi, Chinese cabbage	2 weeks after transplanting; 4 weeks after sowing seed
Okra	after first pods are harvested
Onions (green and bulb)—from sets	when tops are 6 inches high
—from transplants	when established and actively growing
Peanuts	none
Radishes	none
Southern peas	none
Summer squash	before bloom when plants are 8 to 10 inches tall and again in 4 weeks
Sweet corn	when 8 inches high and again when knee high
Sweet potatoes	none
Turnips (roots), rutabagas	4 weeks after sowing seeds
Tomatoes	when first fruit are 1 inch in diameter; again at first harvest

Soil Prep Is Important for Successful Gardens

Preparing the soil is one of the most important steps in gardening.

If erosion is not a problem, plow or spade clay soils and grassy areas in the fall. Limestone is most effective when applied in the fall.

On new garden sites that were lawn areas or were heavily infested with weeds, consider using an approved chemical to kill existing plants before turning the soil. Plow or turn soil to a depth of 7 or 8 inches. Leave fall-plowed land rough until spring.

Many garden tillers are not adequate equipment for the initial breaking of soil in a new garden site. Starting in early spring, disc or rake the soil several times at regular intervals to keep down weeds and to give a smooth, clod-free planting bed.

If you did not plow or spade the garden site in the fall, turn the soil in spring as soon as it is dry enough to work. A good test to determine if the soil can be worked is to mold a handful of soil into a ball. If the ball is not sticky but crumbles readily when pressed with your thumb, the soil is in good condition.

If you did not apply recommended lime to the garden site in the fall, apply both lime and recommended fertilizer in the spring. Plow or spade the soil, spread the lime and fertilizer, and mix it in with a disc, harrow, or rototiller.

Pulverize the soil and get a smooth, level surface by raking as soon as possible after turning. This helps to firm the soil, break up clods, and leave a smooth surface for seeding. Soil left in rough condition for several days after turning in the spring may dry out and form hard clods, making it much more difficult to prepare a good seedbed.

Prepare a small garden plot for planting by using a spade, shovel, or spading fork to turn the soil. Use a small tractor or garden tiller for a larger garden. Completely cover all plant material on top of the ground and work it into the soil when the soil is turned.

Where the soil is clay and level and likely to stay wet, use a hoe, rake, or tiller to pull the soil into raised rows that are 10 to 12 inches across on the tops. Let the sides slope gently to the walkways to provide good surface drainage.

Conventional row spacing is 36 to 40 inches apart, but spacing depends on a number of factors: equipment, garden size, and vegetables being grown. Rows for vigorously vining vegetables like watermelons, cantaloupes, pumpkins, and winter squash are usually 6 to 8 feet apart.

Raised bed gardens are relatively easy to prepare for planting once the beds are constructed. (See Raised Beds on page 3.)

Organic Gardening

Interest in organic gardening—using organic and natural materials for fertilization and disease and insect control—is increasing.

Much of the interest is on reducing or eliminating use of man-made pesticides for controlling insects and diseases. There is less interest in the use of natural and organic fertilizers.

Organic gardening in Mississippi faces some serious problems with the rapid loss of soil organic matter and severe insect and disease pressures on vegetable plants. Organic gardeners, to ensure the greatest chances for success, should have the garden soil tested for pH and nematodes.

The most beneficial input for both organic and conventional gardeners is to add organic matter to the soil. This can be done by adding composted or fresh organic materials and incorporating them into the soil. Gardeners need to pay attention to the amount of nitrogen in the materials they are adding. Straw; fallen, dried leaves; sawdust; wood chips; and paper should be blended with a high nitrogen material like grass clippings, manure, or blood meal since incorporating large amounts can actually keep the nitrogen in the soil from the crop plants while decomposing. The nitrogen becomes available again after decomposition is through.

Soils with a low pH (acid) can be corrected using limestone, ground oyster shells, wood ashes, or dolomitic limestone. Adding organic matter benefits soils with a high pH (alkaline).

Animal manures are the most widely used organic fertilizers. Unfortunately, their composition varies with the source, age, degree of rotting, water content, and amount and kind of litter used.

Green manures and cover crops can also be used to provide nutrients. When allowed to grow over the winter, hairy vetch or crimson clover can fix up to 100 pounds of nitrogen per acre. Southern peas can be grown during summer to provide nitrogen for fall vegetables. Green manure crops should be mown and plowed into the soil at least four weeks prior to planting the next crop.

Most organic materials do not contain plant nutrients in balance with plant requirements and must be supplemented to correct these imbalances. A well-leached animal manure has an estimated fertilizer value of 1-1-1, or 20 pounds each of N, P_2O_5, and K_2O per ton of manure. Besides being relatively low in nutrient content, the nutrients are available more slowly than nutrients from inorganic sources. This protects nutrients from leaching, but when a rapid change in nutrient level is needed, this can be a problem.

Controlling diseases and insects by natural means alone is difficult. There are several insecticides available including Bt formulations for caterpillar control and spinosad or pyrethrums for other insects, but disease control is difficult. Neem oil, bicarbonate, and copper- and sulfur-based fungicides provide some protection against diseases, but the best results for disease management come from selecting resistant varieties and proper timing and spacing during planting. For these reasons, organic gardening is easier on a small scale.

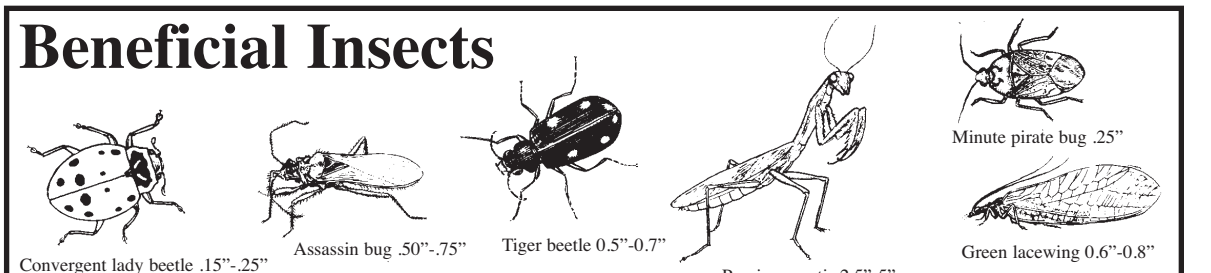
To increase chances for success, organic gardeners should follow these practices:

- Plant disease- and nematode-resistant varieties.
- Use marigolds, mustard, solarization, and organic products like Clandosan 618 to control plant parasitic nematodes (see **Extension Publication 483 Nematode Control in the Home Garden**).
- Plant seeds from disease-free plants.
- Plant only healthy vegetable transplants.
- Place a cardboard collar around plant stems at ground level to prevent cutworm damage.
- Incorporate plant residues and animal manures early to allow sufficient time for them to decompose before planting.
- Use mulches to control weeds and keep soil from splashing onto the plants and fruit.
- Use aluminum foil or reflective plastic mulches to repel aphids and thrips that injure plants and also transmit plant viruses.
- Plant as early in the spring as possible to avoid some insect problems.
- Keep the garden free of weeds that may harbor diseases and insects.
- Hand-pick insects.
- Water so plants are not wet at nightfall.
- Remove diseased plants and plant parts from the garden.
- Control insects using biological controls and natural products.
- Rotate garden areas.
- Encourage natural insect predators. Trap slugs under boards and moist burlap laid on the ground, or use beer traps.
- Stay out of the garden when the plants are wet to prevent spreading diseases.
- Do not use tobacco products while working in the garden.
- Mix different vegetables in a row to eliminate monocultures and the chance for a disease to spread rapidly.

Nutrient Content of Organic Materials

	Percent Nutrient			
	N	P_2O_2	K_2O	Availability
Rock Phosphate	0	20 to 30	0	very slow
Bone Meal	1	15	0	slow medium
Compost	up to 3	1	1	slow
Dried Blood	12	1.5	.5	medium rapid
Fish Emulsion	5	2	2	rapid
Cotton Seed Meal	6	3	1.5	slow medium
Cow Manure, fresh	.25	.15	.25	medium
Sawdust	4	2	4	very slow
Wood Ashes	0	1 to 2	3 to 7	rapid

Beneficial Insects



Try New Varieties for Advantages Over Established Varieties

Most of the varieties in this section will not be available from seed racks or as plants from your regular sources, so be prepared to search for them in catalogs or online. Whenever a new variety is trialed, it should be planted near the normal variety you grow so you can compare them. Be sure to label the plants and treat both old and new varieties the same way so there is a fair comparison.

Minuet is a miniature Napa cabbage that produces heads weighing 1½ to 2 pounds, rather than the 3- to 6-pound heads of full-sized varieties. The crisp leaves resemble romaine lettuce, but they have a very mild cabbage flavor. Minuet grows from seed to harvest in about 50 days. Minuet is well adapted to small-container production.

All America Selections

A vegetable variety designated as an All America Selection (AAS) has been judged in a number of national trial gardens to have some advantage or uniqueness over a standard comparison variety. This may be disease resistance, color, productivity, flavor, or something else. All America Selections must show wide adaptability to climatic and soil conditions. AAS is a nonprofit organization that accepts variety entries from breeders around the world.

Not all new varieties developed each year are submitted for testing in the AAS trial gardens, so there are many excellent varieties that do not bear the AAS designation. Many AAS vegetables are suited for growing in Mississippi, so be sure to try these new varieties as well as other new varieties listed in catalogs.

The Vegetable section (pages 22-30) includes a list of recommended varieties. Some previously designated AAS varieties are no longer available, since the program is more than 50 years old. The year of introduction for AAS varieties listed in this publication is given with the variety descriptions in the Vegetable section.

Indigo Ruby tomato produces teardrop fruit with a purple cap and dark red bottom on a medium to large plant. Each fruit weighs less than 2 ounces. The plant is indeterminate, and harvest lasts 6 weeks.

La Bomba is a medium-hot jalapeño pepper that produces glossy green and red peppers on a small plant that is well adapted to medium-sized containers. The peppers are 3 inches long and 1 inch wide. Peppers seldom display skin corking if picked when red color is freshly completed.

Siberian kale is not a new variety, but recent research has shown it to be one of the most productive and hardy of the winter pot herbs. This kale is very cold tolerant and

See New Varieties, page 19

Zones Determine Planting Dates

Use the map and chart in this section to determine dates for planting vegetables in your garden. Use the map to identify the zone (1, 2, 3, 4, or 5) in which you garden. Some Mississippi counties are in only one zone, while others are in more than one.

The zones are based on weather data for the median (most frequent) dates of last freezes (temperature of 32 °F or less) in spring. In some years the last freeze occurs earlier, and in some years later, than the median dates. The zones are listed at the top of the chart. The cool- and warm-season vegetables are listed on the left, and the recommended planting dates make up the body of information in the chart.

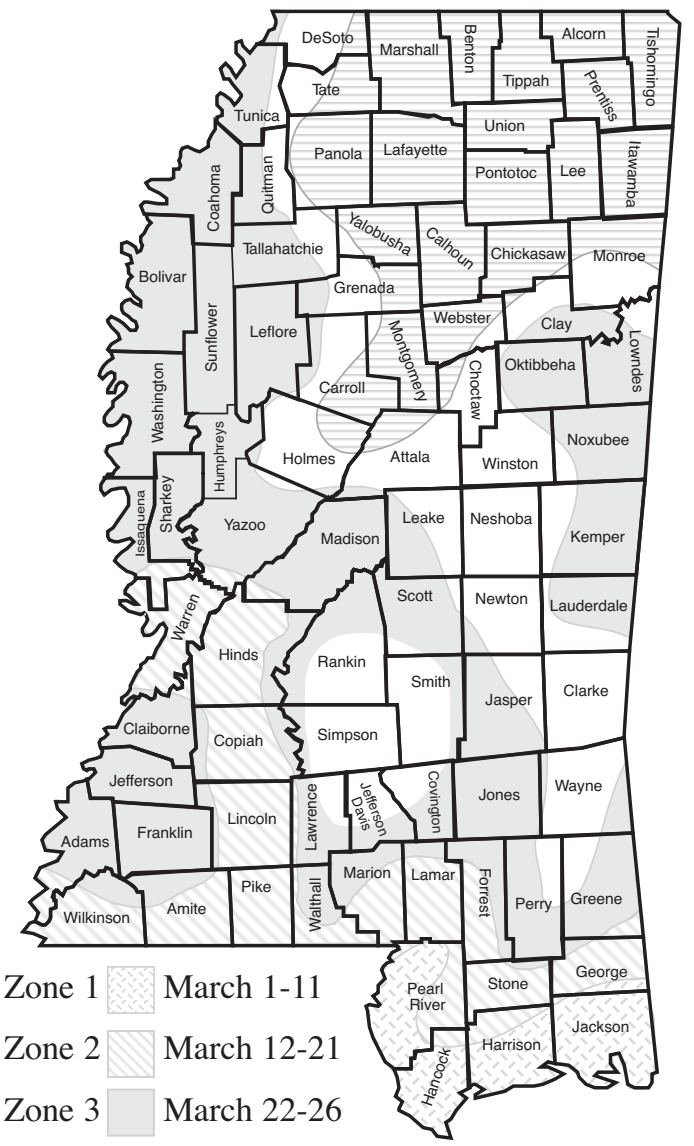
Beets, for example, are recommended for planting in zone 1 from February 1 to March 1. The starting dates are 4 and 6 weeks before the last median frost date for the zone for cool-season vegetables, and 2 and 4 weeks after the last median frost date for warm-season vegetables.

The cut-off date for planting cool-season vegetables is to provide sufficient time for the vegetables to mature before the heat of summer. The cut-off date for planting warm-season vegetables is to permit maturity and harvest before disease, insect, and weather pressures become too great and before cold temperatures in the fall.

Most cool-season vegetables can be planted in both spring and fall. This gives two opportunities for successful harvests. Most warm-season vegetables can be planted over a period of several weeks ranging from midspring to midsummer.

Multiple plantings at 10-day intervals of beans, corn, peas, radishes, and leafy greens within the recommended planting intervals provide for successive harvests.

Some of the cool-season vegetables like broccoli, cabbage, Chinese cabbage, cauliflower, collards, kale, spinach, and rutabagas produce better when grown in the fall. These plants mature as the weather is getting cooler, and they are of better quality and produce over a longer period of time.



Median Date of Last Freeze in Spring

Planting Zones – To use the map, find your county and determine which zone it is located in. Then find the vegetable planting dates for your zone on the chart to the right.

Spring and Summer Planting Dates

Cool-Season Vegetables

Vegetable	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Beets	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Mar. 1	Mar. 15	Apr. 1	Apr. 1	Apr. 5
Broccoli (plants)	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Feb. 15	Mar. 1	Mar. 10	Mar. 15	Mar. 20
Cabbage, Collards (plants)	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Feb. 15	Mar. 1	Mar. 15	Mar. 20	Apr. 1
Carrots	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Apr. 15	Apr. 15	Apr. 15	Apr. 15	Apr. 15
Cauliflower (plants)	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Feb. 15	Mar. 1	Mar. 10	Mar. 15	Mar. 20
Chard, Swiss	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Mar. 1	Mar. 15	Apr. 1	Apr. 1	Apr. 5
Kohlrabi	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Mar. 1	Mar. 15	Apr. 1	Apr. 1	Apr. 5
Lettuce, head	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Mar. 1	Mar. 1	Mar. 1	Mar. 5	Mar. 10
Lettuce, leaf	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Apr. 1	Apr. 1	Apr. 1	Apr. 10	Apr. 15
Mustard	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Apr. 1	Apr. 1	Apr. 15	Apr. 15	Apr. 20
Onions (sets or plants)	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Mar. 1	Mar. 1	Mar. 1	Mar. 1	Mar. 15
Peas, English	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Mar. 10	Mar. 10	Mar. 15	Mar. 20	Apr. 1
Potatoes, Irish	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Feb. 15	Mar. 1	Mar. 1	Mar. 10	Mar. 15
Radishes	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Mar. 15	Mar. 15	Apr. 1	Apr. 15	Apr. 25
Spinach	Jan. 20	Jan. 29	Feb. 8	Feb. 13	Feb. 18
	Feb. 15	Mar. 1	Mar. 15	Mar. 15	Mar. 15
Turnips	Feb. 1	Feb. 12	Feb. 22	Feb. 27	Mar. 3
	Apr. 1	Apr. 1	Apr. 15	Apr. 15	Apr. 20

Warm-Season Vegetables

Beans, snap bush	Mar. 15	Mar. 25	Apr. 4	Apr. 8	Apr. 14
	Apr. 15	Apr. 20	May 1	May 1	May 10
Beans, snap pole	Mar. 15	Mar. 25	Apr. 4	Apr. 9	Apr. 14
	Sept. 1	Aug. 15	Aug. 15	Aug. 10	Aug. 1
Beans, lima bush	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 15	Aug. 1	Aug. 1	July 25	July 15
Beans, lima pole	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 5	Jul. 20	Jul. 20	Jul. 15	Jul. 5
Corn	Mar. 1	Mar. 11	Mar. 21	Mar. 26	Mar. 31
	Jul. 15	Jul. 15	Jul. 15	Jul. 15	Jul. 15
Cucumbers	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Sept. 14	Aug. 28	Aug. 21	Aug. 14	Aug. 10
Eggplant (plants)	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 15	Aug. 10	Aug. 10	Aug. 1	July 15
Muskmelons	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	May 1	May 1	May 15	May 15	Jun. 1
Okra	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Jul. 15	Jul. 15	Jul. 15	Jul. 15	Jul. 15
Peanuts	Mar. 15	Mar. 25	Apr. 4	Apr. 9	Apr. 14
	May 1	May 1	May 1	May 15	May 15
Peas, southern	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 10	Aug. 1	Aug. 1	Aug. 1	Jul. 20
Peppers (plants)	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 15	Aug. 10	Aug. 10	Aug. 1	Jul. 15
Potatoes, sweet (plants)	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Jul. 1	Jul. 1	Jul. 1	Jul. 1	Jul. 1
Pumpkins, Winter Squash	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Jul. 1	Jul. 1	Jul. 1	Jul. 1	Jul. 1
Spinach, New Zealand	Mar. 15	Mar. 25	Apr. 4	Apr. 9	Apr. 14
	Apr. 15	Apr. 15	Apr. 20	May 15	May 15
Squash, summer	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Sept. 14	Aug. 28	Aug. 21	Aug. 14	Aug. 10
Tomatoes (plants)	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	Aug. 15	Aug. 10	Aug. 10	Aug. 1	Jul. 20
Watermelons	Mar. 29	Apr. 8	Apr. 18	Apr. 23	Apr. 28
	May 1	May 1	May 15	May 15	Jun. 1

* For Fall Gardening, see page 19.

Transplants Can Shorten Planting-to-Harvest Time

Some vegetables are planted in the garden using small plants (transplants) rather than seeds. This is standard practice with warm-season vegetables like tomatoes, peppers, and eggplant, and is becoming the practice with cucumbers, squash, cantaloupes, and watermelons because transplants shorten the time by several weeks between planting and harvest.

Sweet potato plants are grown from stored sweet potato roots and not from true seed. In the early spring garden, transplants of cabbage, broccoli, cauliflower, head lettuce, and onions are recommended.

Not all vegetable plants transplant with the same degree of ease as small seedlings or when setting them out in the garden. But even vegetables described as difficult to transplant can be transplanted into the garden with great success when they are started in containers.

Grow vegetable transplants in a cold frame, hot bed, greenhouse, or a well-lighted window.

Here are some advantages to growing your own plants:

- They are often less expensive to grow than to buy.
- They are available when you need them. You grow the varieties you want and are not forced to accept substitutes.
- You avoid the danger of bringing in diseases and insects.

You can successfully grow transplants of many vegetables by following a few simple guidelines:

Seed. Use fresh seed from a reputable source. Transplants require several weeks to grow, so get your seeds early. Do not buy too much seed. A small amount produces many plants. If the seed has not been treated with a fungicide as indicated on the package, do so with a small amount of fungicide. (See the Before-You-Plant Practices section on seed treatment on page 17.)

Soil. Most garden soils are not good enough to be used for raising transplants because they are poorly drained and contaminated with disease and weed seeds. Several commercial sterile soilless mixes are available. Prepare a soilless mix using these ingredients:

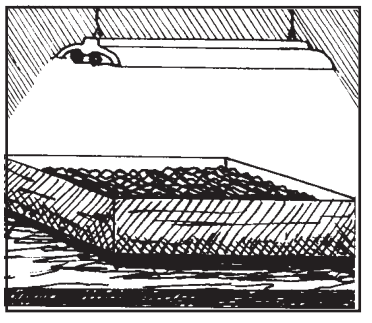
2 quarts Sphagnum peat moss
1 quart vermiculite
1 quart perlite
1 tablespoon limestone

Container. Containers for seed germination can be plastic egg cartons, half-pint milk cartons, small trays, aluminum foil loaf pans, pie tins, peat pots, or peat pellets. Make sure there are drainage holes in the bottom of the container before filling the container nearly to the top with the mix. Wet the mix thoroughly and let excess water drain. Expandable peat pellets (available at nurseries and garden supply stores) eliminate the need for a mix and a container except for one to hold the pellets.

Place dry, flat pellets in a shallow tray and sprinkle them several times with warm water until they are completely expanded. Allow a little time between sprinklings. Surround the expanded pellets with sand or vermiculite to hold them upright and slow their drying between waterings.

Planting Seeds. Do not plant seeds too thickly. When using trays or pans, plant the seeds in rows and cover with one-fourth of an inch of mix. When using individual containers, plant two or three seeds per container. With the expanded pellets, make a small depression in the top and drop in the seeds. Plant seeds of watermelons, squash, and cucumbers in individual containers.

Transplants are recommended for seedless watermelons. To aid germination, plant seedless watermelon seeds with the rounded end facing down and the pointed end facing up.



Use cool, white 40-watt fluorescent tubes for a supplemental light source.

Germination. Cover containers with a piece of plastic, or slip them into a clear plastic bag to keep the humidity high. The best temperature for germination is 80 °F. As the temperature drops below 80 °F, germination slows. Tomato, pepper, and eggplant seeds won't germinate at temperatures below 60 °F. Even at the optimum temperature, eggplant and pepper seeds may take 2 weeks to germinate.

As soon as the seedlings begin to come through the mix surface, remove the cover, lower the temperature, and increase the amount of light to prevent spindly growth. Use cool, white 40-watt fluorescent tubes placed several inches above the seedlings for 18 hours a day for a supplemental light source.

Tomato, pepper, and eggplant seedlings grow best when the day temperature is 70 to 75 °F and the temperature at night is 60 to 65 °F.

Broccoli, cabbage, and cauliflower prefer cooler temperatures—

See Transplants, page 8

Planting Guide

Vegetable	Seeds or Plants per 100 ft	Depth of Planting (inches)	Distance between Plants (inches)	Average Crop Expected per 100 ft	Average No. of Days to Harvest
Asparagus	1 oz 65 plants	1 6-8	18	30 lb	2 years
Beans, snap bush	½ lb	1	3-6	60 lb	50-55
Beans, snap pole	½ lb	1	4-12	80 lb	65
Beans, lima bush	½ lb	1	3-6	47 lb in shell 18 lb shelled	65
Beans, lima pole	½ lb	1	4-12	66 lb in shell 25 lb shelled	80
Beets	1 oz	½	2	75 lb	65
Broccoli	⅛ oz 50-65 plants	¼-½	18-24 18-24	50 lb 50 lb	80-115 75
Cabbage	⅛ oz 65-100 plants	¼-½	12-18 12-18	150 lb 150 lb	100 80
Cabbage, Chinese	⅛ oz	¼-½	12	100 lb	80
Carrots	⅛ oz	¼-½	2	100 lb	75
Cauliflower	⅛ oz 50-65 plants	¼-½	18-24 18-24	80 lb 80 lb	80-115 65
Chard, Swiss	1 oz	¼-½	6	75 lb	50
Collards and Kale	¼ oz	¼-½	8-16	150 lb	55
Corn, sweet	3-4 oz	1-2	12	10 doz	80
Cucumbers	½ oz	1	12-18	100 lb	55
Eggplant	50 plants		24	150 lb	85
Kohlrabi	⅛ oz	¼-½	3-4	75 lb	55
Lettuce, head	¼ oz 75-100 plants	¼	12 12-14	75 head 75 head	80-115 80
Lettuce, leaf	¼ oz	¼	8-12	50 lb	50
Muskmelons	¼ oz	1	36-48	100 fruit	90
Mustard	¼ oz	¼-½	2	100 lb	45
Okra	1 oz	1	12-18	90 lb	65
Onions, green	600 sets or plants		2	100 bunches	35
Onions, bulb	220 sets or plants		6	100 lb	110
Parsley	⅛ oz	¼	4-6	30 lb	90
Peanuts	½ lb	1-2	3-4	45 lb green 15 lb dry	110
Peas, English	1 lb	1-2	2	30 lb in shell	65
Peas, southern	½ lb	1	4-6	40 lb in hull	65
Peppers, bell	50 plants		24	150 lb	75
Potatoes, Irish	10 lb	4	12	150 lb	100
Potatoes, sweet	75-100		12	100 lb	120
Pumpkins	½ oz	1-2	48	300 lb	90-110
Radishes	1 oz	½	1	40 lb	28
Rutabagas	½ oz	¼-½	12	90 lb	90
Spinach	½ oz	½	4	70 lb	45
Squash, summer	½ oz	1	36	150 lb	55
Squash, winter	½ oz	1	48	100 lb	90
Tomatoes	35-65 plants		18-36	125 lb	70
Turnips, greens	¼ oz	¼-½	2-3	50-100 lb	50
Turnips, roots	¼ oz	¼-½	2-3	50-100 lb	60
Watermelons	½ oz	1½	48-72	60 fruit	85

Planting and Thinning Tips

Plant only fresh seeds from a reliable source. Old seeds are slow to germinate and often produce spotty stands and deformed plants.

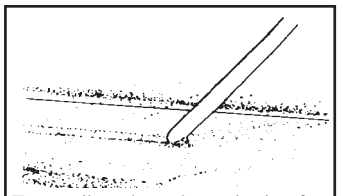
When planting seeds, mark straight rows with stakes and a cord to make cultivating, spraying, and harvesting easy. Rake the seed bed clean of clods, rocks, and other types of debris. Make shallow furrows suitable for small seeds by drawing a hoe handle along a string.

For deeper furrows, use a corner of the hoe blade. In the spring, plant seeds shallow to speed germination. As the season progresses, plant seeds deeper to ensure a good supply of moisture.

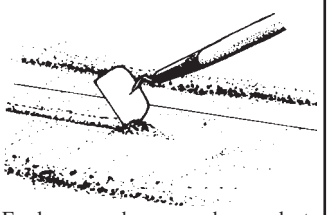
Small seeds are difficult to distribute thinly and evenly and are easier to space if mixed with dry sand or dry, pulverized soil before planting. When planting small seeds like carrots that germinate slowly, mix in some radish seeds to mark the row.

Seeds that are large enough to handle easily can be planted in groups (hills) or spaced evenly (drilled) in the row. When planting in hills, place several seeds in small areas at the desired final plant spacing. Sweet corn, squash, pumpkins, melons, and okra are often planted in this way. Once the seeds germinate and the seedlings are established, remove the excess seedlings. Sweet corn, okra, and summer squash are thinned to one plant per hill, pumpkins and melons to two plants per hill.

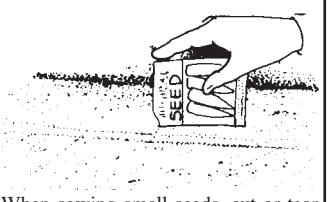
Seeds of beans, peas, beets, chard, and sweet corn are frequently spaced evenly down the row when planted. Individual seeds may be spaced 1 or more inches apart but at a spacing closer than the desired final plant spacing.



For small seeds, make a planting furrow with a hoe handle or rake drawn along the cord.

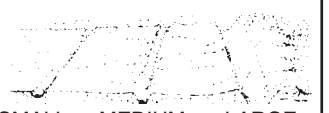


For larger seeds, open a deeper planting furrow with your hoe.



When sowing small seeds, cut or tear off a corner of the packet and scatter seeds in the furrow while tapping gently with your index finger.

Space larger seeds evenly and drop by hand.



Seed size determines depth of planting.

After germination and seedling establishment, remove extra seedlings. The choice of planting method, drill or hill, for many vegetables is up to the gardener.

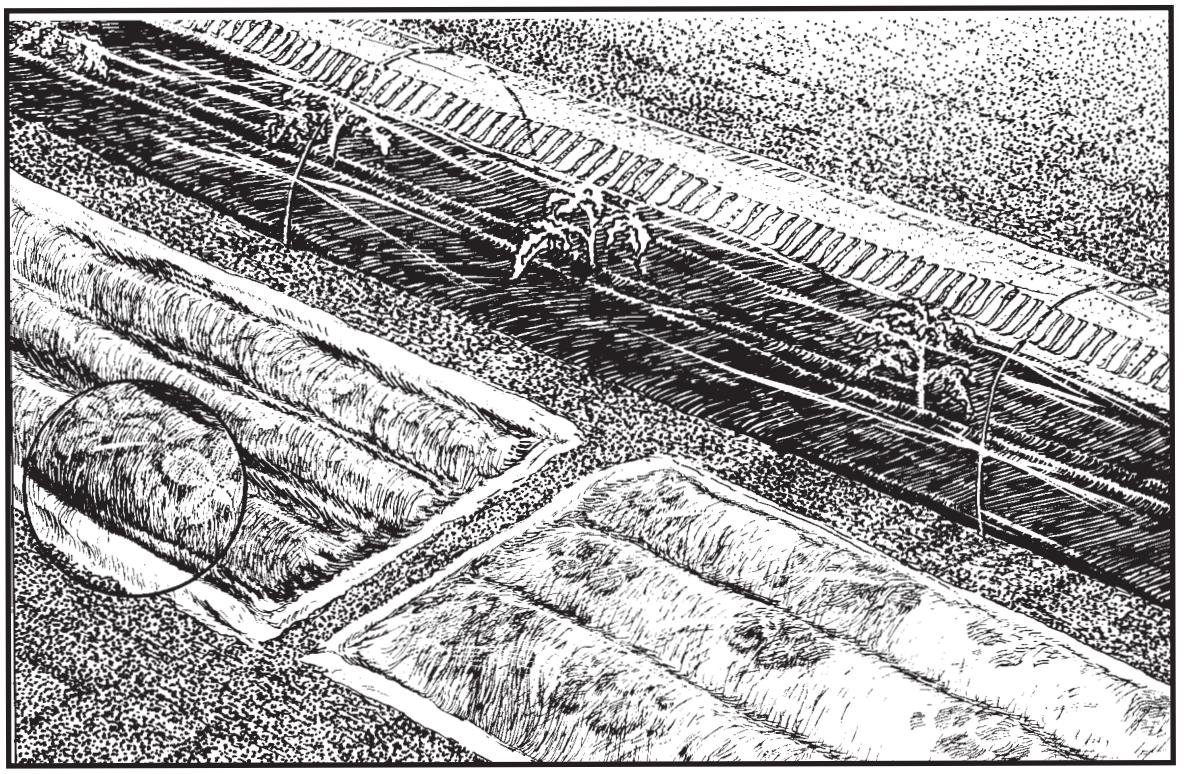
If your seeds are 1 or more years old, plant them thicker than you would fresh seeds. Extra seeds at planting time cause poor germination and seedling death from disease and insects.

After the seeds are placed, cover them with soil. (See the Planting Guide on page 7 for depth of planting). Firm (do not pack) soil over the seeds with the flat blade of a hoe. Be careful not to plant seeds too deeply. Seeds covered with too much soil do not come up.

Removing the extra seedlings (thinning) seems wasteful to many gardeners, especially new gardeners. However, when the majority of seeds germinate and the seedlings survive, the plants become crowded.

Leaving the plants spaced too closely together reduces yields, makes the plants more susceptible

See Tips, page 9



Plastic row tunnels and floating row covers permit early planting and provide some protection against cold. Plastic tunnels can be used in combination with black plastic mulch. Floating row covers made of a non-woven polyester also provide early insect protection.

Days from Planting to Seedling Emergence
Under Good Growing Conditions

Beans 5-10	Cucumbers 6-10	Peppers 9-14
Beets 7-10	Eggplant 6-10	Radishes 3-6
Broccoli 5-10	Lettuce 6-8	Spinach 7-12
Cabbage 5-10	Okra 7-10	Squash 4-6
Carrots 12-18	Onions 7-10	Tomatoes 6-12
Cauliflower 5-10	Peas 6-10	Turnips 4-8
Corn 5-8	Parsley 15-21	Watermelons 6-8

Transplants

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65 to 70 °F during the day and 55 to 60 °F at night. At these temperatures, broccoli, cabbage, and cauliflower take 5 to 7 weeks to reach the size for transplanting to the garden. Peppers and eggplant may need 8 to 10 weeks to reach the size for setting out in the garden.

Thinning and Transplanting. Individual containers with more than one seedling must be thinned to one plant. Pinch out or cut off the extra seedlings while the first leaves are still small.

Seedlings germinated in trays must be transplanted to individual containers while still small. Lift and separate seedlings and replant them into individual containers such as peat pots, plastic cel-paks (saved from previously purchased transplants; be sure to wash them), peat pellets, or other small containers. Use a commercial soilless potting mix or prepare your own.

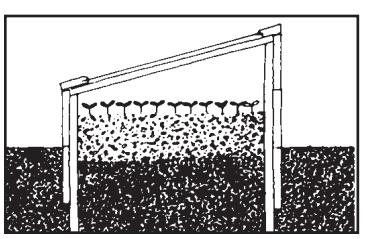
Fertilizer. Some potting soils contain a small amount of fertilizer but not enough to grow the seedlings. Homemade mixes of peat, vermiculite, and perlite contain no fertilizer. Seeds contain a small amount of nutrients to get the seedling started, but you must supply fertilizer such as water soluble 20-20-20. Prepare a fertilizer solution following instructions on the container.

Disease. Damping-off is the major disease that attacks seedlings. Seedlings appear pinched at the soil line, fall over, and die. Control this disease by thoroughly watering (drenching) the growing mix after planting the seeds with 1 tablespoon of Captan (50 percent wettable powder) per gallon of water.

Hardening Off. Transplants grown in a cold frame are stockier and better able to withstand outside garden conditions than transplants grown indoors or in a greenhouse. Before setting out tender transplants, place them in a cold frame for 1 to 2 weeks to acclimate them to colder temperatures, brighter light, and wind. This greatly increases their chances of survival once set in the garden.

Cold Frame

Cabbage, broccoli, and cauliflower transplants can be easily grown in an outside cold frame. Build a simple frame and cover it with polyethylene. Plants grown in a cold frame require 8 to 10 weeks to reach the size for setting in the garden, so start early. Place the cold frame in a sunny location with the low side facing south and the high back facing north. Paint the inside white to reflect light and promote uniform growth.

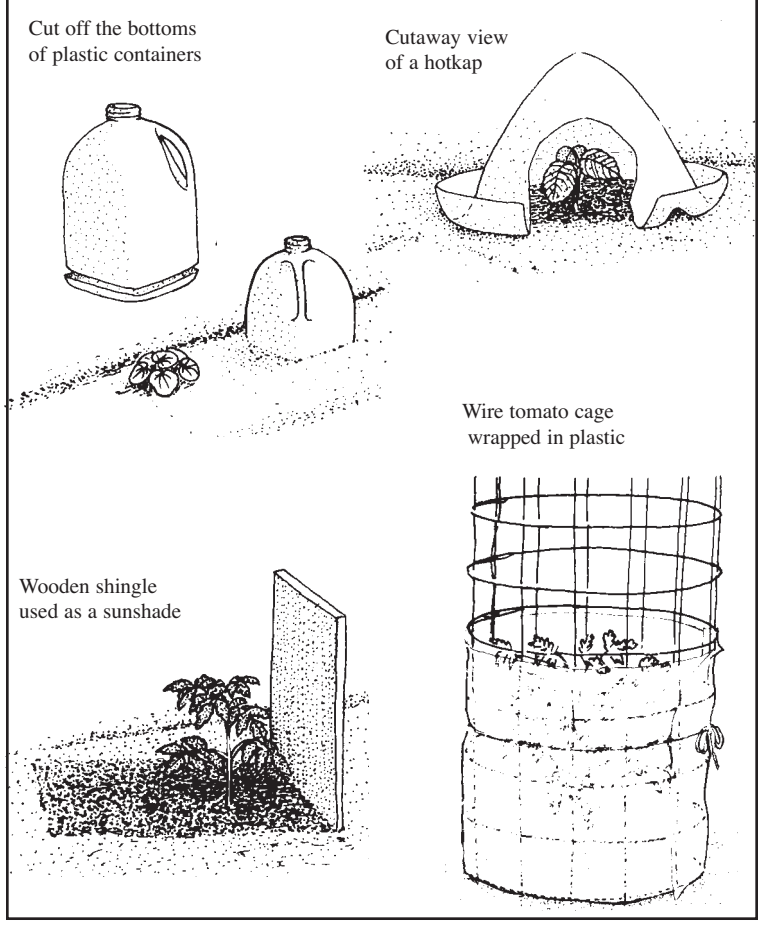


Plants must grow in a cold frame for 8 to 10 weeks before setting in the garden.

Since temperatures in a cold frame are frequently below the optimum for seed germination, plant seeds in a soilless mix in trays and germinate them indoors. Once the seeds have germinated, move the trays to the

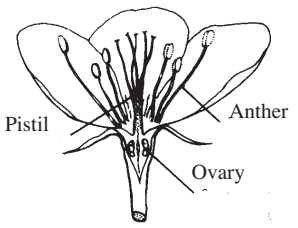
See Transplants, page 9

Protect Newly Set Plants



Pollination

Pollination, the transfer of pollen within a flower or between flowers, is needed for many vegetables to produce. With vegetables we grow for their leaves (greens, spinach, cabbage) and roots (beets, carrots, radishes), pollination is not important. But with vegetables we grow for their developing fruit, ripened fruit, or seeds (melons, corn), pollination is almost always needed.



Flower Parts

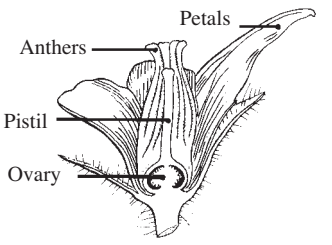
Pollen is produced in the anthers (male parts) and must be moved to the pistil (female part). One part of the pistil, the ovary, develops into the seed or fruit that is eaten—squash, tomatoes, cucumbers, corn kernels. Pollen is moved from the anthers to the pistil in one of three ways.

Corn pollen is carried by the wind as it falls from the tassel to the silks of the ears. If anything prevents this wind transfer of pollen, the result is ears with empty rows and missing kernels. Corn planted in a single row loses most of its pollen. This is why corn should be planted in a block of adjacent rows rather than one or two very long rows. High temperatures and drought do not interfere with the transfer of corn pollen but can prevent proper pollination and fertilization, resulting in poorly developed ears.


Corn pollen is carried by the wind as it falls from the tassel to the silks of the ears.

The pollination process in all beans, peas, and tomatoes is called self-pollination because the transfer of pollen takes place within the individual flowers without the aid of insects or wind.

Squash, pumpkins, melons, and most cucumbers are insect-pollinated. In these vegetables, which have the male and female flower parts in separate flowers (yet still on the same plant), insects transfer pollen from male flowers to female flowers while going from flower to flower, collecting nectar and pollen. The most common pollinating insects are honeybees and bumblebees.

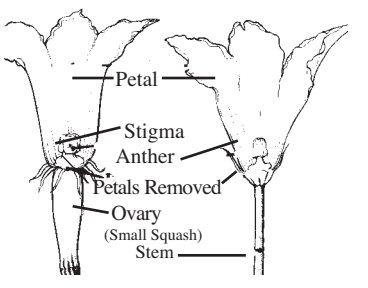


Bees often are seen on vegetables that are wind- and self-pollinated, where they are collecting pollen and nectar. Since pollinating insects are so important in the garden, it is important to consider them when choosing and applying insecticides. Choose insecticides that are least toxic to bees, and apply them late in the day when bees are not actively working in the garden.

Vegetables that are self- and insect-pollinated often suffer from lack of pollination and fertilization, just as wind-pollinated corn does. High temperatures, shade, and insufficient moisture often result in pollen that does not behave normally and causes a lack of fruit development. Poorly shaped fruit (cucumbers, watermelons, tomatoes) result from incomplete pollination.

Cross pollination between different vegetables is an unnecessary worry of many gardeners. Different varieties of the same wind- and insect-pollinated vegetables may cross, but there is no crossing between the different vegetables: cucumbers, melons, and squash. All summer squash, Halloween pumpkins, vegetable spaghetti, acorn squash, and small ornamental gourds are closely related and do cross if planted close to one another. This is of no concern to gardeners who do not save their own seed. Jumbo pumpkins and most winter squash can cross. If you grow several varieties of summer and winter squash and pumpkins in the same garden, purchase fresh seed each year.

The different corn colors (yellow and white) and types (normal, sugary enhanced, supersweet, field, and pop) crosspollinate if planted close to one another, and if they silk and tassel at the same time. Results can vary from a few yellow kernels on normally all-white ears to a situation where the corn is not fit to eat. All sweet corn must be isolated from field and popcorn, and all supersweet corn must be isolated from all other corn.



Squash Flowers

Transplants

continued from page 8

cold frame. Open the cold frame cover for ventilation or remove it on clear days when the air temperature is 45 degrees or higher. Thin the seedlings to stand one-half inch or more apart. Crowding results in spindly, weak transplants. Fertilize to promote growth.

Growing onion transplants requires considerable time. Start by planting seeds in September or October in closely spaced rows in a cold frame. Transplants will be ready for setting out in January and February. To have transplants of cabbage, broccoli, and other cool-season vegetables ready in time for spring planting, you must start very early in the year, which may not be practical. Transplants of these vegetables can be grown for the fall garden.

Sweet potato transplants (slips) are produced by planting potatoes in beds of sawdust or sand. Maintain the temperature in the bed close to 80 °F. Since disease problems can be carried on the mother roots and transmitted to the slips, it is better for gardeners to purchase their sweet potato slips or to use vine cuttings. Vine cuttings are made by cutting potato slips above the surface of the bedding material. The cuttings develop roots rapidly when planted in warm, moist garden soil.

Buying Transplants

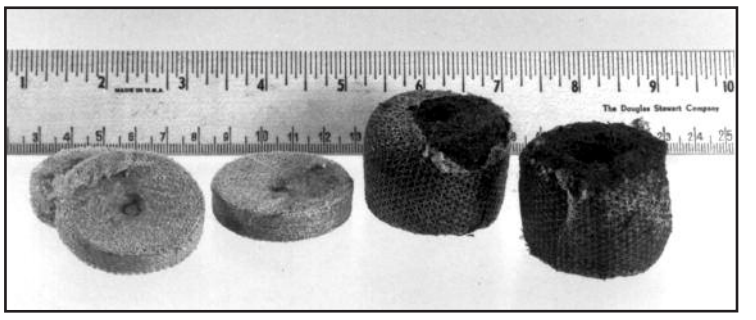
When buying vegetable transplants, select recommended varieties when possible. Plants with good roots that are healthy, stocky, medium-sized, and free of disease or insects are best. Avoid yellow, spindly, or oversized plants and those with spotted foliage, brown marks on the stems, or knots on the roots. Buy plants in containers (fiber pots or plastic tray packs) so that root systems are intact and protected. Bundles of bare root plants (cabbage, onions, broccoli, peppers, lettuce, and tomatoes) should be fresh, have a good green color, and have moist and healthy roots.

Transplanting to the Garden

Transplants of cucumbers, squash, and melons grown in small containers must be set in the garden while still quite young (cotyledons expanded and first leaf showing), about 3 weeks after planting the seeds.

If possible, set all vegetable transplants on a cloudy day or in the evening. Place peat pots and other fiber pots directly into the planting holes. Be sure to cover the upper edges of the pots with soil to prevent wicking the moisture out of the pots.

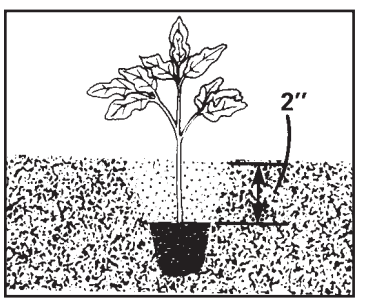
Plant tall transplants deeply, burying the stem to the first set of leaves.


Pictured are dry and expanded peat pellets.

Starter Solution. Starter solution is a dilute mix of a water soluble fertilizer high in phosphorus, such as 11-57-0. Used at the rate of 1 cup per plant, it stimulates root growth and helps plants get off to a fast start. Starter solution is prepared by dissolving 2 tablespoons of the dry fertilizer (11-57-0) per gallon of water or 3 pounds per 50 gallons.

Protection. Protect newly set plants from sun, cold, and wind. Homemade shelters include boxes, baskets, flower pots, and plastic milk containers. Commercial hotkaps of paper or plastic and devices containing water protect young, tender plants from frost. A wooden shingle stuck in the ground at a slant on the south side of a plant serves as a sunshade. A piece of newspaper or a paper grocery bag pinned down over a plant provides protection from the sun.

Wire tomato cages with the bottom 12 to 18 inches wrapped with clear plastic provide some protection to transplants from wind, cold, and blowing sand.



Place the top edge of the peat cup 2 inches below the soil level.

Tips

continued from page 8

to disease, and generally starves the plants for water and nutrients.

In the thinning process, try to save the strongest seedlings and remove excess plants with a hoe, rake, or your fingers. Where seedlings are very close together and pulling disturbs the roots of the remaining plants, pinch out or cut the excess plants. Seedlings of some vegetables, if carefully removed during thinning, can be transplanted and used to fill in empty places, to expand your planting, or be shared with other gardeners.

The temperature of the garden soil at planting time affects the rate at which seeds germinate or if they germinate at all. Most cool-season vegetable seeds germinate at a soil temperature of 60 °F, while most warm-season vegetable seeds germinate slowly at a soil temperature of 75 °F. The longer seeds are in the soil without germinating, the more they are subject to attack by diseases and insects.

Black plastic mulch is an effective way of raising the soil temperature to permit early planting of warm-season vegetables. (See Mulching on page 10.)

Other materials available to home gardeners are plastic row tunnels and floating row covers that permit early planting and provide some protection against cold. Plastic tunnels can be used in combination with black plastic mulch. Floating row covers made of a nonwoven polyester also provide early insect protection.

Mulching

A mulch is any material used to cover the surface of the garden soil to protect plant roots from heat, cold, or drought, to keep fruit clean, or to control weeds. Mulches help to make more attractive, higher yielding vegetable gardens.

A mulch in the garden changes the environment where the plants are growing, resulting in better plant growth and higher yields. If used improperly, a mulch can lower yields or result in plant death. When deciding to use a mulch, weigh the advantages against possible disadvantages, cost, and availability of a particular mulching material.

There are many types of mulching materials, but they can be divided into two general categories: natural and synthetic. Natural mulches are materials such as straw, hay, compost, composted bark, or pine needles. Synthetic mulches are plastics and papers.

Natural Mulches

Natural mulches consist of organic plant and/or animal residue or by-products. They are generally spread over the ground surface around established plants or over the entire growing area in a layer 2 to 5 inches deep. Composted sawdust, bark, wood shavings, leaves, grass clippings, rice hulls, ground corncobs, and animal manures may also be used. Pine needles, hay, and straw are light and airy; therefore, a 4- to 5-inch deep layer is needed for them to be effective.

Most natural mulches have some fertilizer value and are good soil conditioners when worked into the soil. They improve both the physical and chemical properties of soil. Organic matter incorporated into the soil improves water-holding capacity, nutrient availability, and aeration of the soil.

Some mulching materials, such as pine needles, peat, and oak leaves are acid in nature and lower the soil pH. Regular soil testing indicates the amount of lime necessary to make any soil pH adjustment.

Finely ground peat moss makes a poor mulch. It is easily blown around by wind and becomes almost water repellent when dry. Peat is best used to improve soil organic matter content, moisture holding capacity, and structure by mixing it with the soil.

Organic mulches are summer mulches, since most of their advantages are realized in hot weather. A summer mulch protects soil from compacting rains, foot traffic, drying winds, and heat. It also controls weeds by excluding light from germinating seeds and seedlings. Mulches prevent weed problems, thereby reducing competition for light, water, and nutrients. The resulting fewer cultivations mean less crop-damaging root pruning.

By reducing the loss of soil moisture, mulches lessen the frequency of necessary watering, and garden vegetables suffer less in dry periods. Organic mulches also increase the water absorption rate of soils. The reduced soil temperatures under organic mulches encourage root growth in the upper soil layer where there is more oxygen and fertilizer.

A mulch reduces soil erosion and the splattering of soil on vegetable leaves and fruit during rains or sprinkling. This can reduce losses to soil-borne diseases.

Apply organic mulches to warm-season vegetables when the soil has warmed sufficiently for good plant growth and when plants are established and large enough that they won't be covered. The soil should be weed-free, recently cultivated, and contain plenty of moisture. Mulching warm-season vegetables early in the growing season makes them susceptible to frost injury by preventing soil warming and by insulating plants from any warmth in the soil.

Organic mulches are beneficial when applied to cool-season vegetables like broccoli, cabbage, and English peas in midspring. They help to keep the soil from rapid warming and drying and can extend the growing and harvest periods.

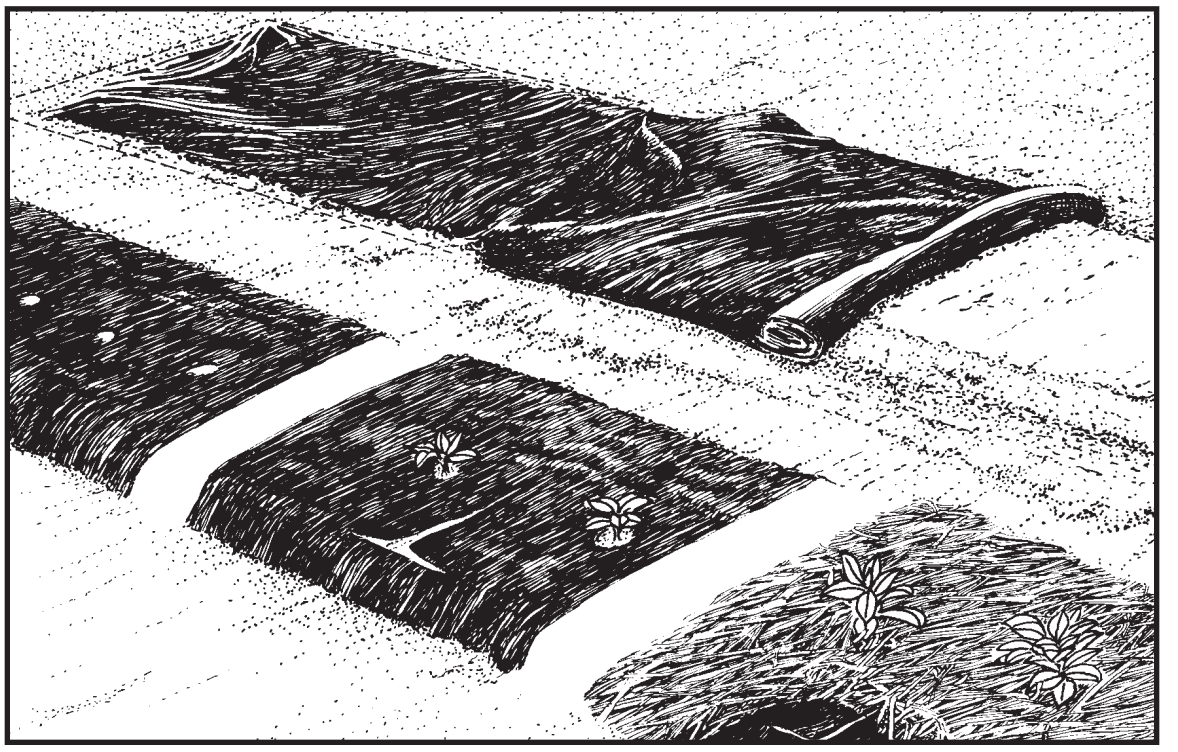
Some organic mulches require changes in methods of garden fertilization. Sawdust, wood shavings, and ground corncobs are low in nitrogen. As they decompose, nitrogen is drawn from the soil, causing a shortage of nitrogen in the mulched vegetables. To prevent this, add one-fourth pound 34-0-0 or its equivalent to each bushel of sawdust, shavings, or corncobs before applying mulch. When it is time to side-dress, pull the mulch back from plants and apply fertilizer to the soil surface. With sawdust, compost, or bark, apply fertilizer to the mulch surface and water it in.

Always remember that dry mulch may catch fire.

Synthetic Mulches

Plastic mulches are springtime mulches. They help warm the soil, permitting early planting; promote rapid growth; provide for early harvest; and provide weed control.

Plastic mulches reduce loss of soil moisture and protect vegetable plant fruit and leaves from soil-borne diseases. Black plastic is the most commonly used synthetic mulch. It is widely available, relatively inexpensive, and comes in various widths and lengths. Use plastic with a thickness of 1½ mils (.0015 inch).



To apply a plastic mulch, bury one end of the plastic and roll the other end over the row. Bury the edges and cover the ends so there are no exposed edges. Cut planting holes into the plastic at intervals. If you need to apply additional side-dress fertilizer or water after the mulch is down, apply it through the planting holes and upside-down "T" slits.

Use clear plastic mulch only when soil has been fumigated to kill weed seeds. Clear plastic warms soil more rapidly than black plastic, but weed seeds germinate under clear plastic.

Warm-season vegetables like cucumbers, melons, squash, tomatoes, peppers, and eggplant grow better and produce more when grown on black plastic mulch than when grown on bare soil. Transplants can be set through plastic mulch by cutting holes with a sharpened bulb planter. Use the same tool to plant seeds of widely spaced vegetables like squash and melons.

While frequently used with warm-season vegetables, plastic mulch can be used with cool-season vegetables like cabbage, broccoli, and cauliflower to promote early growth. Plastic mulch is not used with vegetables that are closely spaced in the rows.

Black plastic mulch can also be used with plastic row tunnels to promote early growth and harvest.

Applying Plastic

Prepare the soil completely before applying a plastic mulch. Incorporate all fertilizer and lime, remove all weeds and debris, and break up all large clods. Rake the soil to prepare a smooth, level surface. Make sure the soil contains a good supply of moisture before being covered. Plastic that is 3 to 4 feet wide is best for covering a standard garden row. Select a time to apply plastic mulch when there is little or no wind. Bury one end of the plastic and unroll it down the row. Get the plastic as straight as possible and in contact with the soil surface. Cover all edges to prevent wind problems.

If you have a small garden, use large sheets of black plastic to cover the whole area rather than covering individual rows. However, this has the disadvantage of excluding rain and sprinkler irrigation from the entire soil surface. Also, wet plastic is slippery, and working in the garden when there is dew on the plastic can be hazardous.

Soils lose less moisture from evaporation with plastic mulches, so you won't need to irrigate as often. In prolonged dry periods and with vegetables that are in the garden for a long time, supplemental water becomes necessary. The easiest way to irrigate with plastic mulch is to install a drip irrigation system, or lay soaker hoses on the surface of the rows before covering them with plastic.

Because a plastic mulch protects soil from leaching rain, the soil needs less fertilizer. When additional fertilizer is required, apply it through the planting holes and upside-down "T" slits cut at intervals into the plastic.

Although plastic warms the soil in spring, it can have disadvantages in summer. Excess heat can build up under the plastic, and high soil temperatures can injure plant roots and reduce yields. Rather than remove the plastic and lose the advantage of weed control, cover the plastic with pine needles, hay, or similar material to shade it where the crop foliage does not provide good cover.

You can spray black plastic mulch with a white latex paint after the mulch is installed or after an early crop to reduce the buildup of excess heat under the mulch. This will make it useful for summer and fall vegetables. The light-colored surface reflects much of the heat, and the other benefits of the mulch remain.

At the end of the season, remove the plastic because it will not decompose in the soil as organic mulches do.

Newspaper

Newspaper is an organic material, but as a manufactured product it may be thought of differently from other organic mulches. Newspaper makes a good mulch when you use a thickness of several sheets. Hold newspaper to the soil surface with soil, sticks, or coat hanger wires.

Some gardeners use a thin layer of pine needles to hold the newspaper down. Apply a newspaper mulch after plants are established. Like other organic mulches, newspaper decomposes rapidly and adds organic matter to the soil.

Insects – Identification and Control

The average home vegetable garden may contain more than a dozen different types of vegetable crops, and each of these crops may be attacked by several different species of insects. Being able to manage and control these insect pests is one of the keys to successful vegetable gardening.

Insect pests can damage vegetables in several different ways. Pests like tomato fruitworms, cowpea curculios, stink bugs, and pickleworms cause direct damage by feeding on the fruit. Pests like tobacco hornworms, which feed primarily on the leaves, or aphids, which suck sap from the plant, cause indirect damage. Even though the fruit is not damaged directly, the plant's ability to produce fruit can be reduced if it loses enough leaf area or sap. Pests like thrips and bean leaf beetles also can cause damage by transmitting plant diseases. In addition to the direct damage they cause, pests like corn earworms and cowpea curculios also contaminate food.

Even though there are many different species of insect and mite pests that can occur in home vegetable gardens, they do not usually all occur at one time, so you probably will not have to "spend the summer spraying bugs" in order to have a successful garden. There are many methods besides insecticide sprays that can manage insect populations and keep them from reaching levels where insecticide sprays are necessary. Many of these methods are passive, requiring relatively little effort from the gardener, and many are things that you will do anyway if you want to grow a vigorous, productive crop.

Sometimes insect pest populations will reach damaging levels and you will need to treat with insecticides. Apply these treatments only to the crop (or crops) being attacked. Rarely will you need to apply a broadcast treatment of insecticide to every crop in the garden. In fact, doing so can be counter-productive, causing pest problems that you otherwise would not have had. This is because unneeded insecticide treatments can destroy beneficial insects, allowing the pests that they were keeping in check to increase in numbers.

However, there are situations when repeated insecticide treatments may be needed to adequately protect certain crops. This is especially true when you are trying to produce a crop when pest populations are especially high (because of the time of year or planting location).

For example, yellow squash are very likely to experience heavy infestations of squash bugs and squash vine borers when grown in midsummer to fall. When grown in the same location year after year, southern peas are likely to experience heavy infestations of cowpea curculios if you do not apply timely insecticide treatments. Fall tomatoes normally experience heavy infestations of stink bugs and tomato fruitworms. There are many other examples, and experienced gardeners quickly learn which pests are especially troublesome in their area and when to expect these pests.

Common Garden Insect Pests

Insects damage plants by eating the foliage, boring in stems or roots, sucking plant juices, and attacking the fruit. The type of damage caused by a particular insect depends on the type of mouthparts the insect has. Pest insects can be classified as having one of two different types of mouthparts: sucking or chewing.

The following two sections briefly discuss some of the more common insect pests in these two groups. For more detailed information on insect management and control, see **Extension Publication 2347 Insect Pests of the Home Vegetable Garden**.

Sucking Insects

Insects that have sucking mouthparts inject saliva into plants and remove plant juices. The results of feeding may be on individual leaves and stems, or the whole plant may be affected, especially seedling plants. Sucking insects can deform fruit like peas and beans before the pod hardens. The following paragraphs describe examples of garden pests with sucking mouthparts.

Aphids or **plant lice** are soft-bodied insects that may be green, pink, black, or yellow. They remove the sap from leaves or stems, causing curled leaves and yellowish plants on many garden crops. They also can inject poisonous saliva or disease-causing organisms during feeding. Very large numbers of these insects can occur on cabbage, tomatoes, mustard, and peas. These insects secrete a sticky substance known as "honeydew," which supports the growth of black sooty mold fungi. Although sooty mold fungi do not invade the plant, heavy buildup of sooty mold is unsightly and can interfere with photosynthesis.

Harlequin cabbage bugs overwinter as adults in old cabbage stalks, bunches of grass, or other areas that give protection. They are black with brilliant red or yellow markings. They suck sap from cabbage, collards, mustard, and turnips, and cause the plants to wilt and die.

Stink bugs can be either brown or green. They give off an unpleasant odor when handled or crushed. Stink bugs are large, shield-shaped insects that may or may not have any distinguishing marks. They suck the sap from seeds in developing bean and pea pods, scarring the developing seed. In some cases, the punctured seed will not develop normally. The outside of the pod will be marked with a small, pimple-like structure at the puncture site.

Thrips are very small insects rarely more than one-sixteenth of an inch long. The insect is straw-colored with a pair of fringed wings. It damages plant leaves or flower buds by puncturing plant cells with its single, ice pick-like mouthpart and feeding on the escaping sap. The feeding causes the leaves to curl and have a silvery appearance. The shoots of infested onions take on the same silvery appearance. To check for thrips, place a handkerchief between the rows and slap the plants toward the handkerchief, or pull one or two plants and shake them over an empty box. If the insects are present, you will see them on the white background.

Whiteflies are small white insects commonly found on the underside of leaves. When infested plants are disturbed, the insects flutter about. Both adults and immatures are damaging. They feed by piercing the tissue and removing plant sap. Whiteflies can occur in great numbers on plants like eggplant and tomatoes. Early detection and complete plant coverage are important to control this pest.

Chewing Insects

Insects with chewing mouthparts cut holes in leaves and fruit, and bore into stems and fruit. The following paragraphs describe examples of garden pests with chewing mouthparts.

Ants are attracted to the garden for many reasons. Some feed on honeydew produced by aphids, some feed on decaying fruit, and some search for other insects. In many cases, ants are considered only a minor nuisance pest, but fire ants can inflict a painful sting. Control ants by controlling aphids, keeping fruit harvested, and using labeled fire ant baits around the perimeter of the garden (not *in* the garden).

Bean leaf beetles overwinter as adults in or near garden sites. They are ready to feed on young beans and southern peas as they emerge from the ground. Adult coloration and markings can vary, but they are typically reddish to yellowish with a black band around the edge of the first pair of wings. Sometimes, but not always, they may have three or four black spots on the back. However, there are numerous exceptions to this color pattern, and some specimens are red, solid tan, and even pink. You may overlook the beetles because they feed on the underside of the leaves. If disturbed, they will drop to the ground and hide. Adults eat small holes in the leaves. When treating for bean leaf beetles, be sure to apply insecticide to both the upper and lower leaf surfaces.

Blister beetles are gray, black, or striped slender beetles about three-fourths of an inch long. The adults eat the foliage of most garden crops, especially tomatoes.

Cabbageworms or **cabbage loopers** are pale green measuring worms with light stripes down their backs. Imported cabbageworms are velvety green. They make ragged holes on the undersides of leaves and bore into the heads of cabbage, collards, and related plants.

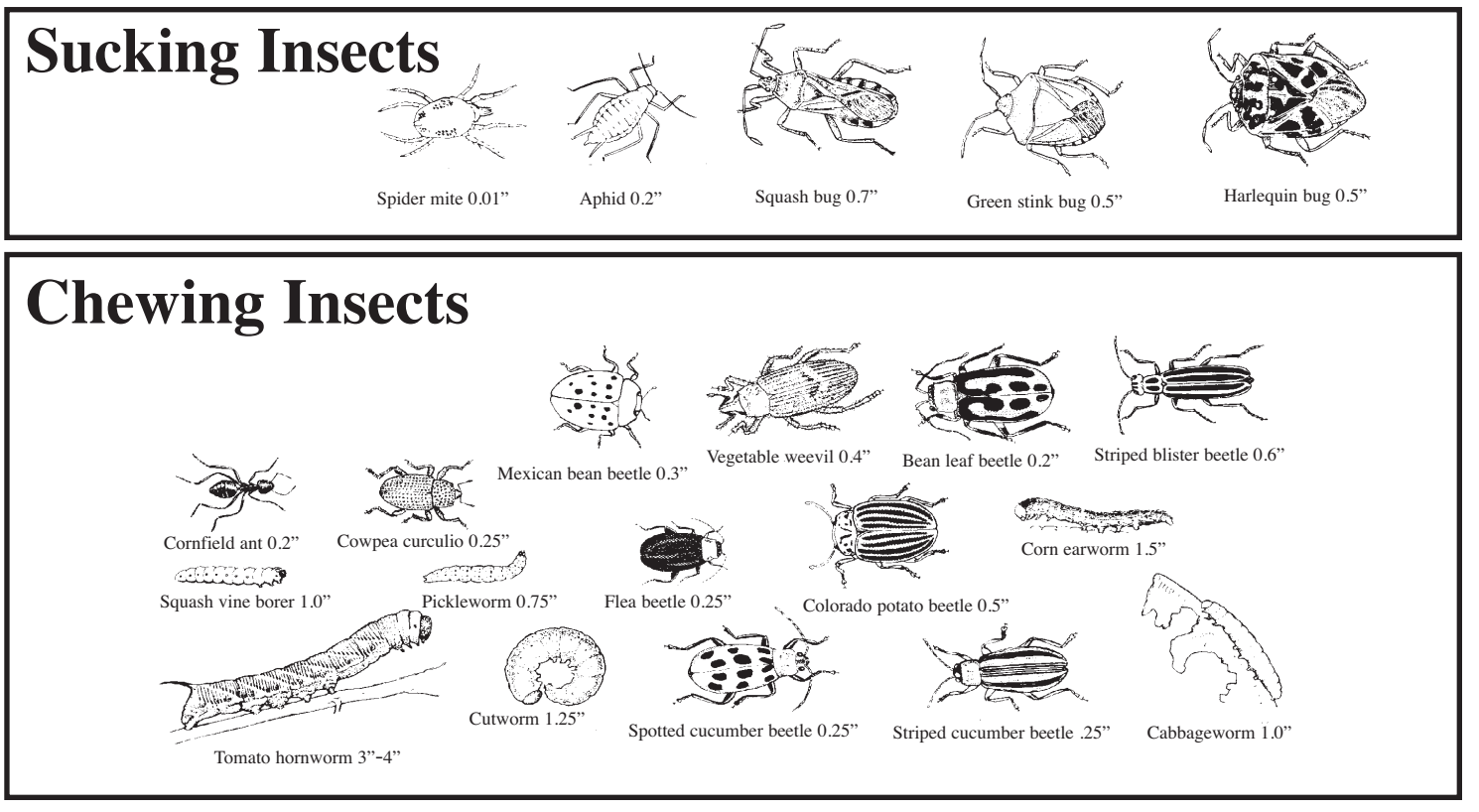
Corn earworms are green, pinkish, or brown with light stripes along their sides and on their backs. These worms reach a length of nearly 2 inches before they are ready to pupate. They attack corn at two different growth stages. In corn that has not tasseled, the worms will feed in the whorl, damaging new leaves as they form. Later, the adult moths are attracted to the new silks for egg laying. After hatching, the young larvae will burrow into the ear and feed on kernels near the tip of the ear. Many gardeners do not bother with trying to control this pest in corn, preferring instead to simply discard the damaged portion of infested ears. However, this insect will also attack tomatoes, and heavy infestations can cause severe injury to this crop.

For control of earworms in corn during the whorl stage, direct sprays into the whorl when you first note damage. To prevent damage to the ears, apply insecticide when silks first appear. Make spray applications 3 to 4 days apart until the silks are dry. Treat the ear area of the stalk thoroughly. To provide as much protection as possible for bees, make applications in early morning or late afternoon, and do not treat the tassel.

Cowpea curculio adults are secretive insects that are rarely seen. They are small and dark gray. The larva, a white legless grub, is the most damaging stage. It feeds on developing seeds within the pods of beans and peas and destroys their usefulness. To control cowpea curculios, apply a foliar spray when small pea pods first appear, and make a total of three applications at 5-day intervals.

Cutworm adults are dull-colored moths that are most active during the night. The worms are dull gray, brown, or black and may be striped or

See Insects, page 14



Insecticides for the Home Vegetable Garden

This section provides general information about commonly used garden insecticides. See the Insecticides for Home Vegetable Gardens table for specific pest/insecticide recommendations.

Use insecticides safely! Before using any insecticide, always be sure to read the label carefully and follow all label directions regarding personal protection equipment and instructions for mixing and applying the product. The label is the law, and the use directions it specifies are designed for the safety of the applicator, the environment, and those using the area. Handle insecticides with the respect they deserve. They are poisons, and excessive exposure can result in acute and/or chronic health problems.

Be sure the insecticide is labeled for use on the vegetable being treated. Few insecticides are labeled for use on every vegetable crop grown in the garden. Before applying an insecticide to a particular crop, be sure to read the label and verify that the product is labeled for use on that crop.

Observe and follow the pre-harvest interval. The pre-harvest interval, or PHI, is the amount of time that must elapse between making an insecticide application and harvesting the crop. PHIs vary greatly depending on the insecticide being used and the particular vegetable crop being treated. For example, the PHI for carbaryl (Sevin) is 3 days on tomatoes, 7 days on Irish potatoes, and 14 days on turnips. Failure to observe PHIs can result in consumption of excessive insecticide residues.

Specific Insecticides

(* indicates insecticides that are suitable for use in organic gardens.)

Carbaryl is most commonly sold under the brand name Sevin. This product has been a standard for insect control in the home vegetable garden for many years. It is effective against a wide range of pests and is labeled for use on most vegetables. It is especially useful against many beetles. However, this product does have a tendency to flare spider mites when used excessively.

Malathion is another long-time standard insecticide for home vegetable gardens. Like carbaryl, it controls a wide range of pests and is labeled for most vegetables. It is especially useful for control of aphids, "bugs," and certain beetles.

Bt kurstaki*: *Bacillus thuringiensis* is a bacteria that produces compounds that are toxic to certain insect species. There are different species and strains of this bacteria that produce different toxins. ***Bt kurstaki*** produces a compound that is toxic to certain caterpillars but has no effect on other insect species. Thuricide is one of the more common brand names for this product. It is most effective against leaf-feeding caterpillars like loopers and diamondback moths.

Spinosad* is a relatively new microbial insecticide that is very effective against a number of different caterpillar pests. Two commonly available brand names that are labeled for use on many different vegetable crops are Green Light Spinosad Lawn and Garden Spray and Fertilome Bore, Bagworm, Leafminer, and Tent Caterpillar Spray. Spinosad is very effective against most caterpillar pests, but it is not effective against most other types of insects. However, it is also effective against thrips, leaf miners, and Colorado potato beetles. It is acceptable to use certain formulations of spinosad in organic gardens.

Insecticidal soaps* are potassium salts of fatty acids. They control insects that they contact by disrupting cell membranes. They are most effective against soft-bodied pests like aphids, mites, and thrips. Thorough coverage of the pest is necessary in order to achieve control. Insecticidal soaps have a short pre-harvest interval and are labeled for use on most vegetables. Safer Insecticidal Soap is an example of one brand name.

Neem oil* is a botanical product that is primarily useful against aphids, mites, and whiteflies. It is labeled for use on most vegetables and is sold under several brand names (Monterey 70% Neem Oil is one example). Thorough coverage of the pest is necessary in order to obtain control.

Azadirachtin* is an organic product labeled for use on all vegetables, with a 0-day PHI. Azatrol is the brand name most often used by home gardeners, but several other commercial formulations are available. Azadirachtin has activity against a wide range of insect pests but is most useful against soft-bodied sucking pests, such as whiteflies and aphids. Although azadirachtin and neem oil both come from the seed of the neem tree, they are not the same product.

Pyrethrin* or pyrethrum is a botanical insecticide that is used primarily by organic gardeners. This insecticide provides rapid knockdown of most insects, but insects often recover. Piperonyl butoxide (PBO) often is mixed with pyrethrin to act as a synergist. This increases the overall effectiveness and helps prevent pests from recovering, but piperonyl butoxide is not acceptable for organic gardening. Pyrethrin or pyrethrin + PBO is active against a wide range of insects, is labeled for use on most vegetables, and has a very short pre-harvest interval. However, its efficacy is limited by its very short residual activity.

Acetamiprid has only recently been labeled for use in home vegetable gardens. It is especially effective against whiteflies and aphids and is labeled for control of many other pests. Ortho Max Flower, Fruit, and Vegetable Insect Killer is one common brand name. This product is sold as a ready-to-use spray and as a concentrate.

Pyrethroids are a group of relatively new synthetic insecticides that are modeled after the botanical pyrethrum molecule. These products are effective against a wide range of insect pests and are used at very low rates. The following pyrethroid insecticides are currently labeled for use in the home vegetable garden.

1. **Permethrin** is one of the most useful insecticides for home vegetable gardeners. It can be used on a wide range of crops and controls a broad spectrum of pests. It also has shorter preharvest intervals than most other pyrethroid insecticides. Permethrin is readily available in most farm and garden stores and is sold under many different brand names (Bonide Eight Insect Control Concentrate, Hi-Yield Garden, Pet & Livestock Insect Control, and Martin's Vegetables Plus are three examples). Permethrin is effective against many beetle, bug, and caterpillar pests, but it is not effective against whiteflies and spider mites.

2. **Bifenthrin** is an especially useful pyrethroid on crops for which it is labeled, but bifenthrin is not labeled for all vegetable crops. Ortho Bug B Gon Insect Killer for Lawns and Gardens is a commonly available brand name. Bifenthrin is somewhat less likely than other pyrethroids to trigger outbreaks of spider mites and aphids.

3. Lambda **cyhalothrin** is one of the newer pyrethroid insecticides (Spectracide Triazicide Insect Killer for Lawns and Landscapes is the most common brand name). It is very effective against a number of different insect pests, but it

See Insecticides, page 14

Insecticides for Home Vegetable Gardens

Crop	Pest	Insecticide (PHI)*
Tomatoes	tomato fruitworm tobacco hornworm	bifenthrin (1), carbaryl (3), cyhalothrin (5), esfenvalerate (1), malathion (1), permethrin (1), pyrethrins (0), spinosad (1)
	looper	*Bt kurstaki* (0), spinosad (1)
	stink bug leaf-footed bug	bifenthrin (1), carbaryl (3), bifenthrin (1), cyhalothrin (5), malathion (1), permethrin (1), pyrethrins (0)
	spider mite	insecticidal soap (1), neem oil (NA)
	thrips	bifenthrin (1), carbaryl (3), bifenthrin (1), cyhalothrin (5), esfenvalerate (1), malathion (1), permethrin (1), pyrethrins (0), spinosad (1)
	whitefly	azadirachtin (0), acetamiprid (7), insecticidal soap (1), neem oil (NA), insecticidal oil (see label)
	leafminer	spinosad (1)
	aphid	azadirachtin (0), acetamiprid (7), insecticidal soap (1), neem oil (NA), malathion (1)
Peppers	aphid	azadirachtin (0), acetamiprid (7), insecticidal soap (1), neem oil (NA), malathion (3)
	leafminer	spinosad (1)
	flea beetle	bifenthrin (7), carbaryl (0), permethrin (3)
	European corn borer	esfenvalerate (7), permethrin (3), spinosad (1)
	thrips	malathion (3), esfenvalerate (7), permethrin (3), spinosad (1)
	spider mite	insecticidal soap (1), neem oil (NA)
	pepper weevil	malathion (3), permethrin (3)
Eggplant	flea beetle	bifenthrin (7), carbaryl (3), malathion (3), permethrin (3)
	Colorado potato beetle tortoise beetle	bifenthrin (7), carbaryl (3), permethrin (3), spinosad (1)
Okra	aphid	acetamiprid (7), azadirachtin (0), insecticidal soap (1), neem oil (NA), malathion (1)
	stink bug leaf-footed bug	bifenthrin (7), malathion (1), pyrethrins (0)
	corn earworm	bifenthrin (7), spinosad (1)
	looper other caterpillars	*Bt kurstaki* (0), spinosad (1)
Corn	cutworm	bifenthrin (1), carbaryl (2), esfenvalerate (1), permethrin (1)
	chinch bug stink bug	bifenthrin (1), carbaryl (2), esfenvalerate (1), malathion (5), permethrin (1)
	corn earworm fall armyworm European corn borer	bifenthrin (1), carbaryl (2), esfenvalerate (1), malathion (5), permethrin (1), pyrethrins (0), spinosad (1)
Squash, Pumpkins	squash bug	acetamiprid (0), bifenthrin (3), carbaryl (3), esfenvalerate (3), malathion (squash-1; pumpkins-3), permethrin (1), pyrethrins (0)
	squash vine borer	acetamiprid (0), bifenthrin (3), esfenvalerate (3), permethrin (1)
	pickleworm	bifenthrin (3), carbaryl (3), esfenvalerate (3), permethrin (1)
	cucumber beetle	bifenthrin (3), carbaryl (3), esfenvalerate (3), malathion (squash-1; pumpkins-3), permethrin (1)
	spider mite	insecticidal soap (1), neem oil (NA)

Insecticides for Home Vegetable Gardens

Crop	Pest	Insecticide (PHI)*
Melons	thrips	bifenthrin (3), esfenvalerate (3), permethrin (1), spinosad (3)
	cucumber beetle flea beetle	bifenthrin (3), esfenvalerate (3), carbaryl (3), malathion (1), permethrin (1)
	leafminer	spinosad (3)
	looper	spinosad (3), *Bt kurstaki* (0)
	pickleworm melonworm	bifenthrin (3), esfenvalerate (3), permethrin (1), spinosad (3), carbaryl (3)
	whitefly	azadirachtin (0), insecticidal soap (1), neem oil (NA)
	spider mite	insecticidal soap (1), neem oil (NA)
Beans (lima beans, snap beans, pole beans)	aphid	acetamiprid (7), azadirachtin (0), malathion (1), insecticidal soap (1), neem oil (NA)
	spider mite	insecticidal soap (1), neem oil (NA)
	bean leaf beetle cucumber beetle Mexican bean beetle	bifenthrin (3), esfenvalerate (3), carbaryl (3), malathion (3), bifenthrin (3)
	cowpea curculio	esfenvalerate (3), carbaryl (3), bifenthrin (3)
	corn earworm lima bean pod borer other caterpillars	bifenthrin (3), esfenvalerate (3), spinosad (3)
	leaf miner	spinosad (3)
	stink bug plant bug	malathion (1), carbaryl (3), pyrethrins (0), bifenthrin (3)
Southern Peas (cowpeas, field peas, black-eyed peas, crowder peas)	aphid	acetamiprid (7), azadirachtin (0), malathion (3), insecticidal soap (1), neem oil (NA)
	spider mite	insecticidal soap (1), neem oil (NA)
	bean leaf beetle cucumber beetle Mexican bean beetle	carbaryl (3), malathion (3), bifenthrin (3)
	cowpea curculio	carbaryl (3), bifenthrin (3)
	corn earworm lima bean pod borer other caterpillars	spinosad (3), bifenthrin (3)
	stink bug plant bug	malathion (3), carbaryl (3), pyrethrin (0), bifenthrin (3)
Sweet potatoes	armyworm looper	spinosad (7)
	flea beetle cucumber beetle tortoise beetle	carbaryl (7), permethrin (7)
	sweet potato weevil	carbaryl (7) Stored sweet potatoes may be treated with phosmet (Imidan dust) according to label.
Irish potatoes	Colorado potato beetle	acetamiprid (7), spinosad (7), carbaryl (7), permethrin (7)
	blister beetle flea beetle	carbaryl (7), permethrin (7)
	potato tuberworm	spinosad (7), permethrin (7)
	leaf miner	spinosad (7)
Peas (English peas, sweet peas, snow peas)	aphid	acetamiprid (7), azadirachtin (0), malathion (3), insecticidal soap (1), neem oil (NA)
	thrips	malathion (3), spinosad (3)
Peas (English peas, sweet peas, snow peas) (cont.)	caterpillar	spinosad (3), *Bt kurstaki* (0)
	leaf miner	spinosad (3)
Onions	onion thrips	malathion (3), cyhalothrin (14), insecticidal soap (1)
Turnips	aphid	azadirachtin (0), malathion (7), insecticidal soap (1), neem oil (NA)
	vegetable weevil yellowmargined leaf beetle flea beetle	malathion (7), carbaryl (14), spinosad (1)
	looper diamondback moth	*Bt kurstaki* (0), spinosad (1)
Collards	aphid	azadirachtin (0), malathion (7), insecticidal soap (1), neem oil (NA), acetamiprid (7)
	looper diamondback moth	*Bt kurstaki* (0), spinosad (1)
	harlequin bug stink bug	malathion (7), carbaryl (14), permethrin (1)
Mustard	aphid	malathion (7), insecticidal soap (1), neem oil (NA)
	looper diamondback moth	*Bt kurstaki* (0), spinosad (1)
	vegetable weevil yellowmargined leaf beetle	malathion (7), carbaryl (14)
Spinach	aphid	azadirachtin (0), malathion (7), insecticidal soap (1), neem oil (NA)
	leafminer	spinosad (1)
	looper other caterpillars	*Bt kurstaki* (0), spinosad (1)
Cabbage	aphid thrips	acetamiprid (7), malathion (7), insecticidal soap (1), neem oil (NA)
	looper diamondback moth cabbageworm	*Bt kurstaki* (0), spinosad (1)
	harlequin bug stink bug	carbaryl (3), cyhalothrin (1), malathion (7), bifenthrin (3), permethrin (1)
Brocolli, Cauliflower	aphid	acetamiprid (7), malathion (broccoli-3; cauliflower-7), insecticidal soap (1), neem oil (NA)
	looper diamondback moth other caterpillars	*Bt kurstaki* (0), spinosad (1)
	harlequin bug stink bug	carbaryl (3), cyhalothrin (1), malathion (broccoli-3; cauliflower-7), bifenthrin (7), permethrin (1)
Brussels sprouts	aphid	acetamiprid (7), malathion (7), insecticidal soap (1), neem oil (NA)
	looper diamondback moth other caterpillars	*Bt kurstaki* (0), spinosad (1)
	harlequin bug stink bug	carbaryl (3), cyhalothrin (1), malathion (7), permethrin (1)
Lettuce	aphid	azadirachtin (0), malathion (head lettuce-7; leaf lettuce-14), insecticidal soap (1), neem oil (NA)
	caterpillar	*Bt kurstaki* (0), spinosad (1)

*The numbers in parentheses indicate the pre-harvest interval (PHI), or the number of days that must elapse between treatment and harvest. **Always verify PHIs on the label of the insecticide being used.**

Insects

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spotted. Cutworms feed at night and remain hidden during the day. They damage stands by cutting young plants at the soil line. Control cutworms by using aluminum foil or wax paper collars to protect young transplants. You can also use sprays containing permethrin to control cutworms and/or prevent injury.

Fall armyworm adults are dull-colored, night-flying moths. They usually do not appear in our area until the first part of June. Larvae will vary in color from light tan or green to nearly black, with yellowish lines down their sides. The larvae feed primarily on corn but will sometimes feed on peas, tomatoes, and beans. They infest the whorls of corn and can be found 1 to 2 inches deep in the whorl. It is difficult to get insecticides to the target; direct sprays into the whorls.

Flea beetles are small with enlarged hind legs. They jump vigorously when disturbed. These beetles eat tiny round or irregular holes out of leaves. The leaves often look as if they had been peppered with very fine soot. The beetles attack cabbage, eggplant, peppers, potatoes, spinach, sweet potatoes, tomatoes, turnips, and related crops.

Mexican bean beetles are short, yellow to coppery-brown beetles with a curved shape. When the insects are at rest, 16 black spots are visible on their backs. Good coverage of upper and lower leaf surfaces will help control this insect.

The **pickleworm** and **melonworm** are similar in appearance but vary in their feeding habits. The pickleworm often enters the fruit from the ground side, causing the inside of the fruit to sour after air enters. It also tunnels in the vines. The melonworm rarely enters the vine. It feeds on the foliage more than the pickleworm. When mature, both worms are about three-fourths of an inch long and range from whitish to green. Damaging populations are more likely to develop on late-planted crops. Start control procedures when young caterpillars are in and around blooms.

Seed maggots are small, white to dirty-white fly larvae. Seed attacked by this insect usually fail to germinate, or plants are weak and stunted. Infestations are usually most severe during wet, cool springs and on ground that is high in organic matter. If these conditions are present, delay planting until conditions are right for good germination and growth.

Serpentine leaf miner adults are tiny flies. Their maggots feed on the tissue between the upper and lower surfaces of leaves, causing slender, white, winding trails through the interiors of the leaves. They can severely damage beans, cucumbers, peas, squash, tomatoes, and other vegetables.

Squash vine borer adults are distinctly colored, wasp-like moths. The front wings are covered with metallic, olive-brown scales; the hind wings are transparent. The abdomen is ringed with red, black, and copper. Eggs are placed on leaves and stalks. Small larvae will bore into the plant from these locations, causing the runner to wilt eventually. As with all borers, this insect is difficult to control once it enters the plant because insecticides cannot reach the feeding site. Infestations are more common on pumpkins and late-planted squash, and weekly insecticide treatments are often required to protect these crops. Apply in late afternoon to protect bees.

Cucumber beetles, striped or spotted, damage several garden vegetables. Some of these are cucumbers, muskmelons, squash, and to a lesser extent, beans and peas. The spotted cucumber beetle (SCB) is more of a problem on these latter vegetables than is the striped. They feed on leaves, tender stems, and in some cases, the root system. The larvae of the SCB damage seedling corn and are known as the southern corn rootworm. Use foliar sprays of carbaryl or other recommended insecticides to control adults.

Tobacco hornworm adults are large moths that feed on the nectar of various plants. They do not damage any portion of the plant, but the larvae can eat large amounts of foliage quickly, and larvae will occasionally feed on fruit. This worm is green with diagonal white lines located along the sides and a prominent horn at the tail. These insects are found on tomatoes, eggplant, peppers, and related plants.

Slugs are not insects. However, they can be annoying. These pests leave a trail of thick, sticky material over plant parts that will appear as a silver trail when dry. They feed on young foliage and low-lying fruit like strawberries. Slugs rest in moist, shaded areas during the day and become active at night. To control slugs, use methaldehyde on iron phosphate baits according to label directions. Be sure not to contaminate edible parts of plants. Trapping can be effective. Place wet burlap bags in your garden late in the afternoon. The next morning, look under the bags for slugs and destroy any you find.

Noninsecticidal Insect Management Methods

For every insect pest, there are many different species of predators and parasites that feed on that pest and help keep its population in check. If it were not for these naturally occurring predators and parasites, our gardens would be overrun with insect pests. You, as a gardener, must recognize the importance of this natural control and avoid disrupting it when possible.

Without question, naturally occuring **biological control** is the single most important method of controlling insect pests.

By their very nature, insecticide treatments are disruptive to biological control because they kill beneficial insects, as well as the pests. This is why you should avoid unnecessary insecticide treatments. Destroying naturally occurring beneficial insects can actually cause pest populations to increase.

However, do not allow a fear of disrupting natural control to keep you from making insecticide applications when they are needed. In the Southern garden, there will be times when pest populations escape natural control and reach damaging levels. Prompt, judicious use of insecticides can control pest populations and help prevent crop damage.

When selecting insecticide treatments, keep in mind that some insecticides are more disruptive of natural control than others. For example, Bt products control only caterpillar pests and are harmless to most beneficial insects, while broad-spectrum insecticides like permethrin are more disruptive. Still, there are times when you will need to use one of the broad-spectrum treatments to obtain control of a particular pest or pest complex.

There are many **cultural control practices** that can make plants more or less vulnerable to insect attack and/or injury. Healthy, vigorous plants are generally more resistant and more tolerant to damage by insect pests. Consequently, practices that promote good growth and plant health also aid in insect management.

Because many species of insect pests complete several generations per growing season, with populations increasing substantially with each generation, early-planted crops often experience lower insect pressure than late-planted crops. This is especially important with crops like sweet corn, summer squash, and tomatoes.

Many insect pests also reproduce on alternate weed hosts and overmature vegetable plants that are left in the garden. So good sanitation practices, including weed control and prompt removal of plants that have ceased to produce, will help reduce insect populations.

Some varieties of a vegetable are less vulnerable to insect damage than other varieties of the same vegetable. So variety selection also can be an important insect management consideration. These are just a few general examples of how cultural control practices can influence insect populations.

"Hand-picking and foot-stomping" is one type of **mechanical control** that home gardeners can use successfully. In small plantings, you can control insects by physically removing individual insects or egg masses. Physically washing aphids from plant terminals with spray from a garden hose is another form of mechanical control.

You might also use floating row covers, which prevent insects from being able to attack or deposit eggs on young plants. Collars of wax paper or aluminum foil can protect young transplants from attack by cutworms.

Reflective mulches are another useful mechanical control for certain pests. These are especially effective in preventing thrips from attacking young tomato and pepper plants and spreading virus diseases, particularly tomato spotted wilt virus.

Using plastic mulches instead of organic mulches helps reduce populations of certain pests because the plastic mulch provides less favorable shelter for pests like crickets and slugs. Commercially available pheromone traps or sticky traps also can help you control or monitor certain pest species.

Insecticides

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is labeled for use only on a very few vegetable crops.

4. **Esfenvalerate** is one of the older pyrethroid insecticides. It is labeled for use on a number of different vegetable crops and controls a wide range of insect pests. Monterey Bug Buster II is one common brand name.

Applying Insecticides in Home Vegetable Gardens

You can choose from several different methods of applying insecticides to vegetables in your home garden. Liquid sprays, dusts, and ready-to-use sprays are three of the most common methods.

Dusts—A few insecticides are available for use as ready-to-use dust formulations (5% Sevin Dust and 0.25% permethrin are two examples). Dusts normally are applied using a shaker can—often the container the insecticide comes in is modified so it can be used as a shaker can—or a hand-powered, pump-type duster. Dusts have the advantage of being relatively convenient to apply, but they are generally less effective than sprays. It is also difficult to achieve thorough, uniform coverage with dusts, especially when using the shaker-can method of application. Also, many people consider dusts to be unsightly.

Ready-to-use sprays—Several insecticides are sold as ready-to-use, or RTU, sprays that are labeled for use in the home garden. Permethrin, carbaryl, cyhalothrin, cyfluthrin, and neem oil are examples of active ingredients that are sold as RTUs. These products come in hand-pump spray bottles in which the product has already been diluted to its final-use strength. These RTU treatments are a very convenient way to apply spot treatments to individual plants. However, they are too costly to use on a large scale.

Single-nozzle hand-pump sprayers—Single nozzle hand-pump sprayers are the most common method of applying insecticides in the home garden. They come in sizes ranging from 1 quart to 5 gallons, with 1 gallon being the most common size. They can be used to apply liquid concentrate, wettable powder, or wettable granule insecticides according to label directions. Here is an example of the directions that might appear on the label of a liquid concentrate: "Mix 1 tablespoon/gallon of water and spray to runoff, taking care to direct spray to undersides of leaves."

Hand-pump sprayers are powered by pumping air into the headspace over the insecticide mixture. This compressed air then forces the insecticide spray through the nozzle when the spray valve is opened. Most hand sprayers have a nozzle that can be used to adjust the coarseness or fineness of the spray droplets. Be sure to thoroughly rinse the sprayer after each use.

To avoid disappointing crop injury, it is strongly recommended that insecticides not be applied with a sprayer that has previously been used to apply herbicide. It is best to dedicate one sprayer specifically for herbicide use and another for applying insecticides and fungicides. Label each sprayer clearly.

Caution!

1. Be sure to read and follow all label directions.

2. Note and observe the pre-harvest interval (PHI).

3. Store insecticides in a safe, secure place where children cannot get to them.

4. If you spill any of the insecticide on your body, wash with soapy water immediately. Wash all exposed skin after dusting or spraying.

5. Wash all food before preparing or eating.

Vegetable Diseases

Garden vegetables can be attacked by a wide range of fungi, bacteria, viruses, and nematodes. Since no single control measure is effective against all diseases caused by these microscopic pests, gardeners must rely on a well-balanced defense to keep diseases in check.

One of the first steps in setting up a disease control program is correct identification of disease problems—the earlier the better. With quick action, you can control leaf spots, blights, and mildews within the same season. Other disease problems may not be treatable this season, but correct disease identification allows you to take preventive disease control measures next year.

Many garden vegetable diseases are easy to identify. Others may need the advice of someone more experienced, such as an Extension county agent, home economist, or plant pathologist. Disease is best identified on plants that are less than 50 percent damaged. Do not use dead plants.

Common vegetable disease symptoms and recommended control measures are provided below. If you cannot identify a disease problem from these descriptions, call, write, or visit your county Extension staff for assistance.

To have a plant pathologist diagnose a diseased specimen, wrap the specimen in newspaper, paper towel, or (preferably) waxed paper. Pack it in a box or carton and ship it immediately to **Extension Plant Pathology Lab, P. O. Box 9655, Mississippi State, MS 39762.**

Additional information on diseases and nematodes that attack garden vegetables is available at your county Extension office.

Diseases take their toll in Mississippi gardens every year, but adequate planning and following recommended disease controls will keep losses to a minimum.

Specific Diseases and Control Measures

Damping-Off (seedling disease)—Seeds of many vegetables are susceptible to damping-off fungi when planted in infested soils. The seeds may fail to germinate, or seedlings may be attacked before or after emergence and turn brown, shrink, and finally die. Control measures include these: plant fungicide-treated seeds in well-drained areas; do not apply excessive amounts of nitrate forms of nitrogen fertilizers; and rotate the location of the vegetables.

Root Rot of Beans and Southern Peas—Root rot is severe on green beans, lima beans, and southern peas. The disease first appears as reddish or reddish-brown areas on stems and roots. As the disease advances, discolored areas spread until the entire root and lower stem are affected. Aboveground symptoms include stunting, yellowing, drooping of leaves, failure to produce normal pods, and death.

These control practices reduce losses from root rot:

- Use high-quality seeds treated with a fungicide like Arasan.
- In-furrow fungicides (Terraclor) help control root rot. Apply one-fourth of the material in the open furrow and the remainder in the covering soil during planting.
- During cultivation, do not throw soil against plant stems.
- Plant in a 4- or 5-year rotation with other vegetables.
- Plant in well-prepared soils with a pH of about 6.5, fertilized according to a soil test and treated for nematodes if recommended. Plant seeds 1 inch deep only during favorable weather, in warm soils, and on top of a bed to avoid "drowning."

Early Blight of Tomatoes—Early blight is a major disease of tomatoes in Mississippi. Symptoms first appear on lower, older leaves as circular, dark brown to black spots that often contain rings, giving a "target board" effect. As the disease progresses, leaves turn yellow, wither, and drop off. Frequently, only the upper half of the plant has green leaves, and in severe cases, the plant becomes completely defoliated.

Early Blight – Tomato

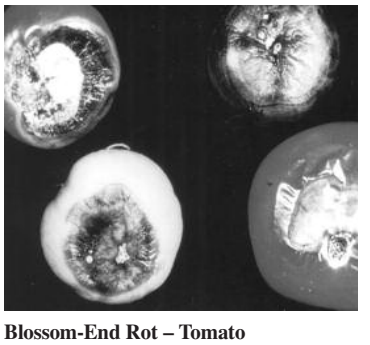
Early blight also occurs on plant stems and sometimes on fruit. On seedlings, the disease may girdle the stem and give the appearance of damping-off.

Reduce losses to early blight by providing good ventilation in plant beds and watering when leaves have time to dry. Seed treatment with Thiram aids in controlling the damping-off stage. Do not set tomato plants where early blight occurred the year before, and remove and destroy all diseased plant debris in the garden after harvest.

Applications of chlorothalonil or mancozeb effectively control this disease. There is no waiting period after application until harvest for Bordeaux mixture or chlorothalonil, but there is a 5-day waiting period for mancozeb.

Begin applying when plants are 8 to 10 inches tall, and continue at 7-day intervals through the growing season. Applications of these fungicides also control some of the other leaf, stem, and fruit diseases of tomatoes.

Blossom-End Rot of Tomatoes—Blossom-end rot occurs on the tomato fruit. It may also be a problem on peppers, squash, and watermelons. It is more common on fruit that is one-third to one-half grown and occurs on the blossom end of the fruit. It begins as a small, water-soaked spot that develops into a dark brown, leathery spot that may involve half the fruit. The surface of the spot shrinks and becomes flat or sunken.



Blossom-End Rot – Tomato

Blossom-end rot is caused by a lack of calcium in the developing fruit. The uptake of calcium from the soil by the tomato plant can be reduced by fluctuations in soil moisture—either excessively wet soil or excessively dry soil. The disease commonly occurs when plants are grown rapidly and luxuriantly early in the season and are then subjected to prolonged dry weather. Because of drying conditions, the disease may be more serious on the windward side of a garden and on staked tomatoes than on unstaked or bushy plants.

Prevent blossom-end rot by maintaining a soil pH around 6.5, irrigating and mulching to maintain uniform soil moisture, and avoiding heavy applications of nitrogen. Control blossom-end rot by spraying with 4 tablespoons of 96 percent calcium chloride per gallon of water at 7- to 10-day intervals for four applications. Begin spraying with first appearance of symptoms. Overdosing plants with calcium chloride may result in leaf burn. Calcium chloride is suggested only for tomatoes.

Spotted Wilt of Tomatoes and Peppers—This viral disease is transmitted by several species of thrips and may kill plants or drastically reduce fruit-set. Fruits from diseased plants are generally small and distorted. Tomatoes develop irregular yellowish blotches.

Spotted Wilt

Initial symptoms appear as thickening of veins on younger foliage. Younger foliage generally exhibits a pronounced downward curling. Internodes become shortened, and immature fruit does not ripen. Dark purple streaks can occur on leaves, stems, and fruits. Other symptoms are blighting and blackening of young shoots. On individual leaflets, small, dark, circular dead spots may appear. Badly spotted leaves may turn dark and wither.

Some varieties are now being released with resistance. Check with your seed source. It is not clear how effective or long-lived these resistant cultivars will be.

Try these control practices:

- Remove and destroy diseased plants.
- Keep weed populations down in and around gardens to reduce movment of virus-carrying thrips from weeds to garden plants.
- Suppress thrips by applying approved insecticides (Malathion 50 or Diazinon 25 EC at 2 teaspoons per gallon).
- Further suppress thrips with shiny mulch materials around tomatoes and other susceptible vegetables. Apparently, light reflection from the mulch surface repels thrips and reduces the chances of virus transmission. Conventional black plastic may be sprayed or hand painted with aluminum-colored paint. Oil-based paints adhere to plastic surfaces and may be easily applied. This technique gives best results when mulch is laid down at the time of planting and used in combination with other recommended control procedures.

Southern Blight—Southern blight affects most garden vegetables. The fungus that causes southern blight attacks plant parts (roots, stems, leaves, or fruit) that are in contact with or just under the soil surface.

Southern Stem Blight

The first visible symptoms are usually an advancing yellowing and wilting of the foliage, beginning with the lower leaves. During warm, moist weather, a white fungus growth may appear on the lower stem near the soil surface and on organic debris in the soil. Later, light tan to dark brown mustard seed-like bodies called sclerotia develop in the mold. As the disease advances, several plants next to one another in the row die.

Southern blight is difficult to control, but you can reduce losses with these practices:

- Plow 6 inches deep in the fall to bury organic debris and the sclerotia.
- Avoid throwing soil on the plants when cultivating.
- Where a few scattered plants are affected, remove them from the garden along with the soil 6 inches deep and 6 inches from the stem.
- Control foliar diseases, since dead leaves on the ground may trigger infection. Also control weeds early in the season for the same reason.
- Wrap transplant stems with a 4- by 4-inch strip of aluminum foil and plant so that 2 inches of wrapped stems are below and 2 inches are above the soil.

Stem Anthracnose of Lima Beans—Stem anthracnose is the most common disease of lima beans. The first stages of infection appear on pods as small, brick-red blotches. These blotches may spread over the entire surface of the pods. Later, the diseased areas become brownish to grayish and may have many tiny black specks which are fruiting bodies of the fungus. Occasionally, diseased pods fall from the plant.

Stem Anthracnose – Lima Bean

A brick-red streaking may occur along the veins on the under side of leaves and on young stems.

Reddish spots occur on the lower leaf surface and enlarge and become noticeable on the upper leaf surface. Occasionally, leaves are killed and fall from the plant. Severely diseased plants are yellow and stunted.

Reduce damage from stem anthracnose by following these practices:

- Because stem anthracnose can be carried over on seed to the next free, western-grown seed.
- Never plant lima beans in the same location more than once in 3 years.
- Avoid fall planting of lima beans in an area of the garden where stem anthracnose was a problem the previous spring.
- Apply Bordeaux mixture or another copper-based fungicide on a 7-day schedule, beginning at full bloom.

Mosaic—This virus disease commonly infects beans, sweet corn, squash, melons, cucumbers, peas, peppers, and tomatoes. Symptoms include the following:

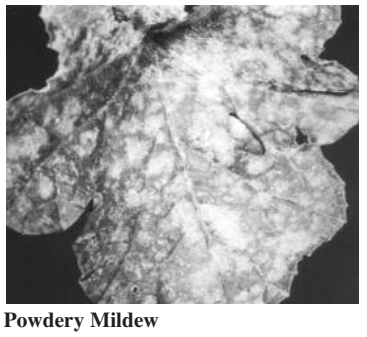
Continued on next page

Mosiac – Southern Pea

- Misshapen leaves with light and dark green areas.
- Fruit with green specks, yellow and green mottling, or bumps.
- Distorted fruit.
- Overall stunted plants. Control of virus diseases is difficult. Reduce chances of mosaic in these ways:
  - Plant resistant varieties when available.
  - Control insects.
  - Eliminate weeds.
  - Remove diseased plants as they appear.
  - Purchase certified transplants or buy western-grown seed.
  - Do not use tobacco products when handling plants.

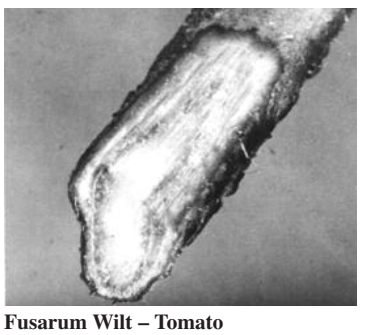
Phenoxy herbicide damage (such as 2,4-D) resembles symptoms of mosaic disease. Leaves and stems are typically twisted, deformed, curled, leathery, and excessively long and narrow. Apply herbicides carefully and correctly in and around the garden.

Powdery Mildew—Powdery mildew is caused by a fungus that commonly occurs as a white, powdery growth on leaves of cucumbers, squash, melons, beans, and English peas. Benomyl and chlorothalonil effectively control powdery mildew on vine crops, and sulfur provides control on beans and peas.



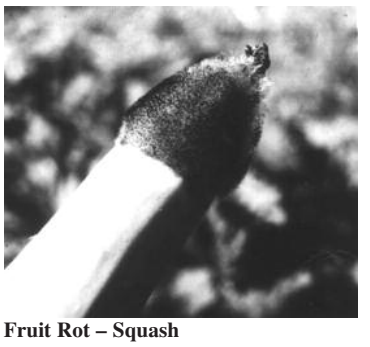
Powdery Mildew

Fusarium Wilt—This fungal disease often infects watermelons, cabbage, tomatoes, sweet potatoes, beans, and peas. Lower leaves often turn yellow on one side of the plant only. Two brownish streaks that originate from the roots are exposed when the stems are split lengthwise. Infected plants are usually stunted and wilted. The best way to control fusarium wilt is using resistant varieties.



Fusarum Wilt – Tomato

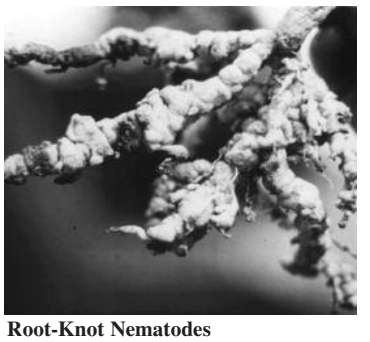
Fruit Rot—Bacteria and fungi often infect fruit, resulting in soft, slimy fruit with an offensive odor. You can reduce the occurrence of fruit rot by staking, mulching, avoiding mechanical injury to fruits, controlling insects, following a regular fungicide program, and removing mature fruit from the garden.



Fruit Rot – Squash

Rust—This fungus disease occurs commonly on beans and sweet corn as reddish-brown spots on leaves that rub off when touched. Apply fungicides like chlorothalonil or sprayable sulfur at the first sign of disease and at weekly intervals thereafter until the disease is under control.

Nematode Diseases—Nematodes are slender, tiny, worm-like animals that feed on plant roots, stems, and leaves. Nematodes cannot ordinarily be seen with the naked eye and go unnoticed until plants become unthrifty and stunted. They seldom kill plants; however, they can reduce quality and yields of many vegetables, such as beans, beets, carrots, cucumbers, lima beans, okra, peas, squash, tomatoes, and watermelons.



Root-Knot Nematodes

Nematode injury to roots reduces uptake of water and nutrients from the soil. Typical aboveground symptoms are general stunting, yellowing, loss of vigor, and overall decline. The most common underground symptom in gardens is root-knot galling.

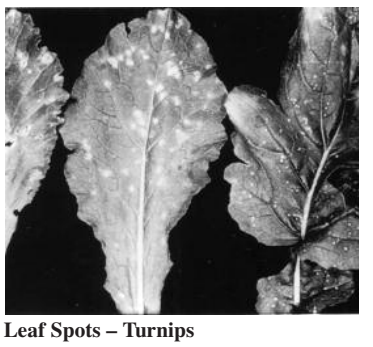
Nematodes other than the root-knot nematode also can cause severe plant damage. Some of the less obvious symptoms are stubby roots, tiny lesions, excessively branched roots, or complete loss of secondary roots.

The best time to determine if you have a nematode problem is during the fall when nematodes are most active. To detect root-knot nematodes in the growing season, observe the galled roots. Have your soil tested for nematodes by sending a soil sample to the Extension Plant Pathology Lab, P. O. Box 9655, Mississippi State, MS 39762.

Once you know nematodes are present, you can use certain cultural practices to help reduce nematode populations. These include setting nematode-free transplants, rotating crops, fallowing, practicing good sanitation, controlling weeds, and planting resistant varieties. Vegetable varieties having resistance or tolerance to root-knot nematodes are marked in the list of recommended varieties starting on page 22. In addition, you can plant marigolds in gardens to help reduce nematode populations.

As an alternative to chemical treatment, solarization can reduce parasitic nematode populations. Solarization is the use of heat from the sun for killing nematodes in the soil prior to planting. To use solarization, place clear plastic (1 to 1.5 ml thick) on moist, tilled soil, and seal the edges with soil, bricks, or other materials. Apply the plastic in May or June. Leave it in place for at least 8 weeks. Remove the plastic in August in time to establish a fall garden, if desired. If not, remove it before cold weather begins.

Leaf Spots—Leaf spots, caused by fungi or bacteria, commonly occur on many vegetables. They appear on leaves and sometimes stems as distinct, dark-colored or tan spots one-sixteenth to 1 inch in diameter. The regular application of a fungicide generally provides acceptable control of fungal leaf spots. Applying copper fungicides helps control bacterial as well as fungal leaf spots.



Leaf Spots – Turnips

Bacterial Wilt of Cucumbers—This destructive disease is caused by a bacterium that overwinters in the bodies of adult striped and spotted cucumber beetles. As these beetles feed on young plants in the spring, bacteria are introduced into the vascular system. Here they are able to multiply rapidly and produce a sticky material that stops movement of moisture through the plant. As a result, leaves on an infected runner wilt rapidly, and within a short time all runners become permanently wilted. Plants can die within a week or two after initial symptoms appear. Yellowing is not normally associated with this disease.

A symptom of bacterial wilt is a thick, white, sticky substance that oozes from the cut stem of a wilted vine. If you press your fingertip against the cut surface several minutes after cutting and then slowly remove it, the bacterial ooze frequently remains attached and strings out in thin threads.

Since bacterial wilt-resistant cucumber varieties are not commonly available, the best control is to keep cucumber beetle populations in check. A rigid spray schedule with recommended insecticides (refer to the Insect Control section on page 11) should reduce the incidence of bacterial wilt.

Black Rot of Cabbage—This disease attacks cabbage and other crucifer crops like collards, mustard, cauliflower, Brussels sprouts, kohlrabi, rutabagas, kale, and rape. Black rot may affect plants at any stage of growth but usually is most prominent close to maturity. On older plants, yellow wedge-shaped areas appear at leaf margins and expand toward the center. Blackened veins are apparent in affected areas. Vascular tissue within the stem also may become discolored.

Black rot causes head dwarfing, and soft rot frequently develops on affected heads.

Practices important for controlling black rot include these:

- Use disease-free seeds that have been hot-water treated. This is the most effective treatment for ridding seeds of the causal bacteria.
- Purchase transplants that have been certified as disease-free.
- Rotate in the field so that at least 2 years, and preferably 3, elapse between cruciferous crops.

Yeast Spot of Lima Beans—Gray-brown sunken lesions on young or nearly mature seeds is a good indication of this disease. Yeast spot is more a problem in seasons when southern green stink bug populations are high because the yeast fungus enters seeds through pod punctures this insect makes. The spots, or lesions, develop within 2 to 3 days of inoculation. Bright, sunny days allow the stink bug to move from one plant to another, spreading the disease.

Yeast spot is best controlled by following a good insect control program to discourage build-up of stink bugs.

Precaution:
Because of possible changes in pesticide recommendations, you must follow all label instructions.

Fungicides for Disease Control

Vegetable	Chlorothalonil	Copper	Sulfur	Mancozeb or Maneb
Beans, Lima				
Beans, Snap	7			
Beets				
Broccoli	0			See label
Brussels Sprouts	0			See label
Cabbage	0			See label
Carrots	0			
Cauliflower	0			See label
Collards				
Corn, Sweet	14			7
Cucumbers	0	Cleared for use on most vegetables; no time limitations.	Cleared for use on most vegetables; no time limitations.	See label
Eggplant				See label
Endive				See label
Lettuce				See label
Melons	0			See label
Mustard Greens				
Okra				
Onions	14			See label
Peas, Southern				
Peppers				
Potatoes, Irish	0			0
Potatoes, Sweet				
Pumpkins	0			See label
Radishes				
Spinach				
Squash	0			See label
Tomatoes	0			5
Turnips	0			

Check label to determine that the fungicide is cleared for use on the intended crop.
Numbers indicate the number of days that must pass from last application to harvest.
Blank spaces indicate the fungicide is not cleared for use on that crop.

Watering

Vegetable gardens usually need about 1 inch of water (630 gallons per 1,000 square feet) per week in the form of rain or irrigation during the growing season. Gardens in sandy soil may need as much as 2 inches of water per week in midsummer. Where a water source is located close to the garden, there are few excuses (a local ban on watering during a shortage) for letting the garden suffer in dry weather.

Mulches that slow soil surface evaporation can reduce the amount of water needed. Soaker hoses and drip or trickle irrigation systems wet only the soil in the root zone and can cut in half the amount of water used.

Adequate soil moisture is important for seed germination, uniform growth, and productivity. The most critical periods for adequate moisture are during seed germination, early growth, flower and fruit development, and root enlargement of root crops, and immediately following transplanting.

Where a water source is not close to the garden, it is possible to water some plants with a little work. Partially bury 1-gallon plastic milk jugs between tomato, pepper, eggplant, squash, and other widely spaced plants. Punch a few small holes near the bottoms of the jugs before placing them in the soil. Fill the jugs periodically with water hauled to the garden. The water will slowly seep into the soil, providing moisture to the root zone. Periodically place 1 to 2 tablespoons of fertilizer in the jugs to stimulate plant growth.

Sprinklers

There are several choices of garden sprinklers, ranging from the simple garden hose with a spray nozzle to semi-automatic equipment. Many portable lawn sprinklers are adequate for the garden. Adjust the rate of water application so that it is not faster than it can enter the soil. Water applied too rapidly runs off, resulting in erosion or puddles, and causing soil compaction.

Place the sprinkler so plants do not interfere with the pattern of application. This often means mounting the sprinkler above the tops of the plants where wind may affect the distribution pattern. Small cans placed throughout the garden can be used to measure the amount of water applied and show the overlap necessary to approach an even application of water.

Since overhead sprinklers wet plant leaves, water early enough in the day to allow time for leaves to dry before night. This helps keep leaf diseases from developing and spreading. Each watering should wet the top 3 to 5 inches of soil. Frequent light waterings result in shallow rooting, susceptibility to damage by drought, and plants that are easily blown over.

Drip and Trickle

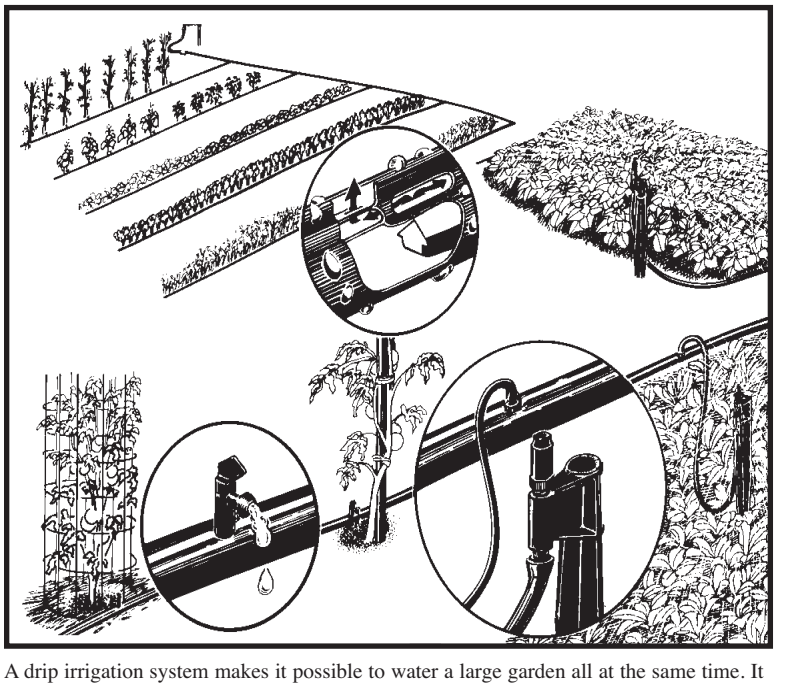
Soaker or perforated plastic hoses are excellent for watering the garden. Place the hose with holes up along one side of the plants or underneath an organic or plastic mulch.

A number of different drip and trickle irrigation systems are available online and through mail-order catalogs, magazine ads, and local distributors. These systems usually consist of a supply line that connects to a garden hose and delivery tubes that are placed next to the plants. A 150-mesh filter is recommended to prevent clogging small pores and emitters. The systems operate at low pressure and deliver small amounts of water very slowly through pores in the delivery tubes or emitters punched into the delivery tubes.

An irrigation system makes it possible to water a large garden all at the same time. You also are able to harvest, cultivate, spray, and do other garden chores while watering. The largest disadvantage of a drip system is the initial cost.

Advantages include these:

- Reduces water use by one-half or more.
- Water is placed where it is needed: at the base of plants and not in walkways.
- Permits working in the garden while watering.
- Keeps plant leaves dry.



A drip irrigation system makes it possible to water a large garden all at the same time. It also allows you to harvest, cultivate, spray, and do other garden chores while watering. The major disadvantage of a drip system is the initial cost.

Correct use of a drip irrigation system should keep vegetable plants actively growing in dry periods yet cause no problem when rain occurs following irrigation. The system, when properly operated, keeps soil at the base of the plant (root zone area) moist. This may require operating the system for short periods three or four times a week during dry weather. Never allow the soil to dry completely. Drip irrigation, when used correctly, prevents drought stress but is not designed to correct drought stress like sprinkler irrigation, which wets all the soil.

Single drip lines will not adequately water wide-row or raised-bed gardens, but several spray heads are available that do a good job in these special types of gardens when fitted to the drip irrigation delivery tube.

Planting Vegetables

Vegetable seeds and transplants are available from many sources. See pages 22-30 for suitable varieties. After selecting the varieties to plant, check local sources to see if the varieties are available.

It is important to locate seeds early, especially if you are going to grow some of your own transplants for the spring garden. You can order new varieties that are not available locally from mail order seed catalogs. Check the Planting Guide on page 7 for amounts of seed to buy. It is important to a garden's success that the seed is fresh and packaged for the current year. Home-saved vegetable seeds and those carried over from the previous year may give disappointing results. Since most of the new varieties are hybrids, do not attempt to save seed from one year's crop to plant the next year. Also, because some diseases are carried on seeds, home-saved seeds may continue to cause a disease problem in your garden. The only vegetable seeds that gardeners should save are those of varieties that have been in the family for many years and have become heirloom varieties.

Once the garden is completely planned on paper, the land prepared, and the seed on hand, the job of planting begins.

Planting is not a "one shot" operation. There are different times for planting different vegetables. Vegetables may be grouped in the garden plan and planted according to their hardiness and temperature requirements. Lettuce and English peas are cool-season vegetables and grow best in cool weather. Okra and southern peas are warm-weather vegetables and need warm temperatures for best growth.

Cool-season vegetables differ from warm-season vegetables in that they are hardy or frost-tolerant, seeds germinate at cool soil temperatures, and root systems are shallow and require frequent irrigation. Cool-season plants are smaller, respond more to nitrogen fertilizer, and are generally more tolerant of shade than warm-season vegetable plants.

Before-You-Plant Practices

Site selection. To reduce chances of damping-off, root rot, and other problems associated with wet soils, choose a well-drained site. If such a site is not available, plant on raised beds to promote drainage and faster warming of the soil. Keep surface water from flowing across the garden to help prevent disease-causing organisms from coming into the garden from outside areas.

Sanitation. Since many disease-causing organisms live through the winter in old plants, plow under crop debris at least 6 inches deep as soon as possible.

Tobacco mosaic virus, a common problem on tomatoes and peppers, can be transmitted through tobacco products. Wash your hands with soap and water before working in the garden if you use tobacco.

Disease-free seed. Weather conditions in Mississippi favor the development of many seed-borne diseases. Therefore, buy certified seeds produced in the western United States where the climate is dry and the seeds are relatively free of disease-causing microorganisms.

Seed treatment. Most seeds are treated with a fungicide, as indicated by their red, blue, purple, or green color. If they have not been treated with a fungicide, treat them yourself.

Treat large seeds in a jar. To treat small seeds, tear off one corner of the seed packet. Lift out as much of the seed treatment fungicide (Thiram or Captan) as is held on the tip of the blade of a penknife, and insert the dust through the hole in the seed packet. Fold down the corner of the packet and shake thoroughly.

DO NOT eat treated seed or feed it to livestock.

Healthy transplants. Select healthy, vigorous plants for transplanting. Buy them from a reputable dealer or grow your own.

Crop rotation. An easy and economical way to reduce soil-borne diseases is to rotate vegetables. Corn and members of the cabbage family can be alternated with other vegetables from one year to the next. If space permits, move the garden to a new location every 3 to 4 years, preferably to a site that was in grass.

Resistant varieties. Make every effort to buy disease-resistant varieties. Consult the list of recommended varieties, seed catalog variety descriptions, or your county Extension office for help in selecting varieties that are disease resistant.

Fertilization. Use fertilizer according to recommendations based on a soil test. Fertilizers do not prevent diseases, but a healthy, well-fertilized plant is less susceptible to disease than one growing in soil lacking required nutrients.

Plant spacing. Crowding plants allows moisture from dew or rain to remain on leaf surfaces. You should avoid this because it promotes disease development.

After-Planting Controls

Spraying. Control diseases like rust, mildew, anthracnose, and leaf spot with a foliar fungicide. Sprayers and dusters are available for this purpose. A spray is generally more effective than a dust.

Successful disease control with fungicides depends on these factors:

- Apply early to prevent early-season infection and rapid spread of disease.
- Select the proper fungicide because not all fungicides control the same disease.
- Cover all foliage thoroughly.
- Repeat application.

Suggested fungicides include chlorothalonil and other products listed in the Fungicides for Disease Control table on page 16. These fungicides are usually applied at rates ranging from 1 to 2 tablespoons per gallon of water. Refer to labels for recommended rates for specific vegetables and diseases controlled on those crops.

Some gardeners prefer to prepare their own fungicide. Bordeaux is an example of a fungicide that can be easily prepared by combining copper sulfate (blue stone), lime, and water. Directions for making Bordeaux mixture are available at **http://msucares.com/newsletters/pests/infobytes/19990915.htm.**

Weed control. Weeds can harbor disease-causing organisms. A weedy garden also reduces air movement and sunlight, which creates conditions favorable to disease development.

Insect control. Insects feeding and laying eggs cause wounds on roots, stems, and fruits. These wounds let

See Planting, page 30

Weed Control

Weeds (plants growing out of place) are a serious garden problem. They rob vegetable plants of sunlight, water, and nutrients. They also provide hiding places for insects and serve as a source of vegetable diseases.

Weeds can kill a gardener's enthusiasm, which can cause them to abandon the garden in midsummer. It is important to control weeds while they are small and before they get out of control.

Since any plant growing out of place can be considered a weed, a sweet corn plant (from a carelessly dropped seed) growing in a row of bush snap beans is technically a weed; but the most common garden weeds are crabgrass, yellow and purple nutsedge, morningglories, bermudagrass, and pigweed.

Most weeds can be controlled and kept from becoming serious problems in the garden. Methods of control include hand-pulling, cultivation, mulching, and use of chemicals.

Hand-Pulling

Hand-pulling is not an effective way to control weeds in a large garden, but it can be effective under certain circumstances. Hand-pull weeds that appear in the row with vegetable plants, as well as those that grow in the planting holes of a plastic mulch.

Weeds that grow between closely spaced rows of vegetables in wide rows, raised beds, or small gardens also may require hand-pulling. Weeds growing in containers used for vegetables should be hand-pulled. Extremely small weeds are difficult to pull by hand, but do not wait until the weeds get so large that pulling them destroys adjacent vegetable plants. Thinning seedlings spaced too closely together and hand-weeding frequently can be done at the same time.

Cultivation

Cultivation is the most widely used method of garden weed control. It is not a one-time chore, for with each rain, irrigation, and stirring of the soil, weed seedlings emerge.

A variety of hand and power equipment is used for cultivation, but the most commonly used tools are the hoe and garden tiller.

A sharpened hoe blade is an excellent tool for cutting the roots of weeds. The severed plants dry in the sun and die.

A garden tiller and other soil-disturbing tools, the hoe included, are used to disturb the soil around the weed plant's roots. On a hot day, the weeds die when their roots dry and the plants are unable to get water. Small weeds die more quickly than large weeds, so cultivation should be frequent enough to prevent weed seedlings from becoming established. Cultivation should also be shallow so you do not disturb or injure vegetable plant roots.

Deep cultivation, in addition to destroying weeds, injures vegetable plant roots and brings more weed seeds to the surface, where they germinate. "Hoe blight," the wilting and death of vegetable plants after cultivation, often results from careless cultivation.

Take a perennial weed, such as bermudagrass, out of the garden following cultivation because pieces of the plant that have no roots can form roots and make the bermudagrass problem worse.

Mulching

Mulching is an effective way to control garden weeds. Natural and plastic mulches properly applied to weed-free garden soil prevent most weeds from becoming established in the mulched area. Bermudagrass and nutsedge are difficult to control completely with mulches. Weeds that appear in the planting holes of plastic mulch should be pulled by hand.

Herbicides

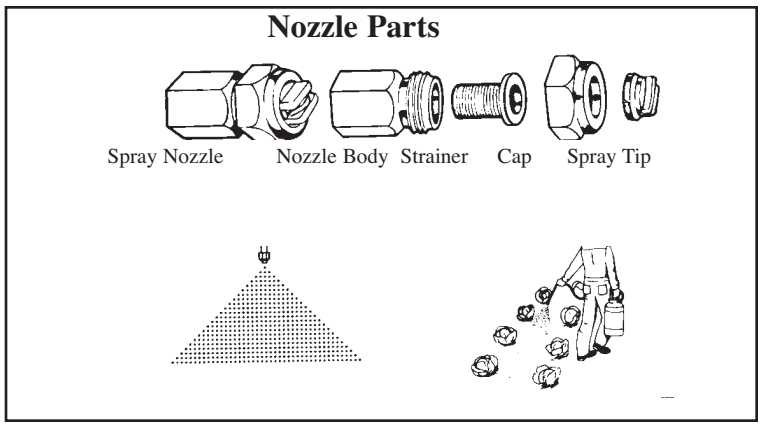
Commercial vegetable growers have a fairly wide choice of chemical weed killers (herbicides) to prevent or control weed problems. Gardeners, however, have a much smaller choice of herbicides.

Don't expect to control all weeds in a garden of mixed vegetables with one herbicide. First, no single herbicide controls all weeds. Secondly, some vegetables are also sensitive to the herbicide, and if the wrong herbicide is used, the vegetable is injured along with the weeds.

Herbicides applied to the soil before vegetables are planted and before weeds have emerged are called preemergence herbicides. Some preemergence herbicides can be applied immediately after the vegetable seeds or plants are planted but before the weed seeds germinate. Postemergence herbicides are applied after weeds have emerged.

Herbicides used in the garden may be in the form of granules, wettable powders, or liquids. The equipment needed for application depends on the formulation used. Use a pump-up pressure sprayer for applying liquids and wettable powders. Since most garden sprayers are equipped with a cone-type nozzle, use a 50-mesh screen and a 8003 E or equivalent fan nozzle attached to the sprayer for applying herbicides.

Chemical herbicides used in the vegetable garden can be washed from the sprayer, but some of those used on the lawn cannot. Therefore, a wise gardener will keep two sprayers: one for lawn herbicides and the other for garden herbicides. When spraying herbicides approved for application over the tops of vegetable plants, do not use a sprayer that has been used with lawn herbicides.



Before using a herbicide in your garden, read the product label for a listing of vegetables it can be used on, the recommended rate of application, and the method of application. Never use a product that is not labeled, and do not exceed the recommended rate.

Dacthal—Several brand names are available. Dacthal can be used on a wide variety of vegetable plants. Applied correctly, Dacthal gives good control of most grasses and a few broadleaf weeds. This herbicide controls weeds as their seeds germinate. Therefore, before applying Dacthal, remove existing weed plants.

Trifluralin—Several brand names are available. Trifluralin is a preemergence herbicide used to control grass problems in the garden. Some planning of the garden to group trifluralin-labeled vegetables in one area is helpful when you use this herbicide. To obtain good weed control, mix trifluralin with garden soil. Cultivate soil to eliminate clods. Broadcast the recommended amount of either the granules or the liquid formulation. Granules are easier for most gardeners to use. After application, mix the herbicide in the top 2 inches of the soil. Two very shallow cultivations provide good mixing with the soil. Trifluralin is labeled for use before planting seeds of several vegetables and before setting transplants of others. Read the package label for a list of approved vegetables.

Poast is a postemergence herbicide that selectively controls grass weeds in several vegetables. Apply Poast to most grasses before plants reach 8 inches high. One application controls most annual grasses, but several applications may be required to control perennial grasses like bermudagrass. Mix a crop oil concentrate in the spray solution before application. Read the Poast label for specific instructions and approved vegetable crops.

Glyphosate—Formulations of this popular nonselective, postemergence herbicide are approved for limited use in the vegetable garden site. Most applications are for eliminating existing weed problems before vegetable seedling emergence and before vegetable plants are in the garden. Read the label for specific application instructions and limitations.

Herb Gardening

Herbs are a special group of plants used for flavoring and scents. Many herbs used in flavoring foods and teas (culinary herbs) can be grown in Mississippi gardens. Most herbs should be grown in full sun, but a few tolerate light shade. They prefer a well-drained soil of medium fertility with a pH of 6.0 to 7.0. An organic mulch in summer benefits the plants.

Herbs that can be grown in Mississippi are annuals that are planted every year, biennials that are planted in the fall and flower the following year, hardy perennials that come back year after year, and tender perennials that may survive a mild winter but often need to be treated as annuals or protected from freezing temperatures.

You can start most popular herbs from seeds. Many of the perennial herbs are propagated by stem cutting, layering, or crown divisions. Annual, and some perennial, herb plants are sold at nursery and garden centers, and seeds and plants are offered by many mail-order catalog companies.

Because herbs are used in very small amounts, just a few plants of each type may be enough. If you want a large quantity of a particular herb, such as sweet basil for making pesto, plant the herb in the vegetable garden. Otherwise, prepare a small area especially for herbs so that they can be enjoyed for their appearance as well as fragrance.

Herbs have few pests, which is good because there are few if any pesticides approved for use on these plants. When planting herbs in the vegetable garden, protect them from pesticides used on vegetables.

Grow herbs started from containers so they can be set in the garden without disturbing the roots. Borage and dill are two herbs that do not transplant well if bare-root. Either scatter seeds in the garden where these herbs are to grow, or start plants in containers.

The flavors and scents of herbs are caused by oils in the plant tissue. High fertilization, excess moisture, and shade result in low oil content and weak flavor. The oil content in many herbs is at its highest just before the plants begin to flower.

Herbs and Their Characteristics

Anise—annual grown for its licorice-flavored leaves and seeds; slow growing; difficult to transplant bare-root.

Basil—annual grown for its leaves; available in several different flavors and plant types; easily gown from seed; purple leaf types make attractive vinegar.

Sweet Bay—tender perennial, evergreen shrub; source of bay leaf; requires cool greenhouse protection in winter; frequently grown as a container plant; start with a nursery-grown plant.

Bergamont—perennial, also known as bee balm; grown for minty leaves; attractive flowers attract bees and hummingbirds; start from crown division or seeds.

Borage—annual grown for cucumber-flavored leaves and attractive small, blue flowers; attracts bees; makes a large, unruly plant; difficult to transplant bare-root.

Salad Burnet—perennial grown for cucumber-flavored leaves; grow from seed or crown division.

Catnip—perennial grown for leaves; a mint; grow from seed, cuttings, or division.

Chamomile—perennial grown as annual; flowers used for tea; grow from seed.

Garlic Chives—grown for leaves with light garlic flavor and scent; grow from seed or division; attractive white flowers sew many seed; self-seeds prolifically.

Onion Chives—perennial grown for onion-flavored leaves; attractive purple flowers; grow from seed or division.

Coriander—annual; grow from seed; fresh green leaves known as cilantro and Chinese parsley; also grown for seeds.

Costmary—perennial; known as bible leaf; grown for minty scented leaves; grow from seed or division.

Dill—annual grown for seed heads and leaves; prefers cool weather; grow in spring and fall; doesn't transplant well bare-root; scatter seeds where plants are to grow or use container-grown plants.

Garlic—perennial grown for dry bulb; plant garlic cloves in October and harvest bulbs in May and June.

Scented Geraniums—tender perennials; available in many different scents: rose, peppermint, lemon, lime, orange, strawberry, apple, almond, mint; variety of foliage forms available;

See Herbs, page 19

Fall Gardening

Fall gardening is the way to have fresh vegetables right into winter. Many fall gardens are carried over from summer gardens. Tomato plants, okra, peppers, and eggplant, if cared for during the summer, continue to produce until cold slows them down and frost kills them.

To keep these vegetables producing, control insects and diseases, keep the plants watered and fertilized, and don't let the garden grow up in grass and weeds. A good fall garden, however, is not just keeping the summer garden alive. It means planting new vegetables to produce in fall and early winter.

Plan the fall garden at the same time you plan the spring and summer garden. Include your seed needs for fall when ordering seeds for the spring and summer garden. It helps to have the seeds on hand so you can plant them at the appropriate time.

Many cool-weather vegetables normally planted in spring grow and produce better in the fall, since they mature as the weather cools. When wet weather causes a delay in planting early spring vegetables (past a time when they can be expected to mature before hot weather destroys them), a fall garden provides a second opportunity. Chinese cabbage (very sensitive to heat) and rutabagas (require a long period of cool weather) are two cool-weather vegetables recommended for planting only in the fall.

Warm-season vegetables planted in midsummer for fall harvest require additional time to mature as the weather cools in September and October. Choose planting dates in midsummer that allow these vegetables to mature before frost.

The map at right provides the median dates of the first freezes (temperatures equal to or lower than 32 ºF) in the fall.

Young Plants

The hot, dry weather in July, August, and September is hard on germinating seeds and young seedlings. Germination and seedling survival is improved if one of these methods is used:

- Water a day or two before planting so seeds are planted in moist soil. Watering after planting can cause the soil surface to pack and crust.
- Plant seeds in moist soil and cover with moistened, non-crusting materials: a mix of peat moss and vermiculite or composted sawdust and sand. Keep the surface moist during germination and seedling establishment.

Plant three to five seeds of the small-seeded vegetables like broccoli and cabbage at the recommended final plant spacing in the garden row. Once the seedlings are established, thin the seedlings to one plant at each location.

Transplants

Start vegetable transplants for the fall garden in individual containers, such as peat pots, small clay or plastic pots, or peat pellets. Setting out plants without disturbing the root systems reduces transplant shock.

Protect young plants from the sun for a few days. You can use bare-root transplants from thinning the seedling row, but be prepared to provide water and shade until they become established.

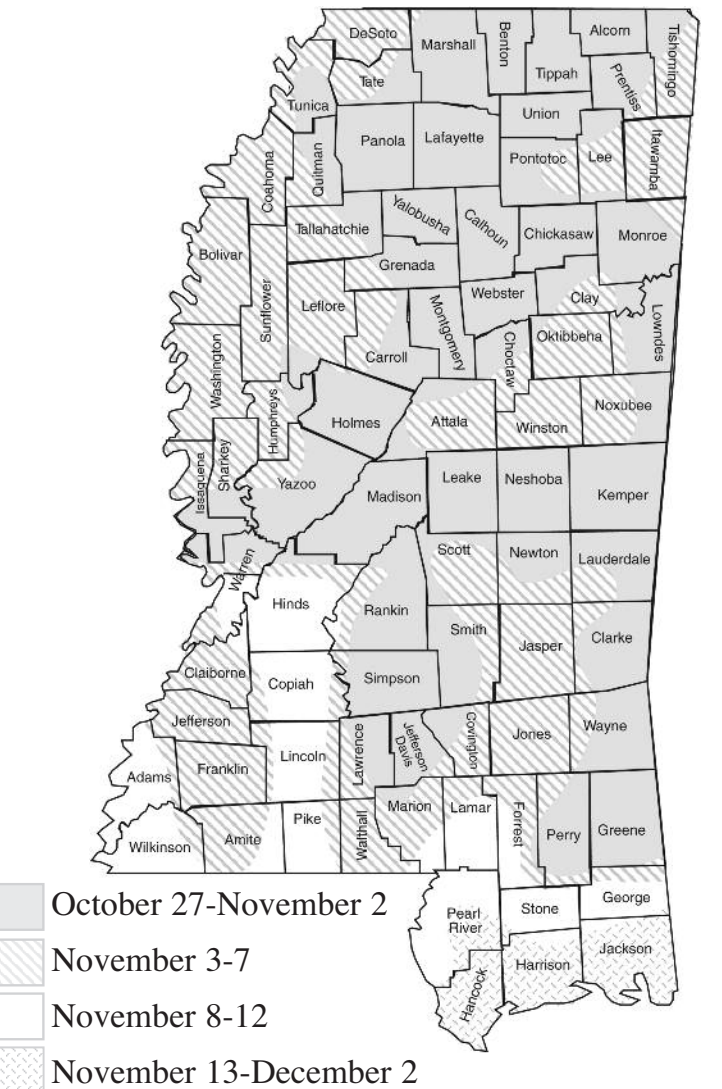
A fall garden is open to attack by insects and diseases just as the summer garden. In some cases, the insect problems are worse. Worms (cabbage loopers and imported cabbage moths) are serious problems on fall cabbage, cauliflower, broccoli, and collards. Control these leaf-eating worms with one of the biological sprays. Squash bugs are troublesome on fall squash and pumpkins.

Fall vegetables need fertilizer just as much as spring and summer vegetables. Don't count on the fertilizer applied in spring to supply fertilizer needs of vegetables planted in late summer and fall. Fertilize before planting and side-dress as needed.

As the danger of frost approaches, pay close attention to weather predictions. Tender plants often can be protected from an early frost and continue to produce for several weeks. When a killing frost is inevitable, harvest tender vegetables.

Green tomatoes that are turning white just before turning pink will ripen if stored in a cool place. Pick these tomatoes, wrap them in paper, and use them as they ripen.

Don't abandon the garden when freezing temperatures kill the plants. Clean up the debris, store stakes and poles, take a soil test, and row up part of the garden to be ready for planting early spring Irish potatoes and English peas.



Median Date of First Freeze in Fall

Vegetables Typically Planted in a Fall Garden

Bush Snap Beans	Carrots	Kohlrabi	Radishes
Beets	Cauliflower	Lettuce	Rutabagas
Broccoli	Chard	Mustard	Spinach
Cabbage	Chinese Cabbage	Onions	Turnips

Herbs

continued from page 18

excellent pot plant; propagate by cuttings.

Ginger—tender perennial grown for pungent root; treat as annual (plant in spring and harvest in fall); propagate by root cuttings; prefers moist, rich soil.

Anise Hyssop—perennial grown for licorice-flavored leaves for teas; attractive purple flowers attract bees; a mint; propagate by seed or division.

Lemon Balm—perennial mint grown for lemon-scented leaves; grow from seed, division, or cuttings.

Lemongrass—tender perennial grown for lemon-flavored leaves used in Asian cooking; attractive as ornamental grass with blue-green color; leaves have sharp edges.

Lemon Thyme—perennial; low-growing attractive plant for sunny area; leaves have strong lemon fragrance.

Marjoram—perennial grown as annual; grown for leaves; grow from seed, cuttings, or by layering.

Mint—perennial; many different flavors and leaf and plant types; spreads rapidly; prefers moist soil, tolerates shade; keep cut for tender growth.

Oregano—perennial grown for leaves; grow from seed, cuttings, or division.

Parsley—biennial grown as annual; grown for leaves; grow from seed; prefers moist soil.

Rosemary—perennial, evergreen shrub but reliably hardy; grown for leaves; available in different plant types, upright and creeping; adapted to pot culture; prefers moist, well-drained soil.

Sage—perennial grown as annual, not reliably hardy; available as common, golden, and variegated; grown for leaves; grow from seed, cuttings, or layering; prefers well-drained soil.

Pineapple Sage—tender perennial; pineapple-scented leaves; large plant; attractive red flowers grow from cuttings.

Summer Savory—annual grown for leaves; grow from seed; unruly plant.

Winter Savory—perennial grown for leaves; grow by layering; a neater plant with better flavor than summer savory.

Tarragon—perennial grown for licorice-flavored leaves; French Tarragon the only type to grow and only grows from stem and root cuttings; suffers with summer heat.

Winter Tarragon—tender perennial, not reliably hardy; also known as mint marigold; licorice-flavored leaves; propagate by cuttings and division; small single, orange, marigold-type flower in fall.

Thyme—perennial, but not reliably hardy; variety of flavors and plant types; grown for leaves; propagate by seed, cuttings, or divisions; prefers well-drained soil.

Lemon Verbena—tender perennial, shrubby, grown for leaves; propagate by cuttings; grow in container and provide winter protection.

New Varieties

continued from page 5

has survived brief exposure to single-digit temperatures. Dwarf Siberian kale is well adapted to production in small containers.

Destiny broccoli produces medium-sized smooth heads on a compact plant. It is well adapted to medium-container production. It does not produce a significant number of side shoots.

Approximate Number of Plants to Expect per Ounce of Seed

Broccoli	5,000
Cabbage	5,000
Cauliflower	5,000
Eggplant	2,500
Peppers	1,500
Tomatoes	4,000

Staking and Training Tomatoes

The main reason for staking and supporting tomato plants is to keep plants and fruit off the ground. This reduces losses from fruit rots when fruit touch the soil and from sunburn when fruit are not shaded by foliage.

Supported plants are easier to spray or dust for insect and disease control and easier to harvest than those sprawling on the ground. Three popular methods of supporting tomato plants are staking, caging, and trellising. Supported tomato plants are pruned (suckered) to reduce the number of branches, thereby making plants more suitable for the selected method of support. Plant type also determines the amount of pruning.

Tomato varieties are divided into two general groups based on their pattern of growth.

Determinate, or self-topping, varieties have short- to medium-length vines. Plants are heavily branched and do not make continuous growth. Rather than having continuous production of leaves and flower clusters, every branch ends with a flower cluster. Determinate varieties often are early and have a short but concentrated production season. These plants are staked or caged but are not adapted to trellising. Some determinate varieties are Celebrity, Mountain Pride, and Rutgers. Determinate varieties are not heavily pruned, regardless of the support system, because most of the fruit is produced on the branches.

Indeterminate varieties continue to grow and produce leaves and flower clusters until disease, insects, cold, or lack of water and fertilizer kills the plants. Indeterminate varieties are Better Boy, Floradel, and Big Beef. Indeterminate varieties are heavily pruned when trellised, moderately pruned when staked, and lightly pruned when caged.

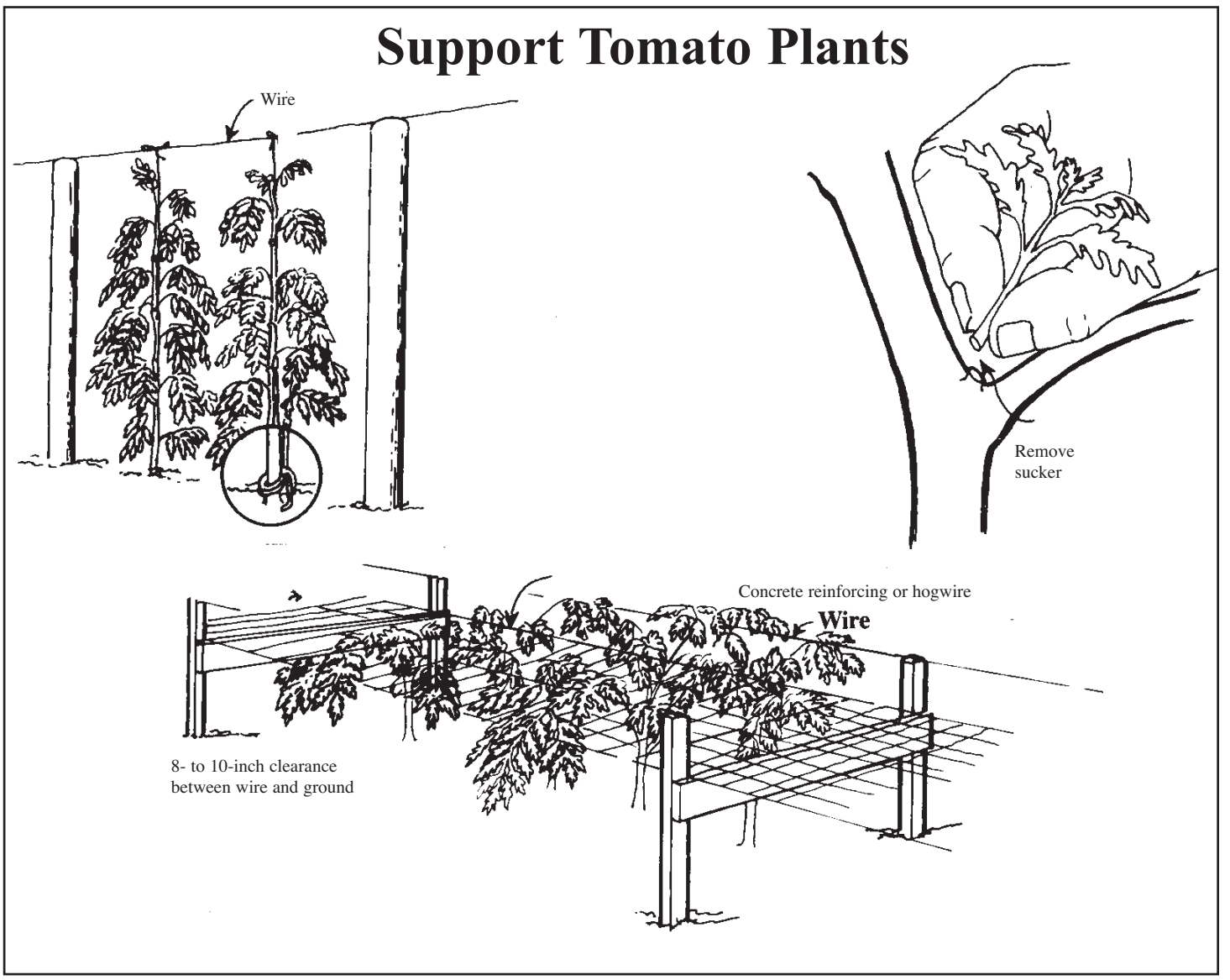
Pruning removes small shoots where each leaf joins the stem. Properly pruned plants produce larger and earlier fruit than non-pruned plants of the same variety. Remove shoots when they are less than 4 inches long to avoid injuring the plant. The larger the sucker before removal, the larger the resulting wound, and the more wasted plant energy that went into the sucker. Remove a sucker by grasping it between your thumb and second finger and bending it to the side until it breaks. This is best done early in the day when plants are crisp and not wilted from the day's sun and heat. Do not cut suckers with a knife because this is one way to spread virus diseases.

Decide on the method of support before setting tomato plants in the garden. Plants for trellising are set closer together than plants to be staked or caged. Plants for caging are set farther apart than plants for staking.

Staking

Staking requires wooden or metal stakes 5 to 6 feet long for indeterminate varieties and 3 to 4 feet long for determinate varieties. Wooden stakes should be at least 1 inch square. Metal stakes can be of smaller diameter and have the advantage of lasting many years. Do not use chemically treated wood. Sections of concrete reinforcing rods (rebar) make excellent tomato stakes.

Space plants 18 to 24 inches apart in the row and drive a stake next to every plant or every other plant. Place the stake 3 to 4 inches from the base of the plant on the side away from the first bloom cluster to prevent trapping the fruit between the plant and the stake.



There are many ways to prune and tie tomato plants. Limit staked indeterminate plants to two or three fruit-producing branches. A popular method is to select the main stem, the sucker that develops immediately below the first bloom cluster (a very strong sucker), and one other sucker below that. Remove all other suckers and as you tie the plants, periodically remove additional suckers that develop on selected branches. Tie individual branches to the stake with soft cord by first tying twine to the stake and then looping it loosely around the plant. Never tie a plant immediately below a fruit cluster because the weight of the fruit may cause the plant to sag and strip the cluster from the plant. Continue to prune and tie the plant as it grows.

The Florida weave is an alternative system to support staked tomato plants in a row. Using polypropylene cord (it doesn't stretch), tie the cord to the first stake about 6 to 10 inches above the ground. Run the cord to the second stake and wrap it around the stake once at the same level. Be sure to keep the cord tight. Repeat this process, going on to the third, fourth, and remaining stakes until you reach the end of the row. Come back with the cord on the opposite side of the stakes, wrapping it around each stake. Plants are held in the space between the cords on opposite sides of the stakes. Repeat this process as plants grow so the branches are always held between the cord. Three to five runs down the row should be enough for the season. Remember to keep pruning plants as they grow to reduce the amount of plant material that must be supported.

When staking determinate varieties, prune only once to remove the first suckers.

Caging

Tomato plants supported by cages made from concrete reinforcing wire require considerably less work than either staked or trellised tomatoes because there is no tying and only limited pruning. A 5-foot length of 10-guage reinforcing wire with 6-inch openings makes a cage of about an 18-inch diameter. Make cages at least 5 feet high for indeterminate varieties. Shorter cages are best for determinate varieties. Using heavy bolt cutters, remove the sections of the bottom horizontal wire, leaving wire legs to stick into the ground.

Set your tomato plants 3 feet apart in the row and place a cage over each plant. Push legs into the ground for anchoring the cage. Protect early plants from cold and wind by wrapping the bottom 18 inches of each cage with clear plastic. Black plastic mulch, in combination with caging and a clear plastic wrap, promotes early blooming.

Caged plants generally are pruned to four or five main fruiting branches. As plants grow, keep turning ends of the branches back into the cages. Caged plants may not produce ripe tomatoes as early as staked or trellised plants, but they produce more tomatoes that are less likely to crack or sunburn.

Trellising

Trellising is only for indeterminate varieties. Set plants about 1 foot apart in the row and prune to just the main stem, or occasionally to the main stem and one strong sucker (the sucker originating just below the first bloom cluster). Remove all other suckers as they develop.

Build a trellis by setting support posts in the ground about 20 feet apart. The tops of the posts should be about 6 feet above the soil surface. Stretch a heavy wire or a piece of barbed wire between the tops of the posts and attach a length of heavy twine to the wire above each plant. Barbed wire prevents twine from slipping as the top wire sags with the weight of the plants. Tie twine to the base of each plant or to a bottom wire if one is used. As plants grow, wrap them around the twine for support, or use the plastic clips that greenhouse tomato growers use. When trellising two stems per plant, use a separate cord for each stem.

Trellising produces ripe fruit earlier than other methods of support. Each plant produces fewer but larger tomatoes that are more subject to sunburn because of the small amount of protective foliage.

Tomato plants loaded with fruit are heavy. Anchor the posts to keep them from collapsing.

Other Wire Supports

Some determinate plants are not suited for standard trellising and staking because of their limited vine growth. These plants, as well as indeterminate plants, can be held off the ground by a wire trellis. Support a 2- to 3-foot width of hog wire 8 to 10 inches above the ground with "H" supports. Center the wire over the row and pull the plants through an opening as they grow. Pruning and tying are not necessary. Space plants about 2 feet apart and the "H" supports 8 to 10 feet apart. A wire stapled to the top of the "H" on each side provides additional support to plants. Tightly stretch and fasten the hog wire at both ends.

Harvesting

Gardening itself is a lot of fun, but harvest is what gardeners work toward. Harvesting at the right time is essential to obtain quality. If you pick vegetables too soon, they can be tough or too tender, lacking substance and flavor. If you pick them too late, they may be tough, fibrous, or too soft.

The number of days from planting to maturity is generally listed in catalog descriptions. For vegetables commonly started with transplants, such as tomatoes and peppers, the number of days given is from setting plants in the garden to harvest. For vegetables that are typically direct-seeded in the garden, such as peas and sweet corn, the number represents the days from planting the seed.

The number of days given represents an average and varies with weather and variety. Cool-season vegetables mature more rapidly as weather warms in late spring; warm-season vegetables mature more slowly as weather cools in fall. Early varieties mature more rapidly than mid- and late-season varieties. Use the number of days as a guide, but also consider the weather, the variety description of early, midseason, or late, and the appearance of the vegetables.

Asparagus—cut or snap spears when they are 6 to 8 inches tall and before leaf bracts at the tips begin to open. Harvest spears of large and small diameter, but leave 20 to 50 percent of the spears to grow to provide energy for next year's crop.

Beans, snap—best when pods are crisp and snap easily but when tips are still pliable, 50 days for bush, 65 days for pole.

Beans, lima—pick when pods are well-filled but still bright green and fresh. End of the pod should feel spongy when squeezed, 65 days for bush, 80 days for pole.

Beans, shell—harvest when beans are very evident in the pods but before pods begin to dry, very much like lima beans and southern peas, 70 days.

Beans, dried—harvest when pods are dry but before they shatter. Plants may be turning yellow. Cut entire plant and dry or pick the pods. When the beans are completely dry, shell them and store in the freezer, 90 days.

Beets—pull when medium-sized (1¼ to 2 inches in diameter), 60 to 70 days; leafy tops are an excellent cooked green.

Broccoli—heads should be compact with tight buds. Individual bud and head size determined by variety, 65 to 75 days from transplants yet within the same time period from direct seeding in the fall. Yellow flowers indicate overmaturity.

Brussels sprouts—cut sprouts from the stalk when they are 1 to 2 inches in diameter and firm, 90 days from transplants. Lower sprouts develop first. Remove the leaf when cutting the sprout.

Cabbage—cut when head is firm and before splitting, 80 days from transplants.

Carrots—harvest according to desired size and weather. Sugar content is higher in mature roots, but younger ones are more tender, 75 days.

Cauliflower—cut when head is firm and smooth, should not be coming apart or ricey in appearance, 65 days from transplants. Pure white color depends on blanching. Creamy color is fine.

Chinese cabbage—cut entire plant at the ground line when the head is fairly compact or the plant has reached the desired size, 80 days.

Collards—as soon as leaves are large enough to pick. Large, old leaves are tough and fibrous, 55 days.

Sweet corn—17 to 21 days after silking. Harvest when silks turn dark and begin to shrivel. Kernels should be bright, plump, and milky, except super sweets, which may appear watery. Small, soft kernels and large, hard, starchy kernels are tasteless, 70 to 85 days.

Cucumbers, pickling—pick when 2 inches or less in length for pickles and 4 to 6 inches for dills. Use large cucumbers for relish. Harvest before cucumbers become dull, puffy, or yellow. Frequent harvest is necessary, 55 days.

Cucumbers, slicing—harvest when 6 to 8 inches long and before the ends become soft or begin to turn yellow, 62 days.

Cucumbers, burpless and European types—harvest when 8 to 10 inches long and 1 to 1½ inches in diameter.

Eggplant—ready when fruit is half grown, before color dulls, 65 to 85 days from transplants.

Endive, escarole—cut plants at ground level when large enough to eat, 85 days.

Gourds, small decorative—cut from the vine with stem attached when the rind is hard, before frost.

Gourds, dipper and birdhouse—cut from the vine with stem attached when they begin to dry. Mature gourds are not injured by frost.

Gourds, luffa—cut from the vine when skin turns yellow or after the gourd has dried. For eating, harvest when small (4 inches or less in length) and tender.

Horseradish—dig roots in late fall after frost. Where soil doesn't freeze and is well drained, roots can be left in the ground until needed.

Jerusalem artichoke—dig tubers all winter after the tops are killed by cold.

Kale—cut entire plant or larger leaves while still tender. Old kale is tough and stringy. Cold weather improves flavor, 55 days.

Kohlrabi—pull when swollen stem is the size of a baseball. Large, old kohlrabi is woody and tasteless, 55 days.

Lettuce, leaf—when leaves are large enough to harvest, 40 to 50 days.

Lettuce, head—harvest for leaves as needed before heads form or as soon as heads are firm, 80 days.

Melons, muskmelons—ready when blossom end of fruit gives to pressure from finger and melon separates (slips) easily from stem. Netting should be coarse and prominent according to variety and with no green lines showing, 42 to 46 days from pollination, 90 days from seed.

Melons, honeydew—when the greenish rind takes on a golden cast, melon does not slip from the vine, 110 days from planting.

Melons, watermelons—ready when undersurface (ground spot) turns from white to cream-yellow, 42 to 45 days from pollination, 90 days from planting.

Mustard—as soon as large enough to harvest, old leaves are tough, 45 days.

Okra—pick when pods are 2 to 4 inches long, 4 to 6 days from pollination, 60 days from planting.

Onions, green—when one-fourth to one-half inch in diameter and tops are 12 to 16 inches tall.

Onions, bulb—dig when tops have yellowed and fallen over.

Parsley—when leaves are large enough to pick, 90 days.

Peanuts—dig when tops are yellowing and inner hulls are brown. All pods do not mature at the same time, but dig the entire plant, 110 days.

Peas, English—best when pods are bright green and fairly well filled. Raw peas should be sweet, 65 days.

Peas, snap—best when pods are green, crisp, and peas have filled pods, 65 days.

Peas, southern—pick purple hull varieties when pod is up to 50 percent purple. Pick tan pod types when pods show a hint of yellow. Peas should be green when shelled, 65 days.

Peppers—pick green bell peppers when shiny green and firm, 75 days from transplants. Colored peppers are harvested when fully colored, yellow, red, etc. Pimiento should be fully red. Sweet banana and hot Hungarian Wax are harvested when fully yellow, turning red, or fully red. Harvest hot peppers when green or fully colored.

Potatoes, Irish—as soon as large enough for early potatoes. Harvest main crop after vines have yellowed. Greenish or sunburned potatoes are not good. Skin should be firmly attached to tuber, 100 days.

Potatoes, sweet—when roots have reached a usable size. Before frost or ground cools below 50 °F, 120 days.

Pumpkins—when fully colored, hard rind, and heavy, 110 days.

Radishes—pull as soon as large enough, 28 days.

Radishes, winter—harvest before ground freezes, 50 days.

Rhubarb—pull leaf stalks from plants when leaves are fully grown. Discard leaf blade and eat the stalk only.

Rutabagas—dig any time large enough. Becomes dry and woody if soil moisture is insufficient, 90 days.

Spinach—use before leaves get old and tough, 45 days.

Spinach, New Zealand—pick terminal 3 to 4 inches of shoots when plants get large enough.

Squash, summer—when medium in size, color good, and rind easily dented with fingernail; zucchini when 6 to 10 inches long and shiny, 55 days from planting; yellow summer 5 to 7 days from pollination, zucchini 3 to 4 days from pollination.

Squash, winter (storage)—color should be good for the variety and the rind very hard, 90 days; acorn 60 days from pollination, butternut 65 days from pollination, hubbard 85 days from pollination.

Swiss chard—as soon as large enough to pick off leaves, from about 12 inches up. Old leaves are tough and fibrous, 50 days.

Tomatoes—when color is good all over. Size is no indication of maturity. Will ripen off the plant, but quality is better when ripened on the plant. Reduce bird damage by picking before fully colored, 70 days from transplants; 45 days from pollination.

Turnips, greens—when large enough to pick. Tough, fibrous, and bitter when old.

Turnips, roots—best when of medium size and firm. Large turnips tough and strongly flavored, 60 days.

Watermelons—see Melons.

Average Bushel Weights of Vegetables

Vegetable	Weight in Pounds
Beans, lima (unshelled)	32
Beans, snap	30
Cabbage (sack)	50
Cucumbers	47-55
Eggplant	33
Greens	23-24
Okra	30
Peanuts (green)	35-45
Peas, English	28-30
Peas, southern	25
Peppers, bell	25
Potatoes, Irish	60
Potatoes, sweet	55
Spinach	20-25
Squash, summer	42

Keep these points in mind when harvesting vegetables:

- Harvest at the proper stage of maturity, not before. You can harvest most vegetables several times if you harvest only the part that is ready.
- Harvest on time. Harvest okra every 1 or 2 days. This also applies to summer squash, beans, and cucumbers.
- Harvest when the foliage is dry. Tramping through wet foliage spreads diseases.
- Don't damage foliage by stepping on vines or breaking stems. This creates wounds and entrances for diseases.
- Don't harvest when plants are wilted. Wounds made by harvesting permit water loss, which increases water stress inside the plant.
- Immediately move freshly harvested vegetables into the shade and keep them cool.
- Use freshly harvested vegetables as soon after harvest as possible.
- Don't injure the plant during harvest. Gently remove the part to be harvested from the plant. Cut eggplants and watermelons with a knife. Cut okra that won't snap off.

Storing Vegetables

In addition to canning, freezing, and drying fresh vegetables, you can store many to use later. The length of successful storage depends on the vegetable and the storage conditions.

Loss of moisture is the major factor that reduces quality during storage. Reducing the temperature slows this loss and delays growth of bacteria and fungi that cause vegetables to spoil.

Some vegetables, such as winter squash, onions, Irish potatoes, and pumpkins, lose moisture slowly; while others, such as leafy greens, lose moisture rapidly. Place vegetables in a plastic bag or container before refrigerating to prevent rapid loss of water. This applies to lettuce, mustard greens, spinach, collards, turnip greens, Chinese cabbage, beets, carrots, radishes, snap beans, shelled limas, cucumbers, broccoli, cauliflower, kohlrabi, and green onions. Turnip roots not only lose moisture rapidly but have a strong odor, so be sure to bag them.

For short-term refrigerated storage, wash vegetables to remove insects, soil, and spray residue before refrigerating.

Some vegetables can be stored for several weeks or longer without refrigeration under proper conditions.

Beets, carrots, turnips, rutabagas—When you grow these root crops in the fall, you can sometimes leave them in the garden until you need them if the garden site is well drained and the vegetables are protected from freezing. Pull soil up over roots or cover them with straw. Store harvested roots in plastic bags in your refrigerator or in moist sand in a cool location.

Cabbage—Protect fall-grown cabbage from freezing. Pull mature heads and wrap leaves over the head. Set the heads, roots up, in a well-drained, cool place, and cover with soil or straw. You can pull mature heads with roots attached and place them in a cold frame.

Onions—After bulbs are harvested and dried, trim tops, leaving about one-half inch. Most southern onions do not store well, but for best storage, keep dry bulbs in a cool, well-ventilated place. If the temperature is too warm, tops will sprout. If humidity is too high, the roots begin to swell and develop.

Irish potatoes—Spring-grown Irish potatoes are difficult to store. Cure potatoes for several days in a warm place to heal cuts and bruises. Do not wash potatoes unless they are very dirty from harvesting in wet soil. Store dry potatoes in boxes in a closet in an air-conditioned home. If the house is on a conventional foundation, store potatoes under the house. Be sure to shut out all light to prevent greening of the stored potatoes.

There are sprays or treatments that prevent spring-grown Irish potatoes from sprouting. Natural dormancy prevents sprouting for about 100 days, but refrigeration or cold storage is the only way to hold these potatoes for several months.

Irish potatoes grown in the fall are easier to store than spring-grown potatoes. Harvest when the soil is dry, and don't expose potatoes to the sun. Cure in a warm, moist place for about a week to heal cuts and bruises; then place potatoes in a cool, dark place. Just make sure they don't freeze. Fall-grown potatoes can be successfully stored for several months.

Sweet potatoes—Sweet potatoes are very sensitive to cold soils and cold storage. Potatoes that are chilled in the soil or in storage will not keep very long. Dig potatoes before soil temperatures drop to 55 ºF. Cure potatoes for 7 to 10 days in a warm, moist place—80 to 85 ºF and 90 percent relative humidity. Curing helps heal all cuts and bruises that occurred during harvest. Store cured potatoes at 55 ºF and high humidity to prevent shrinkage. Storage at warmer temperatures encourages sprouting.

Pumpkins, winter squash—Harvest these vegetables as they mature because they do not store well in the garden. If planted in April or May, they are ready to harvest in July and August. If left exposed to the sun and wet weather, they rot. Store in a cool, fairly dry place. Small quantities can be stored in an air-conditioned home. Do not stack these vegetables in storage, and do not expose them to temperatures below 50 ºF. If the humidity is too high, molds and rots develop.

Tomatoes—Ripe tomatoes store best at a temperature around 60 ºF. At refrigerator temperatures, the quality rapidly deteriorates. Mature green tomatoes (those that have reached full size and are turning white before coloring) will ripen if picked before frost injures them. Wrap tomatoes in paper and store in a cool place. Check them regularly to remove any ripening or spoiled tomatoes. You can have garden tomatoes for Christmas and even later if you strip the vines of fruit before a freeze and handle them as described.

Dried beans and peas—The greatest danger in storing dried beans and peas is infestation by insects. Pick dry pods and thoroughly dry them in a warm, well-ventillated place before shelling. Kill insects by heating dry, shelled beans and peas in a 180 ºF oven for 15 minutes. Store these treated beans and peas in plastic bags in containers with tight-fitting lids. If freezer space is available, you can store dried peas and beans in the freezer without prior heating.

Seed Storage: Cool and Dry

Moisture and high temperatures cause rapid loss in the ability of vegetable seeds to germinate. Therefore, discard vegetable seeds held in storage buildings, vehicles, and other places with widely fluctuating temperatures and humidities.

The longer seeds are stored, the more important it is to control moisture and temperature conditions. Low moisture content in the seeds means longer life, especially if seeds must be kept at warm temperatures.

Seeds can be stored over, but not touching, calcium chloride, dried silica gel, or freshly opened powdered milk by sealing them in air-tight containers.

Bean and okra seeds can be overdried, resulting in hard seed coats and reduced germination. Seeds can be stored successfully at temperatures above 32 ºF. Between 40 and 50 ºF is satisfactory when moisture content of the seed is not too high.

For long-term storage (several months) seeds can be stored in the freezer. Seeds are not harmed if properly dried before storing, but be sure to let them come to room temperature before handling.

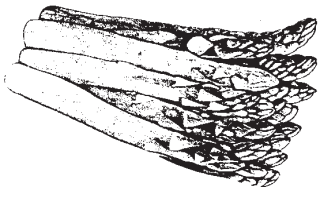
Do not store chemically treated seeds with vegetables or other food items that are to be eaten.

Approximate Years of Storage Life of Seeds Under Cool, Dry Conditions

Asparagus – 3
Beans – 3
Beets – 4
Broccoli – 5
Brussels sprouts – 5
Cabbage – 5
Carrots – 3
Chard, Swiss – 4
Collards – 5
Corn – 1-2
Cucumbers – 5
Eggplant – 5
Kale – 5
Kohlrabi – 5
Lettuce – 5
Muskmelons – 5
Mustard – 4
Okra – 2
Peas, English – 3
Peppers – 4
Pumpkins – 4
Radishes – 5
Rutabagas – 5
Southern peas – 3
Spinach – 5
Squash – 5
Tomatoes – 4
Turnips – 5
Watermelons – 5

Vegetables

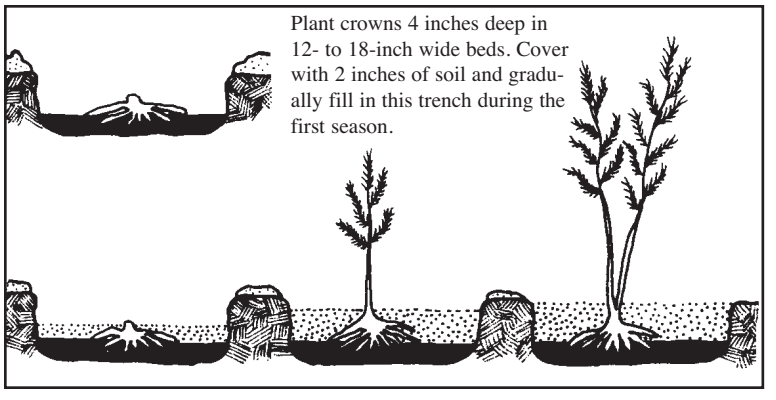
Asparagus



Asparagus is a perennial plant that can be grown successfully in many parts of Mississippi. Performance in south Mississippi gardens, however, is likely to be disappointing. In the southern part of the state, asparagus may not become completely dormant in winter and may continue producing a few weak spears.

Asparagus grows on a variety of soils but prefers well-drained soils high in organic matter. Plants lose vigor, are more susceptible to root rot, and may die when planted in poorly drained soils.

Since asparagus is a perennial plant that grows in the same location for several years, there is only one chance to prepare the soil before planting, so do it right. Start preparing soil about a year before planting by mixing in large quantities of organic matter, such as composted manure, compost, and green manure crops.



Plant crowns 4 inches deep in 12- to 18-inch wide beds. Cover with 2 inches of soil and gradually fill in this trench during the first season.

Mix 2 to 3 pounds of 13-13-13 fertilizer per 100 square feet into the soil and lime to a pH of 6.0 to 6.5. Asparagus does poorly at a soil pH below 6.0.

Mary Washington is the most widely available garden variety. Plants and seeds of newer varieties, such as UC-157, Purple Passion, and Jersey Giant, are of more limited availability to home gardeners.

In early spring, plant 1-year-old crowns 4 inches deep in clay soils and 6 inches deep in sandy-textured soils. Do not use older crowns or pieces of old crowns dug from an existing bed. Dig a trench 12 to 18 inches wide to the desired planting depth in the prepared planting area. Space crowns 12 to 15 inches apart on the bottom of the trench. Spread roots, being sure the crown is right side up. Cover crowns with 2 inches of soil, and during the first season as plants grow, gradually fill in the trench with soil. If you plant more than one row, space rows 4 to 5 feet apart.

Keep bed free of weeds at all times. Remove all brown, frost-killed stalks in winter, and, if available, cover bed with 2 to 3 inches of composted manure. Each spring before growth begins, broadcast 2 to 3 pounds per 100 square feet or 25 feet of row of 6-8-8 fertilizer and work it lightly into the surface. Repeat fertilization after harvest.

Harvest can begin the third year. Harvesting earlier than the third year reportedly weakens the plants. Harvest all spears, large and small, when 6 to 8 inches long, and before leaf bracts at the tip begin to open. Cut spears 1 to 3 inches below the surface, trying not to injure spears developing below the surface, or you can snap spears at ground level. When the diameter of most of the spears drops to the size of a pencil, stop harvest for the year. On young beds, harvest for only 2 to 3 weeks. Harvest established beds for up to 8 weeks.

Do not allow grass to take over the bed during summer months after harvest. Fertilize and keep the bed clean and watered. Asparagus fern can reach 4 to 7 feet in height. Do not cut until after frost kills it in late fall.

Control insects attacking spears during harvest with malathion and carbaryl.

You can grow asparagus plants from seed instead of starting with 1-year-old crowns. To grow plants from seed, soak seeds in aerated water for 3 days. Use a small electric aquarium air pump with a bubbler stone to aerate the soaking seeds. Plant individual seeds about 1 inch deep in small pots or containers. Plants should be large enough to set in the garden in 12 to 14 weeks. Treat seedlings the same as 1-year-old crowns, using the same planting depth and spacing. During the first season's growth, gradually fill in the trench.

Asparagus has both male and female plants. Male plants produce spears of larger diameter than female plants. New all-male varieties are now available. Female plants produce red berries in late summer. Volunteer seedlings originating from these berries may spread asparagus to other garden areas.

Continued on next page

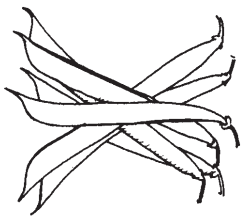
Variety

Mary Washington—leading home garden variety; some resistance to rust.

Jersey Giant—hybrid; 100 percent male; producer of larger, uniform spears; excellent vigor; tolerant to fusarium wilt.

Purple Passion—thick spears; very productive; turns green when cooked.

Beans



All garden beans are sensitive to cold soil and cold air temperatures. Seeds planted in cold, wet soils rot, but colored bean seeds are more tolerant to cold soils than white bean seeds.

Soil type is important to bean seed germination. In germination, the two large seed halves (cotyledons) must come through the soil surface. Clay or compacted soils hold the cotyledons, and germination is poor. Cover seeds with a non-crusting material, or add sand, peat moss, vermiculite, or perlite to the soil. If a crust forms, carefully break it or sprinkle it lightly with water several times to soften it and aid germination. All beans are nitrogen fixing plants, so be careful to avoid heavy nitrogen fertilization and nitrogen-rich soils.

Major problems with beans are blossoms and pods shedding, diseases, and insects. Both too much and too little moisture cause blooms and small pods to shed. This also occurs when summer temperatures are extremely high. Control most diseases by buying western-grown seeds, selecting disease-resistant varieties, using treated seed, rotating land, and not working or harvesting beans when leaves are wet. Major insect pests are bean leaf beetle (round holes in leaves) and Mexican bean beetle (lace-like leaves).

Bush snap beans can be green or yellow (wax) and round or flat. They are sensitive to hot, dry weather; therefore, do not plant them to mature in midsummer. Late-planted bush beans do not set a big crop, and the pods that develop are of poor quality. Bush beans should be planted in a broad band of several closely spaced rows.

Harvest beans at the tender snap stage, but any snap bean variety can be allowed to grow to the green shell stage and be used much like lima beans and southern peas. Most bush snap bean varieties require 50 to 60 days from planting to harvest.

Varieties

Atlantic—mottled seed; medium green; slim; round-oval; long pod; mosaic resistant.

Blue Lake—white seed; dark green; round pod; slow to develop fiber; good flavor; processing type.

Contender—old variety; colored seed; pale green; oval pod; frequently curved; early; fresh-use type that develops fiber rapidly.

Derby—white seed; round; long, slim, straight pods; slow seed development; resistant to common bean mosaic virus; AAS 1990.

Magnum—long, flat pod; light-medium green color; 6.9 inches long; tan seed; 51 days from planting.

Greencrop—white seed; long, flat pole bean type pod; fresh use and processing; no disease resistance; AAS 1957.

Provider—purple seed; round; medium-length pods; white seeded type also available.

Topcrop—medium green; round; medium-length pod; slightly curved; mosaic resistant; brown seed; AAS 1950.

Green-shell beans are grown like bush snap beans. These are special varieties:

French's Horticultural—pods and beans cream colored, splashed with scarlet; a semi-runner type; 68 days.

King Horticultural—similar to French's Horticultural; 75 days.

Taylor's Horticultural—non-running plant; pods and beans similar to French's Horticultural; 75 days.

Pole snap beans extend the harvest of snap beans through the summer. They are more tolerant of hot temperatures than bush beans. Support vines with cane poles, strings, or a trellis, allowing for 6 to 8 feet of growth. Bean vines are heavy, so construct a strong trellis. Barbed wire as the top wire prevents poles and strings from slipping. Support posts to prevent trellis collapse in wet weather. When exposed to very hot summer temperatures and dry soils, beans drop their blooms and small pods. Harvest all beans to keep vines producing. Pole beans yield more than bush beans because they produce over a longer period of time. Nitrogen-rich soils result in excessive vine growth and no beans. Most pole snap bean varieties require 65 to 70 days from planting to first harvest.

Varieties

Alabama No. 1—black seed; nematode resistant.

Blue Lake—white seed; fresh and processing type; pods long; round-oval; smooth; meaty.

Cornfield (Striped Creaseback) —colored seed; pod flat; light green turning purple brown; stringy.

Dade—white seed; fresh use type; similar to McCaslan; tolerant to several diseases; early.

Kentucky Blue—pods 6 to 7 inches long, round, straight; good flavor; mature in 58 to 65 days; vines resistant to strains of bean rust and common bean mosaic virus; AAS 1991.

Kentucky Wonder—colored seed; fresh use; pod long, flat; meaty, brittle; low fiber; good flavor; popular old variety.

Kentucky Wonder 191—white seed; similar to Kentucky Wonder.

Louisiana Purple—purple pods that turn green when cooked.

McCaslan—white seed; fresh use; light green pod; flatter and smoother than Kentucky Wonder; very productive.

Asparagus (yardlong) beans are pole beans that reach 2 feet in length. At this stage they are past their prime and should be used like southern peas. Harvest when pods are 10 to 18 inches long for use as a snap bean.

Varieties

Red Seed—long, dark green pods.

Red Noodle—red pods.

Bush lima beans (butter beans) are more sensitive to cold than snap beans, so delay planting until the soil temperature is at least 65 degrees. Both small- and large-seed types are used as green-shell beans. The small-seed limas produce better than the large-seed types. Most varieties require about 65 days from planting to harvest. Use treated, fresh seeds. Do not use last year's dry garden beans for this year's seeds because of disease carryover problems. The major disease is stem anthracnose. Control this disease by using western-grown seeds and planting rotation in the garden. Do not plant lima beans in the same garden location where they were grown last year.

Varieties

Dixie Butterpea—white seed; 3 to 4 small, plump beans per pod; sets pods under high temperatures; large and vigorous plants; late maturing.

Early Thorogreen—small, flat, rich-green baby lima; heavily productive; sets throughout the plant; very adaptable and vigorous; green-seeded Henderson Bush.

Henderson Bush—creamy white seed; 3 to 4 small, flat beans per pod; most popular older variety; small plant; productive; processing type.

Jackson Wonder—speckled butter bean; seed buff with purple markings; beans small, greenish-white with purple markings at green shell stage; medium-sized plant.

Nemagreen—seeds greenish-white; 3 to 4 small, flat beans per pod; plants small; productive; resembles Henderson Bush; resistant to root-knot nematodes.

Pole lima beans are grown like pole snap beans.

Varieties

Carolina (Sieva)—white seed; 3 to 4 beans per pod; pole type Henderson; popular old variety; widely grown; 80 days.

Florida Speckled Butter Bean—seed buff, splashed with maroon; 3 to 4 small beans per pod; greenish with purple at green shell stage; bears well in hot weather; 78 days.

Willowleaf—dull white seed; similar to Carolina, except dark green leaves are narrow; 90 days.

Beets

Beets require cool temperatures and a loose, moist soil for best production. An adequate supply of potash in the soil is necessary for roots to form. Test soil before planting. Beets do not tolerate acid soils. Beets are shallow-rooted, so never let the soil dry completely. Because beets require cool temperatures, you can grow them in spring and fall.

Most beet seeds produce a small cluster of seedlings when they germinate. Even with individually placed seeds, thinning is necessary for correct plant spacing. Thin seedlings to stand 2 inches apart. Beet seeds are slow to germinate, so mix in some radish seeds to mark the row. Poor stands of seedlings can often be traced to planting too deep or crusting soils after rain or irrigation.

Black spots in beets may indicate a shortage of boron in sandy soil. Dissolve 1 level tablespoon of household borax in 3 gallons of water and apply it to 100 feet of garden row as a corrective measure. Reduce the amount of borax for shorter rows because too much boron can be toxic to plants.

Do not discard beet leaves; they are an excellent leafy green. You can also use the thinnings of young beets as greens. Beets require 60 to 70 days from planting to harvest. Harvested beets can be stored in the refrigerator in a plastic bag for several weeks. A variety with golden roots is available.

Varieties

Burpee's Red Ball—uniform; smooth-skinned; globe-shaped; 3-inch dark red roots; tops erect; medium tall; red and green.

Cylindra—long, cylindrical root that gives uniform slices; dark red; 6 inches long; leaves excellent as greens.

Detroit Dark Red—an old standard variety; globe shaped; smooth; uniform; deep red color.

Golden Beet—yellow interior; orange skin.

Ruby Queen—uniform; smooth; round with fine taproot; superior quality; fine for canning; small crown; AAS 1957.

Broccoli

Broccoli is one of the most nutritious of all vegetables. The edible parts are the compact clusters of unopened flower buds and the attached stems. Each plant produces one large central head and often several smaller side heads following harvest of the main head. This cool-season vegetable grows in all parts of Mississippi in spring and fall, but fall production often is more successful.

For spring broccoli, start plants in a cold frame 6 to 8 weeks before time for setting plants in the garden. This means starting in what seems mid-winter. Grow seedlings at cool temperatures and spaced at least one-half inch apart in rows 4 to 6 inches apart so they are hardy and able to withstand cold temperatures when transplanted.

Seedlings can be grown in individual cups or cells in plastic trays. Seedlings exposed to temperatures below 45 ºF for 2 weeks or more in plant beds may form small flower heads and be unproductive. Seedlings grown indoors, in a hot bed, or in a greenhouse often are killed by the first cold night after transplanting to the garden in early spring. Harden these seedlings for 1 to 2 weeks in a cold frame before setting them out. Use 1 cup of starter solution (page 9) for each plant when transplanting to the garden.

Side-dress broccoli plants with a nitrogen fertilizer as soon as they begin active growth after transplanting. A second side-dressing just before heading will help increase the size of the center heads.

For fall broccoli, plant seeds directly in the garden where they are to grow. Keep the seed bed moist to prevent crusting and to aid germination. Do not delay planting past recommended dates waiting for moisture or for temperatures to cool. If water is not available to keep the seed bed and seedlings moist, do not direct seed.

Fall broccoli is better in quality than spring broccoli because it matures as the weather is getting cooler rather than warmer, but fall broccoli has more insect problems than the spring crop. Control the major worm problems by spraying or dusting with a biological control containing *Bacillus thuringiensis*.

Harvest broccoli while the cluster of flower buds is still tight. Open yellow flowers indicate overmaturity. A hollow stalk may indicate a shortage of boron in the garden soil. Dissolve 1 tablespoon of household borax in 3 gallons of water and apply it to 100 feet of garden row. Use less borax for shorter row lengths. Using more than is recommended can be toxic to plants.

Varieties

Green Comet—hybrid; extra early; medium-sized, 6- to 7-inch uniform heads; large side shoots; 61 to 75 days; AAS 1969.

Packman—hybrid; very early; compact plant with large, flattened head; 62 days.

Premium Crop—hybrid; midsea-

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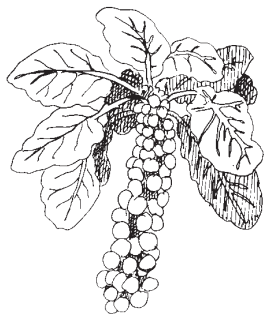
son; medium large, 7- to 8-inch head; minimum of side shoots; 75 to 89 days; AAS 1975.

Brussels Sprouts



This cold-hardy, slow-growing, long-season vegetable is not frequently grown in Mississippi gardens. The cool weather of neither spring nor fall is long enough for maximum yields. When attempting a spring crop, set plants early and side-dress as soon as active plant growth begins and again when sprouts form. For a fall crop, start plants in midsummer. Set plants 24 inches apart and keep them watered. Sprouts develop where leaves join the main stem. As sprouts develop, do not remove leaves. Lower sprouts mature first, and you can cut leaves when you harvest sprouts. Heat causes soft sprouts. Aphids often infest developing sprouts, making them inedible.

Varieties

Jade Cross—hybrid; vigorous plant; uniform sprouts closely spaced; 1½ inches in diameter; 90 days; AAS 1959.

Long Island—sprouts 1½ inches in diameter; firm; plants 32 to 34 inches tall; 90 days.

Cabbage

Cabbage can be green or red, smooth or curly (savoy), and have flat or pointed heads.

Cabbage is grown exactly as described for broccoli in both spring and fall. When purchasing cabbage plants in spring, beware of large plants or those with stems as large as a pencil. Bundled, bare-root transplants with large, woody stems may flower without forming a head.

When growing transplants, select varieties that mature over several weeks to extend the harvest season from a single planting. Also, purchased transplants of a non-hybrid (open-pollinated) variety mature over several weeks. Use starter solution (page 9) when setting transplants in the garden.

As cabbage matures, head-splitting results from the pressure of water taken up by the plants after the heads are solid. Soft heads indicate lack of maturity.

Serious insect problems for cabbage are aphids and cabbage worms. The major diseases, black leg and black rot, are seed-borne and difficult to control except by purchasing disease-free seeds and plants.

Varieties

Red Head—hybrid; main season; red; 85 days; AAS 1971.

Rio Verde—hybrid; heads slightly flattened; strong blue-green; main season late; 85 days.

Round Dutch—open-pollinated; old, popular garden variety; most commonly sold as transplants; main season; round, green head; tolerant to cold weather; resistant to bolting; 75 days.

Ruby Ball—hybrid; very deep red; solid, round head; 5 to 6 inches across; 70 days; AAS 1972.

Savoy Ace—hybrid; savoy heads of deep green; round; 78 days; AAS 1977.

Chinese Cabbage

Several different vegetables are commonly called Chinese cabbage. There are both heading and nonheading types. Michihli types form tall, cylindrical heads. A second type, Napa, forms heads similar to loose heads of savoy cabbage. A third type, Pak Choi or Bok Choi, often called celery cabbage, resembles swiss chard and is nonheading. All types rapidly go to seed in warm weather, which makes them better suited for fall rather than spring gardens. Sow seeds in early fall and thin seedlings to stand 8 to 12 inches apart. It is important that the plant growth not be interrupted.

Varieties

China Express—hybrid; early, slow-bolting Napa type; for spring planting; disease resistant.

China Pride—hybrid; rugged Napa type; best for fall; broad, large heads; good, dark green color; disease tolerant.

Monument—hybrid; Michihili type; 18 inches tall; dense head with deep green outer color and white interior; 80 days.

What-A Joy—Pac Choi hybrid; Joy Choi is white-stalked.

Carrots

Mississippi's high clay content, poorly drained soils are not suited for developing long, straight carrots, so select varieties that are only 6 to 8 inches long. Carrots are sensitive to acid soils. Raised beds filled with improved soil allow you to grow carrots where they wouldn't grow in native soil.

Carrot seeds are slow to germinate, and germination may not be uniform. Hard, packing rains following planting and before germination result in a poor stand or no stand at all. Mix some radish seeds with carrot seeds to mark the row. Carrot seeds germinate best in a warm, moist soil. Cover the planted row with clear plastic or a floating row cover to help get a good stand. Remove the plastic immediately after germination, but you can leave the polyester row cover over the seedlings until they make some growth. To aid emergence, cover the seeds with a noncrusting material like sawdust, sand, or vermiculite, and keep the newly seeded row moist. Thin seedlings to stand about 2 inches apart.

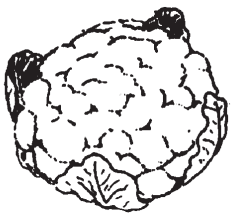
Green shoulders on carrots result from sunburn. Pull a little soil to the row when cultivating to keep carrots covered. Misshapen, twisted, and forked carrots result from clay soils, sticks, roots, stones, or root knot nematodes.

Varieties

Danvers 126—fresh use and processing type; tolerates high temperatures; moderately tapered; stump root 6 to 8 inches long; broad shoulder; open pollinated; 75 days.

Red Cored Chantenay—processing type; choice for heavy soils; tapered; short, thick stump root; 4 to 6 inches long; heavy shoulder; 68 days.

Cauliflower



Cauliflower is grown much like broccoli and cabbage, but plants are less tolerant of heat and cold. Start from transplants in spring. Direct seed or use transplants in fall. Select early maturing varieties to avoid late spring heat and late fall cold. Cauliflower plants are more sensitive to spring freezes than broccoli or cabbage.

Cauliflower plants must be kept growing vigorously from germination through harvest. Any interruption in growth caused by drought, heat, or cold can cause the edible head to fail to develop (button). Use a starter solution (page 9) when setting plants in the garden.

Some of the new cauliflower hybrids are self-blanching (leaves fold over developing head), eliminating the need for tying outer leaves to ensure a white head. With nonself-blanching types, tie the large outer leaves loosely together over the center of the plant when the small head is 2 to 3 inches in diameter. The head should be ready to harvest 7 to 12 days after tying the leaves. Cut the head before it develops a coarse, ricey appearance. Cauliflower plants make only a single head. Downy mildew can be a serious disease problem. Aphids, cabbage loopers, and imported cabbage moths are major insect pests.

Varieties

Majestic—hybrid; earlier than Snow Crown; heads 7 inches across; 66 days.

Snow Crown—hybrid; early Snowball type; white heads up to 8 inches across; 68 days; AAS 1975.

Snow King—hybrid; extra early; withstands heat; ideal for fall; 60 days; AAS 1969.

Swiss Chard

Swiss chard is a close relative of the garden beet that does not develop an edible root. Grow chard just like beets, but space the plants 4 to 6 inches apart in the row.

Harvest chard by cutting the entire plant or by removing the large outer leaves, leaving the smaller leaves to develop for future harvests. If watered, spring-planted chard may survive the summer to produce leaves for fall harvest. The green portion of the leaf can be stripped off, leaving the broad mid-rib, which can be steamed and eaten like asparagus.

There are several varieties of chard; the biggest difference among them is that some varieties have brightly colored stems. The red-stemmed varieties may be mistaken for rhubarb but cannot be used as a rhubarb substitute.

Because of its upright growth and large, attractive leaves, chard can be used as an ornamental in borders and display beds.

Varieties

Bright Lights—red, yellow, purple, and green petioles.

Lucullus—early; leaves crumpled; dark green; broad, pale-green petiole.

Rhubarb—crimson stalks; leaves dark green; heavily crumpled.

Collards

This leafy green seems to be in gardens year-round but is at its best in spring and fall during cool weather. Early spring plantings produce edible leaves right through summer if watered and fertilized, and if insects are controlled.

Some gardeners prefer to harvest the large, mature lower leaves, leaving young leaves and the growing bud to produce more leaves for later harvests. Other gardeners harvest leaves from young plants by cutting them from the plants, leaving the growing buds to produce leaves for later harvests. Collard seeds are sometimes planted in May, June, or July for summer transplants and fall harvest.

Collards are relatively heavy feeding plants and require side-dressing with a nitrogen fertilizer. The most popular old varieties, Georgia LS (long standing) and Vates, are both relatively slow to go to seed. Vates is the preferred variety for overwintering.

Major insect problems are aphids and leaf-eating worms. Larvae of cabbage loopers and imported cabbage moths are serious pests in late spring, summer, and early fall.

Varieties

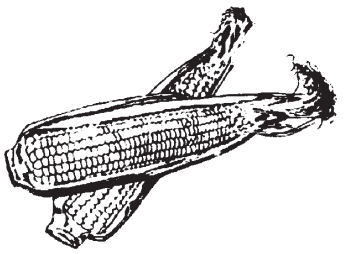
Vates—standard older variety for overwintering; good resistance to bolting; low-growing, compact.

Georgia LS—spring and summer planting not recommended for overwintering.

Blue Max—hybrid; slightly savoyed, large leaves that extend down the petioles; blue-green color; mild taste; upright, vigorous, compact plant.

Champion—Vates type with longer standing ability.

Sweet Corn



Seed companies have offered an explosion of new sweet corn hybrids in recent years. Sweet corn varieties can be divided into three broad groups: normal sweets, sugary enhanced sweets, and super sweets. Within the sugary enhanced group there are two types: those with 100 percent of the kernels being sugary and those with about 25 percent of the kernels being sugary. Both the normal sweets and the sugary enhanced are excellent types for gardens because seeds are normal in size and germinate well.

Super sweet seeds are small, and conditions must be ideal for good germination. Super sweet seedlings are slower to establish than the normal and sugary enhanced types. The super sweets have a sugar content that is two to three times higher than that of normal sweet corn and a slow conversion rate of sugar to starch. Therefore, super sweets hold up well on plants and in the refrigerator.

Both the normal sweet and the sugary enhanced sweet corns have fairly rapid rates of conversion of sugar to starch, but these sweet corns also have a creamy texture, while super sweets are more crisp and watery.

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In addition to differences in sugar content, sweet corn also comes in different colors: yellow, white, and bicolor (yellow and white kernels on the same ear).

Sweet corns also are divided into varieties that mature early (65 to 70 days), midseason (70 to 80 days), and late (80 or more days). Most early varieties are better adapted to the northern states and do not make satisfactory growth or ear size in the south.

For an ear of corn to develop properly, corn pollen from the tassel at the top of the plant must fall to the silks of the ear located about halfway up the stalk. Plant several short rows, rather than one or two long rows, for better pollination. Better pollination means fuller ears. Hot, dry conditions during pollination result in missing kernels, small ears, and poor development of ear tips. A water shortage, signaled by visible wilting (rolling of the leaves), at the time of silk emergence results in reduced yields and quality.

When different varieties of sweet corn planted close together silk and tassel at the same time, crosspollination can occur by wind-blown pollen. This may result in something as simple as yellow kernels scattered in the ears of white corn; but more important is the reduction in quality when super sweet corns are pollinated by any other type of sweet corn. Therefore, isolate the super sweets from other sweet corns by time of planting so that they silk and tassel at different times; or isolate them by a distance greater than the pollen is carried by the wind. If popcorn and field corn pollinate any type of sweet corn, they will destroy its eating quality.

Soil fertility problems frequently cause low yields in sweet corn. If soils are cold and wet during early planting, deficiencies of nitrogen and phosphorus will occur. Small ears at harvest indicate low fertility, and poorly filled ear tips indicate low nitrogen, phosphorus, or potassium.

Corn earworms are the most serious sweet corn pests, although chinch bugs, flea beetles, blister beetles, and armyworms also cause serious damage. As soon as silks appear, spray or dust to control earworms. Continue to apply insecticide on a 3- to 4-day schedule until silks are brown and dry.

Sweet corn is ready to harvest about 20 days after the first silks appear. The ear should feel full, the kernels should be plump, and the juice should be milky in the normal and sugary enhanced types.

Birds are a problem at planting time and at harvest time. They pull seedlings from the soil to feed on the kernels and also feed on the ears as they approach maturity. Problems with animals, such as raccoons and squirrels, feeding on sweet corn as it matures are difficult to prevent. You can prevent some damage by using a 2-strand electric fence around the garden. Place one wire about 4 inches aboveground and the other at about 12 inches. The electric fence should be in operation well before corn approaches maturity.

Varieties

Normal type

Jubilee—yellow; large ear; white silk; late.

Merit—yellow; tolerant to high temperatures and drought; large, heavy ears; smut resistant; sometimes called silkless because silks come off ears easily; midseason to late.

Silver Queen—white; exceptional quality; late.

Sweet G-90—bicolor; very tender and sweet; 75 days.

Sugary Enhanced (se)

Bodacious—homozygous se; yellow; early (75 days); medium-sized ear; excellent eating.

Calico Belle—bicolor; homozygous se; midseason; medium-sized ear; excellent eating; good yields.

Incredible—yellow; an improved Miracle; good husk protection and tip fill; 100 percent se; late.

Miracle—yellow; excellent flavor; tender kernels; large ears; midseason.

Platinum Lady—white; excellent flavor; purple color in stalks and husks; early to midseason.

Snowbelle—white; creamy texture; 1 week earlier than Silver Queen.

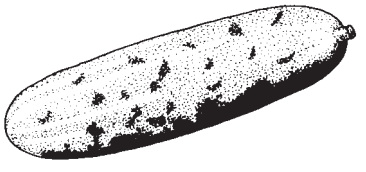
Tendertreat–yellow; excellent flavor and tender; purple color in stalks and husks; tall plants; late.

Super Sweet (sh2)

How Sweet It Is—white; 8-inch ears; late; requires isolation; 88 days; AAS 1986.

Summer Sweet 7210—yellow; 8-inch ears; midseason; requires isolation; 78 days.

Cucumbers



Cucumbers are divided into two broad groups, pickling and slicing, on the basis of shape and color.

Pickling types are short and blocky and have white or black spines on the cucumber (spines are small and easily overlooked). Fruit are generally dark green at stem end and may be almost white at blossom end. Fruit with white spines turn light yellow or white when overmature. Black-spined types turn orange.

Slicing cucumbers have long fruit, are generally dark green from stem to tip, and have white spines. Grow slicing cucumbers on a trellis for straight, uniformly colored fruit.

Fruit types may actually be used interchangeably (except in vegetable shows), and the two types crosspollinate.

The normal type of cucumber plants have separate male (short stem and pollen) and female (little cucumber and pollen-receiving organ) flowers on the same plant. This condition is called monoecious. Some of the newer hybrids are described as being predominantly female, or gynoecious. These plants produce few if any male flowers. Seed packets of gynoecious hybrids generally have about 15 percent seeds of a pollinator (normal plants with male flowers) mixed in.

Until recently, all garden cucumbers required pollination for fruit to develop, and the cucumbers had seeds in them. Plant breeders are now developing seedless (parthenocarpic) varieties that develop without pollination and seeds.

All cucumbers must be harvested before blossom ends soften or fruits begin to yellow. Smaller sizes are more desirable for pickling than the larger fruit, which can be used for relish or mock spiced apple slices. Harvest slicing cucumbers before seed coats on the seeds begin to harden.

Remove all overmature, large, and poorly shaped fruit from the vines to keep plants producing.

Poor fruit shape (crooks, nubs, and balls) is caused by low soil fertility, drought, or poor pollination. A cucumber is almost 95 percent water, so lack of water affects fruit development and quality.

Bitter cucumbers result from poor growing conditions (low soil fertility, high temperatures, and drought). Varieties are now available that do not become bitter, but this is no excuse for neglecting the plants.

Cucumbers do not crosspollinate with melons, squash, or pumpkins, but they do cross with other varieties of cucumbers. This has no impact on the fruit being harvested and should be of concern only if you save seeds. Since most modern varieties are hybrids, saving seeds is not recommended.

Cucumber seedlings that are not grown in small pots or containers do not transplant easily, so plant seeds where they are to grow; or start seedlings in peat pots, pellets, or cups, and set them in the garden before the first true leaf enlarges.

Most new cucumber hybrids are resistant to major diseases. Problem-causing insects are cucumber beetles, squash bugs, and pickleworms.

Varieties

Pickling type

Calypso—gynoecious hybrid; multiple disease resistance; uniform dark green; blocky; white spine; 56 days.

Carolina—gynoecious hybrid; multiple disease resistance; medium-length vine; medium dark green; blocky fruit; white spine; 55 days.

Slicing type

Ashley—straight, slightly tapered fruit; 7 to 8 inches long; 66 days.

Cherokee—gynoecious hybrid; 7 to 7½ inches long; 63 days.

Gemini—gynoecious hybrid; multiple disease resistance; 8 to 8½ inches long; 61 days.

General Lee—tolerates cucumber mosaic virus.

Poinsett 76—open-pollinated; monoecious; 7 to 8 inches long; multiple disease resistance.

Salad Bush—monoecious hybrid with short (24-inch) vines; multiple disease tolerance; dark green fruit; adapted to containers, hanging baskets, and small gardens; AAS 1988.

Slicemaster—early gynoecious hybrid with multiple disease tolerance; 8 to 9 inches long; dark green color; 61 days.

Straight 8—white spine; AAS 1938 and still productive!

Sweet Success—greenhouse type; seedless; 12 to 14 inches long; best grown on trellis; some disease tolerance; AAS 1983.

Sweet Slice—hybrid; multiple disease tolerance; mild burpless; nonbitter; 10 to 12 inches long; 63 days.

Thunder—very early; strong disease package.

Eggplant

Eggplant is an extremely cold-sensitive vegetable, and early planting results in stunted plants. Direct seeding in the garden is not recommended. Start with transplants, either home grown or purchased. Use a starter solution (page 9) when setting out transplants.

You have a broad choice of varieties when ordering seeds from a catalog, but there is often little or no choice of varieties when purchasing plants. Most plant producers grow only Black Beauty, the old standard, late-maturing variety. New varieties and hybrids offer high yields, earliness, and a choice of size, shape, and color.

Eggplant is in the garden from spring planting until frost, so mulch plants to reduce summer's heat and drought stress. Side-dress eggplant when plants are half grown and again after first harvest.

Several diseases and insects attack eggplant. The most serious disease is Phomopsis fruit rot. The most serious insect pest is the flea beetle. This small, black insect eats many tiny holes in the leaves and may defoliate and kill plants.

Varieties

Black Beauty—old standard; low-spreading, bushy plant; fruit round to globe and dark purple; 80 days.

Florida Market—prolific over a long season; plants tall and upright; fruit long, cylindrical, glossy dark purple; Phomopsis resistant; 85 days.

Dusky—hybrid; extra early; free setting heavy yielder; fruit deep oval, glossy black; tolerant to tobacco mosaic virus; 63 days.

Millionaire—Oriental type with purple-calyxed, black fruit.

Endive and Escarole

These two strong-flavored leafy greens are commonly used in salads. Both are cool-season vegetables like lettuce and are best grown like head lettuce; transplants in spring and direct seeding in fall.

Endive has curly, finely cut leaves, while escarole has broad, flat leaves. Both have a somewhat coarse texture and a strong flavor that some interpret as bitter.

Varieties

Florida Deep Heart—broad, dark green leaves, creamy white heart; escarole type; 85 days.

Green Curled—finely cut, curled leaves; endive type; 95 days.

Gourds

Gourds are divided into several groups based on use and flower color. The small, hard-shelled ornamental gourds used for decoration have yellow flowers. Varieties within this group are Apple, Bell, Egg, and Crown of Thorns. Ornamental gourds belong to the same botanical group as summer squash, and they do crosspollinate.

The ultility gourds, dipper and birdhouse, have white flowers. The dishrag gourd (luffa) is a utility gourd with yellow flowers. This gourd can be eaten when young and is also known as running okra. The fruit can reach 2 feet in length and have prominent ribs, or it can be smooth.

Gourds are grown the same way as muskmelons, cucumbers, squash, and pumpkins. Vines are vigorous and spreading and will readily climb a support or trellis. Trellising results in better shaped gourds and keeps them off the ground, reducing rotting and soil staining.

Plant seeds about 1 inch deep when soil is warm and danger of frost is over. Space plants about 2 feet apart when not trellising. Utility and luffa gourds have large, vigorous vines and require a long growing season. Although mature gourds are not hurt by frost, vines of all types are sensitive to frost.

Fertilize as for squash and watermelons. Side-dress when the vines begin to run.

Harvest ornamental gourds in August or September when fruits

Continued on next page

become hard. Harvest dipper gourds when they turn tan or brown and luffa gourds when skin is yellow and can be easily removed. Harvest using clippers to avoid twisting or breaking the stems. Handle carefully to avoid cuts and bruises.

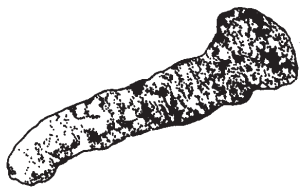
Following harvest, wash the ornamental, dipper, and birdhouse gourds in a non-bleaching disinfectant and place them in a dry location with good air circulation until thoroughly dry. Cure dipper and birdhouse gourds for several weeks in a warm, dry place. Gourds are very hard, and the seeds rattle when completely dry.

With luffa gourds, remove the yellow skin and seeds from the fresh gourds. Remaining fibers can be washed and dried in the sun. Luffa gourds dried with the skin on must be soaked in water for several days to soften the skin to ease its removal. Remove seeds, wash fiber mass, and dry in the sun.

After drying, colorful ornamental gourds can be waxed or dipped in shellac and hung by their stems to dry.

Major insect pests of gourds are cucumber beetles, squash bugs, squash vine borers, and pickleworms.

Horseradish



Horseradish is a hardy perennial plant that is normally grown as an annual. This cool-season root crop is not well adapted to Mississippi's climate and soils.

Start in early spring with root cuttings (sets) that are 8 to 14 inches long. Plant them 18 to 24 inches apart and 4 to 5 inches deep in a trench. Water and mulch to keep soil cool. Horseradish does best in deep, loose, fertile soil. Use a fertilizer high in potash to promote good root development. Keep side shoots removed to force development of one large root. This requires digging around the crown to cut off the side shoots. Harvest in the fall after frost.

Side roots not removed during growth can be removed at harvest, stored, and used to start another crop.

Jerusalem Artichokes (Sunchokes)

This relative of the sunflower produces fleshy tubers you can boil, fry, or eat raw.

In the spring, plant small tubers 2 to 3 inches deep and 18 to 24 inches apart. Stalks reach several feet in height and produce masses of attractive yellow flowers before frost in the fall.

Tubers can be harvested all winter and are best left in the ground until needed. Keep harvested tubers in a plastic bag in the refrigerator to prevent shrinkage.

Beware of this plant. It quickly becomes a weed from small tubers left in the ground at harvest.

Kale

This close relative of cabbage and collards is best grown in the fall garden. Light frost improves the flavor, and in some years, kale plants survive the winter to produce an early spring crop of leaves.

Sow seeds directly in the garden in late summer, and thin plants to stand 8 to 12 inches apart. Harvest the lower leaves, or cut the entire plant. Aphids and leaf-eating worms, such as cabbage loopers and imported cabbage moths, are the most serious pests.

Kale is available in two different types—a curly-leafed type that is normally used for eating and an ornamental type used for garnish. Be sure to grow the correct variety for eating.

Varieties

Dwarf Siberian—hardy; vigorous; large, coarse leaves; deep bluish-green color.

Vates—low, spreading; hardy; slow bolting; leaves curled.

Winterbor—very curly leaves; cold tolerant.

Black Magic—dinosaur type with dark green, crinkled leaves.

Kohlrabi

Known as stem turnip, kohlrabi is a rapid-maturing, cool-season vegetable that can be grown in both the spring and fall garden. This vegetable is not widely grown by Southern gardeners even though the hybrid variety, Grand Duke, was named an All America Selection in 1979.

Kohlrabi grows very well in Mississippi and is becoming popular as an alternative to chips for snack food. Thinly sliced raw roots are used with dips.

Thin seedlings to stand about 4 inches apart. Keep plants watered and fertilized so they won't become woody. The swollen stem can reach several inches in diameter but should be harvested at the 2-inch size.

Varieties

Grand Duke—hybrid; early; vigorous; 50 days; AAS 1979.

Purple Vienna—leaves and stem purple; stem flesh white; 55 days.

White Vienna—standard variety; light green; 55 days.

Lettuce

Both leaf and head lettuce grow well in Mississippi gardens in spring and fall. Leaf lettuce is more cold hardy, faster maturing, more shade tolerant, and a few varieties are more heat tolerant than head lettuce.

Start plants in a cold frame in late winter or early spring for transplanting to the garden, or sow seeds directly in the garden. Head lettuce seeds sown directly in the garden in very early spring make a good crop if May is a relatively cool month. Remember, garden head lettuce doesn't have to form a solid head before being harvested and used.

Lettuce transplants easily, and plants with plenty of growing space develop more quickly than those in the crowded seed row. Thin leaf lettuce to at least 4 inches apart, butterhead bibb types to 6 inches apart, and crisp head types to 10 to 12 inches apart.

All types of lettuce are relatively heavy feeders and need high nitrogen fertility. Because the root system is small and shallow, keep soil moist to promote rapid, constant growth. Lettuce does not grow well in hot weather without plenty of moisture, and even then it may become tough and bitter and go to seed.

Varieties

Crisp head types

Great Lakes—medium-sized; solid head; large, dark green wrapper leaves; slow bolting; frost resistant; resistant to tip burn; AAS 1944.

Leaf types

Black Seeded Simpson—old variety; large, upright plant; light green leaves; heavily frilled.

Grand Rapids—old popular home garden variety; large, erect, compact leaves; light green; wavy.

Prize Head—early; curled and frilly; outer leaves reddish-brown, inner leaves medium green.

Red Sails—deep bronzy-red ruffled leaves; attractive; slow to bolt; AAS 1952.

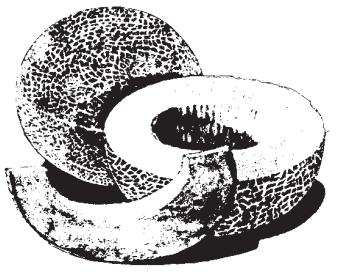
Salad Bowl—slow to bolt; large, upright leaves; light green; deeply notched; AAS 1952.

SloBolt—long-standing Grand Rapids type.

Butterhead types

Butternut Crunch—long standing bibb type; dark green outside leaves; AAS 1963.

Muskmelons (Cantaloupes)



Muskmelons are popular with gardeners who have plenty of space to accommodate their spreading vines.

Muskmelons do not tolerate cool temperatures or transplanting very well, so wait until the soil is warm before planting seeds. To warm the soil, use black plastic mulch, floating row covers, or plastic tunnels. Start transplants in individual containers like peat pots, and move them to the garden shortly after the seeds germinate and the soil is warm.

Muskmelons can be grown on a trellis, but the fruit must be supported with a sling. Control the vigorous vines by pinching out the growing terminals once the melon crop has set. Bees are necessary for pollination.

Muskmelons do not crosspollinate with cucumbers, squash, or watermelons, so off-flavor and poor quality are attributed to growing conditions (excess water while ripening, low soil fertility, and hot, cloudy weather).

Many newer hybrid varieties are resistant to major diseases.

Varieties

Ambrosia—hybrid; excellent flavor; 4-pound melons; light orange flesh; resistant to downy and powdery mildews.

Dixie Jumbo—hybrid; replacement for Hales Best Jumbo; salmon flesh; 4-pound melons; resistant to downy and powdery mildews.

Hales Best 36—round; well-netted; small seed cavity; salmon flesh; 87 days.

Magnum 45—hybrid; early; 3-pound melons; deep orange flesh; resistant to powdery mildew.

Mission—hybrid; western shipper type with no sutures; deep salmon flesh; 3- to 4-pound melons; resistant to powdery mildew.

Mustard Greens

Mustard greens are quick and easy to grow in spring and fall. Mustard does not tolerate heat and bolts (runs to seed) when weather warms in late spring. Plant seeds 4 to 6 weeks before the last frost in spring and 6 to 8 weeks before the first frost in fall. Several plantings, a couple of weeks apart, provide a continuous supply of mustard. Harvest by cutting entire plants, breaking off only the large leaves, or cutting plants to within an inch or so of the crowns, permitting regrowth for a second harvest. Curly leaved varieties trap a lot of sand that is difficult to wash off.

Varieties

Florida Broad Leaf—broad, flat leaf; sawtooth edge; the most popular garden variety.

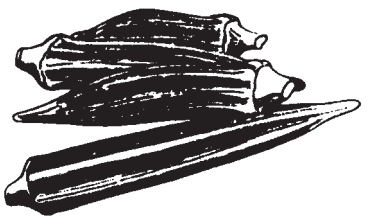
Green Wave—very curly leaf; AAS 1957.

Southern Giant Curled—very curly leaf.

Tendergreen (Mustard Spinach)—strap-shaped leaf; smooth.

Garnet Giant—attractive red leaves that turn green when cooked.

Okra



Okra is a hot-weather vegetable. Most varieties make large plants that require a fair amount of garden space. When two rows are planted side by side, leave extra space between the rows and on both sides to allow for easy harvesting.

Okra seeds are hard. Soak them in water overnight before planting to speed germination.

Space the seed about 4 inches apart in the row and thin seedlings to the recommended spacing, or plant groups of two or three seeds at the recommended final spacing and thin seedling groups to one plant. Planting through black plastic mulch is recommended to promote earliness. Okra seedlings are sensitive to cool, wet soils and cool air temperatures. Acid soils result in poor pod development.

A second planting of okra seeds about 6 weeks after the first planting ensures plenty of tender pods in late summer and fall when production on the early planting is declining.

Cut back tall okra plants to a height of 3 to 4 feet to promote branching, to make harvesting easier, and to renew the plants. Side-dress with a nitrogen fertilizer at the same time.

Harvest okra pods by snapping or cutting frequently. Even the spineless varieties cause some skin irritation, so wear long sleeves when harvesting.

Disease problems are generally minimal, but okra is sensitive to root knot nematodes. Insect pests are corn earworms, stink bugs, and ants.

Varieties

Annie Oakley II—hybrid; Clemson Spineless type; spineless pods slightly ribbed.

Burgundy—burgundy-colored

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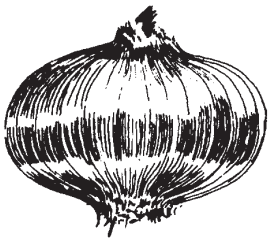
pods; dwarf plants grow to only 4 feet; plant has ornamental appeal with red in stems and leaves; AAS 1988.

Cajun Delight—five-sided; dark green pods.

Clemson Spineless—leading home garden variety; straight pods tapered, ridged, spineless; less foliage than Perkins Spineless; 65 days; AAS 1939.

Onions



Onions are grown for green-topped salad onions and dry bulb onions. Select a loose, fertile soil and start with transplants, small dry bulbs (sets), or seeds. Set out transplants in late winter and early spring, depending on location, and use for both salad and bulb onions. Onion sets planted in early spring also produce salad onions and bulbs. Fall-planted sets produce fall salad onions and when overwintered, produce spring salad onions and bulbs.

Onion seeds are normally planted in fall (September to October) for the production of transplants, but few gardeners go to the trouble of raising their own onion plants.

Separate onion sets into two sizes—smaller than a dime and larger than a dime—before planting. The small sets planted in spring make bulb onions, and planted in fall, may survive the winter to make bulb onions. Large sets planted in spring or fall generally flower and should be used for green salad onions since onion plants that flower do not mature into good dry bulbs.

Space sets and transplants for bulb onions 4 to 6 inches apart in the garden row. Onion plants have shallow roots and are subject to injury from dry soils. Side-dress with a nitrogen fertilizer once or twice to encourage strong and vigorous growth.

As onion bulbs begin to mature, the tops yellow and fall over. Lifting the bulbs gently with a turning fork to break some of the roots hastens maturity. Do not bend over the tops to hasten maturity. This practice reduces bulb size and opens the onions to neck rot.

The onion varieties grown for bulbs in the South do not make strong-flavored, hard-storage type bulbs. The soft, sweet Southern onions keep for several weeks, but plan to use them rapidly.

Varieties

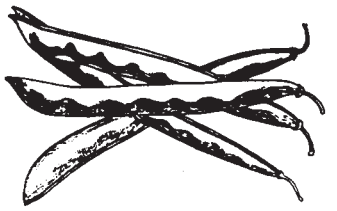
Crystal Wax—white skin and flesh; standard variety; flat, medium-sized bulb; soft, mild flesh; also used for green salad onions.

Granex 33—Vidalia type onion; hybrid; thick, flat globe shape; yellow skin; fair storage quality; mild, sweet flavor; susceptible to pink root.

Granex 429—yellow skin; deeper shape than Granex 33 and several days later maturing; mild, sweet flavor.

Texas Grano-1015 Y—yellow skin; globe shape; sweet and mild; resistant to pink root.

Southern Peas



Field pea, cowpea, and protepea all are names used for the southern pea. There are numerous types and varieties with many old family favorites in the seed trade. Gardeners classify peas several different ways: seed color, pea size and shape, and pod color. Small-sized pea and pod types are referred to as lady peas. Other common types are crowders, creams, blackeyes, pinkeyes, purple hulls, and silver skins.

Do not plant this warm-weather vegetable early in cool soil. Peas grow in all soil types but are sensitive to high levels of nitrogen fertilizer and respond by making all vine and few pods. Older varieties have a tendency to make a vine; newer varieties are semi-vining to bush type.

Seed quality and variety are important to success when growing peas. Varieties such as Mississippi Silver, Mississippi Purple, Magnolia Blackeye, Mississippi Cream, and Mississippi Pinkeye have multiple disease resistance (fusarium, root knot nematode, and several strains of virus) and perform better than varieties that possess no disease resistance, such as California Blackeye, Knuckle Purple Hull, and Bunch Pinkeye.

Major disease problems are fusarium wilt, several viruses, root knot nematodes, and pod rots. The most serious insect problems are cowpea curculios, aphids, and stink bugs.

Varieties

Louisiana Quickpick—bears pink-eyed, purple-hulled pods above the foliage.

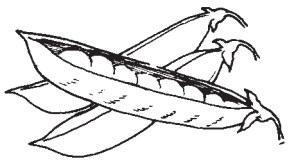
Magnolia Blackeye—green pea is light green to cream with black eye; mature green pod is light green to cream; mature pods are tan; plant is small, and pods are not held up well; plants have multiple disease resistance.

Mississippi Purple—brown crowder type; green pea is large, turning to brown seed; mature pod light green to purple turning brown when dry; semi-vining type plant with multiple disease resistance.

Mississippi Silver—brown crowder type; green pea is large turning to brown seed; mature pod is green turning silvery and then yellow; large, semi-vining plant with multiple disease resistance.

Pinkeye Purple Hull-BVR—a typical pinkeye type but with resistance to blackeye cowpea mosaic virus.

Peas (English, Snap, Snow)



English peas require early spring planting in order to mature before warm weather destroys them. Prepare the planting site in fall by adding all fertilizer except nitrogen. Prepare a high bed so that planting is possible when the rest of the garden may be too wet.

Some varieties of English peas have smooth seeds and others have wrinkled seeds. Smooth-seeded peas have a starchy flavor, even when young, and are used mostly for canning. Wrinkled-seeded peas are sweet when young and are slower to lose quality.

Soil temperatures at planting should be at least 45 °F for good germination. Plant seeds 1 inch deep and 1 inch apart. Allow 8 to 10 inches between double rows. Some form of support makes harvesting easier and keeps vines off the ground, reducing losses to pod rot. Tall varieties must be supported. Double rows of short vine types support themselves. Mulch to keep soil around roots cool and moist.

Grow sugar peas (snow peas) the same way as English peas. Harvest edible pods while still young and tender, and before peas enlarge. Edible-podded peas are also grown like English peas. Plants and pods resemble English peas, but the pods as well as the enlarged peas are eaten together without shelling. Sugar Snap, a 1979 AAS Gold Medal winner, has tall vines that require support. More recently developed varieties have short vines.

Varieties

English peas

Alaska—smooth seed; canning type; early; 28-inch vines; 52 days.

Green Arrow—midseason; wrinkled seed; 24- to 28-inch vine; 4½-inch pods; 9 to 11 peas per pod; resistant to downy mildew and fusarium wilt; 68 days.

Little Marvel—old variety; wrinkled seed; 15-inch vines; early; 3-inch pod; 6 to 8 peas per pod; dark green pea; 62 days.

Thomas Laxton—early; wrinkled seed; 28- to 34-inch vine; 3½-inch pod; 6 to 8 peas per pod; large pea; excellent quality; 61 days.

Wando—midseason to late; small pod; 24- to 30-inch vine; tolerates some heat; 3-inch pod; 6 to 8 peas per pod; 70 days.

Snap peas

Snappy—large pods; 8 to 9 peas; vines 6 feet; mildew resistant; 63 days.

Sugar Ann—bush-type plant; 18 to 24 inches tall; AAS 1984.

Sugar Bon—2- to 3-inch pods; weather tolerant; vines 18 to 24 inches; powdery mildew resistant; 56 days.

Sugar Daddy—stringless; easy to pick; 74 days.

Sugar Snap—4- to 6-foot vine; thick-walled, edible pod; 2½- to 3½-inch pods; wilt resistant; 68 days; AAS 1979.

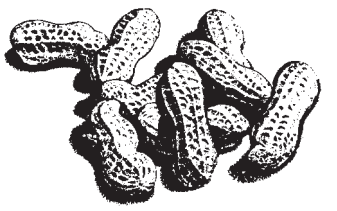
Snow peas

Dwarf Gray Sugar—early; 3-inch, light green pods; vines 2 feet tall.

Mammoth Melting Sugar—4-inch pods; 4-foot wilt-resistant vines.

Oregon Sugar Pod II—4-inch pods; 28-inch disease resistant vines.

Peanuts



Peanuts are divided into four general categories according to plant and nut types: Virginia, Runner, Spanish, and Valencia. Virginia and Runner types are mostly low-growing plants with two large seeds per pod and are the best garden types. Spanish and Valencia types are mostly erect plants, small-seeded, with the Spanish having two to three seeds, and the Valencia three to four seeds per pod.

Peanuts grow best on coarse-textured, sandy loam soils. On fine-textured soils, the Virginia and Runner types are difficult to harvest, and many pods may be left in the ground.

Peanuts are good users of residual fertilizer in the soil and may not need additional fertilizer. Soils of low fertility require about 10 pounds of 0-24-24 or equivalent per 1,000 square feet. Soils of medium fertility require about 7 pounds per 1,000 square feet. Peanuts are very sensitive to low soil pH and low levels of soil calcium.

Remove seeds that are still in the pods, being careful not to damage the seed coat or split the seed. Use one-half pound of seed per 100 feet of row. Virginia and Runner types require 3 feet between rows, with plants 3 to 4 inches apart in the row. Plant Spanish types closer together (in rows 2 feet apart with 2 to 3 inches between plants). Plant on a wide, slightly raised bed. Cover seeds with 1½ to 2 inches of coarse-textured soil. On fine-textured soils, 1 inch is deep enough.

Inoculate the peanut seed where a well nodulated peanut or southern pea crop was not grown on the garden site the preceding year. Buy a fresh commercial peanut inoculant and apply it to the seed immediately before planting.

To prevent poorly developed pods, sprinkle about 2½ pounds of gypsum or basic slag per 100 feet of garden row over the plants when they begin to flower.

Because peanut plants are low-growing, close cultivation is difficult. Keep weeds under control and soil free from crusts that interfere with the pegs (young undeveloped peanuts) entering the ground. Do not throw or pull soil to the plants while cultivating because this kills leaves, interferes with flowering, and increases the chance for disease.

Once pods are developing in the soil, cultivation causes injury and weeding close to the plants must be done by hand.

Peanuts are relatively tolerant to dry soils when compared to some other garden vegetables. However, they need plenty of water when flowering vigorously and when pegs are entering the soil. A water shortage at this time greatly reduces yields. Water is also important as harvest approaches. Do not water peanuts as they begin to mature. The Virginia and Runner types have good seed dormancy, but Spanish types may sprout if watered.

As peanuts mature, leaves turn yellow. Since plants flower over a period of weeks, all pods do not mature at the same time. False maturity (plants yellowing) caused by disease reduces yields. From 120 to 150 days are required from planting to maturity.

Dig when about 75 percent of the inner hulls of Spanish types and 65 percent of the inner hulls of Runner types are brown.

Dig the whole plant with a turning fork, being careful to break off as few pods as possible. Freshly dug green peanuts are excellent for boiling. After several days of exposure to good drying conditions, the moisture content of the peanuts drops from 50 percent to about 20 percent. Move plants to a warm, airy place for 2 to 3 weeks to complete curing before pulling the nuts from the plants.

Yields vary with planting date, soil pH, growing conditions, and type grown. Virginia and Runner types yield about 1 bushel (green-35 to 45 pounds; dry-15 pounds) of peanuts per 100 feet of row.

Major diseases attacking garden peanuts are leafspot, stem and pod rot, and nematodes. Control these diseases by changing the location of peanuts in the garden every year. Also, remove all dead plants and leaves from the garden site or turn them under in the fall to allow time for decomposition.

Control most leafspot diseases by regularly applying fungicides containing chlorothalonil or maneb. Sanitation is the best way to control stem and pod rot caused by southern blight.

Control velvet bean caterpillars, corn earworms, fall armyworms, and thrips with carbaryl (Sevin). Control aphids with malathion.

Peppers

Garden peppers, both hot and sweet, are generally purchased as transplants from a local distributor at planting time. Peppers grow well on black plastic mulch. Use a starter solution when setting plants in the garden. Growing transplants from seeds takes 10 to 12 weeks. Direct

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seeding in the garden is not recommended.

All peppers are sensitive to excessive nitrogen fertilization. Too much fertilization will cause blossoms and small pods to drop off. Hot daytime temperatures and cool nighttime temperatures also cause blossom drop. Problems with peppers other than blossom drop are blossom end rot (resulting from drought and acid soils), southern stem blight, sunburn, leaf diseases, anthracnose, viruses, and aphids.

Varieties

Sweet peppers

Bell Boy—hybrid; medium long; blocky; mostly 4-lobed fruit; tolerant to tobacco mosaic virus; heavy set; AAS 1967.

Big Bertha—hybrid; elongated bell type; resistant to tobacco mosaic virus.

California Wonder—thick walled; blocky fruit; 3 to 4 lobes.

Emerald Giant—large, 4-lobed blocky fruit; tolerant to tobacco mosaic virus.

Jupiter—early; large and blocky; mostly 4-lobed; medium-dark green turning red at maturity; tolerant to tobacco mosaic virus.

Keystone Resistant Giant—large pendant, blocky fruit; resistant to tobacco mosaic virus.

Sweet Banana—Sweet Hungarian type; 6 inches long; tapered; light yellow turning red.

Hot peppers

Cayenne—dark green turning red; 6 inches long; processing type for drying and sauce; concentrated fruiting habit; strong 24-inch plants.

Habanero—a Caribbean favorite; golden-orange lantern-shaped fruit. Be careful.

Hungarian Wax—canary yellow fruit; 6 to 8 inches long; turns red when ripe.

Jalapeno—very hot; thick-walled; tapered green fruit turning red; 3 inches long.

Super Chili—hybrid; thin-walled, tapered fruit; 2½ inches long; fruit held upright on small plants; ornamental value; AAS 1988.

TAM Mild Jalapeno—mildly hot jalapeno type; dark green; thick wall; productive.

Irish Potatoes

Most garden Irish potatoes are grown in the spring, since good seed potatoes are impossible to find for fall planting. This is one of the few vegetables recommended for growing in mildly acid soil. A soil pH below 6.0 is acceptablebecause it retards development of potato scab disease.

Prepare garden rows in fall by building a high bed that will permit early spring planting. Small whole potatoes or cut pieces of large potatoes are referred to as seeds. Use certified seed potatoes that are not shriveled or black on the inside when cut. Do not use potatoes left over from last year's garden because they may be diseased and result in low yields. Do not use potatoes from the grocery store, since the variety may be unadapted and the potatoes may have been treated to prevent sprouting.

Cut seed potatoes into pieces weighing 1½ to 2 ounces with at least one eye per piece. Small seed pieces produce weak plants; large pieces are a waste of seeds. Cut seed potatoes several days before planting and hold them at room temperature spread in a single layer to allow the cut surfaces to dry and heal. This reduces seed piece rot following planting. You need 1 pound of seed potatoes to plant about 10 feet of row; 10 pounds should plant 100 feet of row. Space seed pieces 10 to 12 inches apart and cover with 3 to 4 inches of soil.

Spring-planted potatoes normally bloom, and some of the flowers develop into fruit that look like small green tomatoes. These fruits, the green areas on the skin of potatoes that have been exposed to light, and sprouted potato eyes contain a poisonous substance that may cause illness if eaten. Prevent greening of potatoes by keeping them covered with soil as they grow, and keeping them in the dark after harvest.

Some gardeners prefer to grow potatoes in straw mulch. Potatoes grown in such a manner are clean and easy to harvest. Cover seed pieces with 1 inch of soil. When green sprouts appear, place 4 to 5 inches of straw around the plants. Keep the layer of straw deep and moist. When potato vines die, harvest potatoes by carefully removing the straw.

Problems with Irish potatoes are seed piece rot resulting from planting in clay, wet soils; enlarged lenticels (warts) and tuber rot from excessive soil moisture near harvest; early blight; Colorado potato beetles; and aphids.

Most varieties have white flesh and light brown or red skin. Some specialty varieties have yellow or dark flesh.

Varieties

Atlantic—light brown.

LaChipper—light brown.

Norland—early; red; oblong-shaped; shallow eyes.

Red LaSoda—midseason; red; oblong-shaped; deep eyes.

Red Pontiac—midseason; red; oblong-shaped; deep eyes.

Superior—midseason; light brown.

Norchip—early; light brown; round to oblong; shallow eyes.

Sweet Potatoes

This tropical root crop is started from small plants called slips or vine cuttings. Slips are produced by sprouting sweet potato roots in moist sand or sawdust. Cover roots in a box or bed with 3 to 4 inches of sand or sawdust, water, and keep warm (80 °F). In a few weeks when sprouts are several inches long, pull them from the roots. Additional slips develop and can be used for later planting.

Before planting sweet potato slips (homegrown or purchased), cut about 1 inch from the base of the stem to reduce disease problems. Use starter solution when setting slips in the garden.

Vine cuttings are slips cut at the bed surface with no roots or cuttings taken from the ends of slips set in the garden earlier. They have the advantage over slips of further reducing disease and insect problems. Vine cuttings several inches long can be made until July 1. These cuttings root rapidly when set in warm, moist soil.

Sweet potatoes need warm soils and about 90 to 110 days from setting the plants until harvest. Even good roots will produce poor yields if the soil is clay, wet, or overfertilized with nitrogen. A good sweet potato fertilizer has a ratio of 1-2-4. Select a loose, well-drained soil that allows for root growth and easy digging. Side-dress 3 to 4 weeks after transplanting with a low nitrogen, high potash fertilizer. Many sweet potato varieties flower in late summer. Sweet potato flowers are similar to morningglory.

Dig sweet potatoes when the soil is fairly dry and the air is warm. Early harvest results in many small roots. Late harvest results in jumbo roots and possible cold injury. Do not let freshly dug potatoes sit in the sun; they scald easily. If exposed to temperatures below 50 °F, potatoes may develop hard spots in the roots, a condition known as hardcore, or be chilled and begin to break down.

Problems in growing sweet potatoes are sweet potato weevil in the southern half of the state, larvae of various insects that burrow into the roots, and the diseases scurf (soil stain) and soil rot. Clip the base of the slips before planting or use vine cuttings to reduce scurf infection. Acid soils help to control soil rot. Cracks in the roots indicate nematode damage or interrupted growth caused by periods of drought.

Varieties

Beauregard—light rose skin; moderately deep orange flesh; high yielding; some disease resistance but not resistant to nematodes.

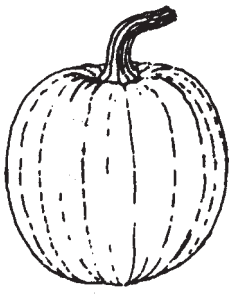
Centennial—variably tapered to cylindrical root shape; medium to large size; orange skin; deep orange flesh; vines thick and vigorous.

Jewel—blocky shape; smooth copper skin with rose blush; orange flesh.

Unit I Porto Rico—old variety; no field disease resistance; root shape variable; copper skin; yellow-orange flesh.

Nancy Hall—popular old variety with no disease resistance; light orange flesh.

Pumpkins



Most garden pumpkins are planted for Halloween. Pumpkins planted in spring, when summer squash, cucumbers, and melons are planted, mature in midsummer, long before Halloween. If left in the garden, they rot. Therefore, they must be harvested and used or stored in a cool, dry place. Pumpkins for Halloween are best planted in late June and early July. They require 90 to 110 days from planting to harvest.

Most pumpkin varieties produce strong, running vines that require plenty of garden space. Some varieties are described as having short vines and are adapted to limited space.

Pumpkins crosspollinate with summer squash, acorn squash, vegetable spaghetti, and small ornamental gourds if they are growing nearby. This is of no concern unless you plan to save seed for another year.

Jumbo pumpkins belong to a different squash group from Halloween pumpkins, and they crosspollinate with many types of winter squash.

The tan pumpkins Kentucky Field and Dickinson Field belong to a third group and crosspollinate with butternut squash.

All of this crossing results in some strange looking volunteer squash-pumpkins in the garden or compost pile the next year.

Pumpkin seeds saved from harvested pumpkins make a nice snack food when roasted. Some pumpkin varieties have seeds with no hulls. Never eat seeds that were purchased for planting because of insecticides and fungicides used as seed treatments.

Problems in growing pumpkins are cucumber beetles, squash bugs, pickleworms, squash vine borers, and powdery and downy mildews.

Varieties

Autumn Gold—hybrid; early; 7 to 10 pounds; fruit begin turning gold at an immature stage; AAS 1987.

Big Max—50 to 100 pounds; fairly round; pinkish orange; rough.

Connecticut Field—20 pounds or more; fairly round; deep yellow-orange; thin, hard shell; thick, coarse flesh.

Cushaw—12 pounds; skin cream-white mottled with irregular green stripes; bulbous blossom end with medium-long curving neck; thick, sweet flesh.

Jack Be Little—miniature pumpkin; 3 inches across, 2 inches high; not edible; for decoration only; small pumpkins last several months.

Jack O'Lantern—10 pounds; medium orange; smooth, shallow ribs.

Prizewinner—hybrid; traditional color and shape; up to twice as big as Big Max.

Spirit—hybrid; 12-inch diameter; 10 to 15 pounds; deep oval; bright orange; semi-bush; AAS 1977.

Spookie—small; average 6 pounds; dark orange; thick, fine-textured, sweet flesh.

Triple Treat—6 to 8 pounds; round; thick flesh; seed with no hulls.

Radishes

Radishes are quick maturing cool-season vegetables for spring and fall gardens. They are ready to harvest within 4 weeks of planting and rapidly pass into a pithy, unusable condition. Radishes that produce only tops result from being planted too thick (late thinning), too much shade, or hot temperatures. Black spots in radishes may indicate boron deficiency. Dissolve 1 level tablespoon of household borax in 3 gallons of water and apply to 100 feet of garden row. Use proportionately smaller amounts for shorter rows.

Some large-root types designated as winter radishes are recommended for the fall garden. They remain crisp longer than small types, are more pungent, and are best grown like fall turnips.

Varieties

Champion—scarlet; deep oval; large root and top; 28 days; AAS 1957.

Cherry Belle—round globe; cherry red skin; crisp, solid flesh; short top; 21 days; AAS 1949.

China Rose—winter type; deep rose skin; white flesh; pungent; long; 52 days.

Round Black Spanish—winter type; large globe shape; 3½- to 4-inch diameter; black skin; pungent white flesh; 55 days.

Scarlet Globe—bright scarlet globe; crisp; white; mild flesh; 24 days.

Snowbelle—hybrid; white; round root; crisp; mild; 30 days.

White Chinese (Winter Cel-

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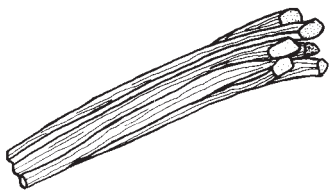
estial)—winter type; 6 to 8 inches long; 3-inch diameter; crisp; white; mild flesh; 60 days.

White Icicle—long; white; crisp; tapered to a point; 28 days.

Rhubarb



This cool-season perennial vegetable is not adapted to Mississippi's hot summers, wet winters, and clay soils. The plant may survive but will not thrive. Rhubarb grows best where summer temperatures do not exceed 75 degrees. Plants are subject to attack by a number of fungi, resulting in crown rot.

If you want to grow rhubarb, select a well-drained soil in a lightly shaded area. The shade reduces summer temperatures. Raised beds provide additional drainage, which may help reduce disease problems.

Set the large, fleshy crown in early spring so the bud is about 1 inch below the soil surface. Each plant needs 4 to 6 square feet of growing space.

Normally, harvest should not begin until the second or third year to allow establishment, but the plants might not live that long in Mississippi. Harvest by pulling the large outer stalks and leaving the small inner stalks to enlarge. Do not eat the leaf blade because it is poisonous. Following harvest, apply a small amount of nitrogen fertilizer around each plant. Mulch plants in late fall and again in early spring. Before growth starts in spring, apply a small amount of mixed fertilizer, such as 13-13-13, around each plant. If plants develop a flower stalk in summer, remove it at first appearance.

Spinach, New Zealand Spinach, and Malabar Spinach

Fresh spinach is a popular salad vegetable. A cool-weather green, spinach is adapted to growing in spring, fall, and winter gardens. Spinach grows best on a well-drained soil rich in organic matter with a pH approaching 7.0. It grows poorly on soils with a pH below 6.0. Spinach plants are shallow-rooted and require adequate soil moisture. Plant spinach seeds 4 to 6 weeks before the last frost in spring and 6 to 8 weeks before the first frost in fall. Soak seeds in water overnight to soften seed coats and hasten germination. With ideal growing conditions, spinach is ready to harvest in 45 to 50 days from planting. Harvest entire plants, individual large outer leaves, or clip plants, leaving about an inch for regrowth.

New Zealand spinach is a hot-weather leafy green. It is not a true spinach, but the tender young shoot tips are used in similar ways. It grows rapidly, has many branches, and prefers a well-drained loamy soil, rich in organic matter. Being a hot-weather plant, the seeds of New Zealand spinach should not be planted until the soil is warm. Soak seed in water overnight before planting to aid germination. Space plants 12 to 18 inches apart in the garden row. Side-dress plants with a little nitrogen fertilizer every 4 to 6 weeks.

Malabar spinach is a tropical, vining plant that does best in hot, humid weather. Easily grown from seed, the plant makes an attractive vine that should be trellised to keep it off the ground. There are two leaf types, red and green. Individual leaves or the tender young shoot tips can be used as a hot-weather spinach substitute.

Varieties

Chesapeake—hybrid; semi-savoy; bolts rapidly; large, upright plant; overwinters; recommended for fall planting.

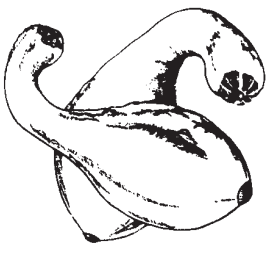
Dixie Market—compact, upright plant; savoyed; recommended for fall, winter, and spring planting.

Long Standing Bloomsdale—large; savoy leaf; semi-upright plant; recommended for spring planting.

Melody—hybrid; semi-savoy; upright plant; recommended for early spring and fall planting; AAS 1977.

Skookum—hybrid; early; dark green; semi-savoy leaf; upright; resistant to downy mildew.

Summer Squash



All summer squash (straight neck, crookneck, bush scallop, and zucchini) are actually true pumpkins. They crosspollinate with each other as well as Halloween type pumpkins, spaghetti squash, and small ornamental gourds. All this crossing does not affect the quality of the current season's production.

Summer squash have a tender skin and are harvested at an immature stage, generally within 4 to 6 days after bloom. The plants are bush type rather than vining and are suited for small gardens. Most new varieties are hybrids.

Summer squash have separate male (attached to the plant by a thin stem) and female flowers (small squash behind the yellow blossom) on the same plant and depend on bees for pollination. Hybrids may produce a few female flowers before male flowers appear, and without pollination, these fail to develop into squash.

Plant summer squash seeds in hills about 3 feet apart, with 3 to 4 seeds per hill or in a row with single seeds spaced about 1 foot apart. Space single plants about 3 feet apart. Crowding leads to low production and disease.

Squash do well on black plastic mulch in spring, especially when planted early. They benefit from warm soil and lack of weed competition. Fall squash can be grown by planting seeds in August, but mosaic virus has been a serious problem in recent years.

Side-dress plants with a nitrogen fertilizer when they have several leaves but before they start to bloom.

Proper harvesting is important for continuous production. Remove all large and overmature squash. This problem is more serious with zucchini than with other types of summer squash.

Several serious insect pests attack squash plants: spotted and striped cucumber beetles, squash bugs, stem borers, and pickleworms. A regular spray program with carbaryl (Sevin) helps reduce damage from these insects.

Disease problems are mainly fruit rot on crowded, shaded plants and mosaic virus.

Varieties

Aristocrat—hybrid zucchini; cylindrical fruit; smooth; uniform; dark green; 53 days; AAS 1973.

Bush Scallop—scalloped white to pale green fruit; 55 days.

Butterbar—hybrid yellow straightneck; long, cylindrical; butter yellow; small seed cavity; 49 days.

Medallion—hybrid; crookneck; lemon yellow.

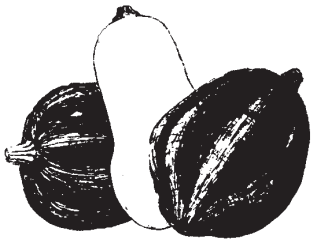
Early Prolific Straightneck—popular old variety; creamy yellow; straight; slightly tapered; 52 days; AAS 1938.

Early Summer Crookneck—popular old variety; yellow; small, curved neck with bulbous blossom end; 55 days.

Senator—hybrid zucchini; 6 to 7 inches long; medium green.

Sunburst—hybrid scallop; bright yellow with green at blossom and stem ends; AAS 1985.

Winter Squash



These hard-shelled squash are grown for harvest in fall and storage through early winter months. Acorn and Butternut are the two most popular types, but the group includes many others, such as buttercup, spaghetti, hubbard, banana, marrow, and turban. Some of the pumpkins, such as cushaw and Kentucky Field, are treated as winter or storage squash. An odd assortment of local squash called "aboveground sweet potatoes" fall into this group.

Most of these squash have strong vining plants. The fruit range in size from the small acorn and hybrid Early Butternut to the large banana and hubbards. Winter squash planted in spring along with summer squash mature in midsummer. These fruit lack the eating quality of those produced on plants from seeds planted in late June or early July along with Halloween pumpkins.

Delay harvest until the fruit rind is very hard and vines begin to die. Immature fruit of most varieties are tasteless. Yellow acorn varieties are edible at all stages of maturity. All winter squash are pollinated by bees and require 60 to 70 days from pollination to maturity.

Varieties

Early Butternut Hybrid—mature fruit are tan; excellent flavor and texture; stores well; viney but not overly vigorous; AAS 1979.

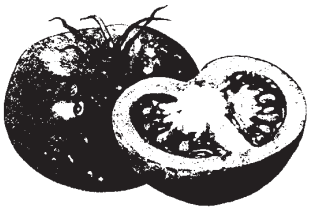
Sweet Mama—hybrid; dark green; 2 to 3 pounds; flattened; round; Buttercup type fruit; orange flesh; stores well; vigorous vines; AAS 1979.

Table Queen—acorn type; small fruit; dark green; deeply ridged; smooth and hard; yellow flesh; bush type plant.

Vegetable Spaghetti—fruit 8 to 10 inches long, 3 pounds; yellow when mature; cooked flesh is greenish-white, spaghetti-like strands; flavor is bland; prolific vine; 90 days; orange-fleshed type also available.

Waltham Butternut—large, tan fruit; 3 pounds; uniform shape; orange flesh; stores well; vigorous vine; AAS 1970.

Tomatoes



The tomato is the most popular garden vegetable. Tomatoes come in many shapes, sizes, and colors, but the most popular is the medium-sized (6 to 8 ounces) red globe.

Tomato plants require full sun, moderate amounts of fertilizer, staking or caging, and an insect and disease control program. Determinate (short, self-topping) varieties like Celebrity, Mountain Pride, and Mountain Spring are gaining in popularity, but the indeterminate varieties like Better Boy are used more widely.

Most tomatoes are set out as transplants, since it takes several weeks longer to harvest from tomatoes planted as seeds. Do not set out transplants too early in the spring. Cool soils as well as cool air temperatures chill plants, resulting in delayed harvest. Use a starter solution when setting the transplants. If transplants have small fruit at planting time, remove fruit to prevent stunting the plants.

Plants set out in spring are sometimes maintained through the summer in hopes of a fall crop. With mulching, irrigation, fertilization, and a good pest control program, this is possible, but the fall fruit that develop are frequently small. This results from failure to maintain a season-long pruning program. A second planting of tomatoes for a fall crop provides large, attractive fruit. Start seedlings in June and set plants out in July or early August. You can use rooted cuttings (suckers) that were removed in pruning to start a second planting.

Set tomato transplants deeper than they were growing in the plant bed, peat cup, or plastic tray; the deeper the better.

All garden tomato plants, indeterminate as well as determinate, must be supported off the ground in some manner to prevent loss of fruit to rots and sunburn. Wooden stakes, placed at planting time or shortly after, are the most common type of support.

Wire cages at least 18 inches in diameter made from concrete reinforcing wire are also popular. Cages wrapped with clear plastic to a height of 18 inches provide some protection from cold winds and wind-blown sand. Black plastic mulch laid before planting, in combination with plastic-wrapped cages, is beneficial to early plants.

Staked plants in a row do not have to be tied directly to the stakes. They can be supported by nylon cord that runs from stake to stake, down the row on both sides of the stakes, and at several levels (Florida weave).

Tomato plants form many branches (suckers) as they grow. It is a common practice to break the suckers out of the plants to encourage larger and earlier fruit and to make the plant easier to tie and spray. Determinate types are not pruned as heavily as indeterminate types, and in no instance are all the suckers removed.

Products advertised to promote fruit development by spraying on the flower clusters are useful at times but should not be counted on for all the fruit set. When conditions are not ideal (shade; cool, wet weather; high temperatures) for natural pollination, these sprays are useful. Fruit that develop entirely from these sprays, with no natural pollination, do not have seeds and are not the best quality.

Tomatoes are attacked by a number of diseases and insects. The most serious diseases are early blight (no resistant varieties), spotted wilt virus (BHN 444 and Amelia are resistant varieties), fusarium wilt, blossom end rot, and root knot nematodes. Regular use of fungicides containing maneb or chlorothalonil controls early blight and several other leaf and fruit dis-

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eases. Plant disease-resistant varieties to reduce disease problems. Disease resistance is indicated in the variety descriptions below by a series of letters, V, F, N, and T. The V indicates resistance to verticillium wilt, F for fusarium wilt, N for root knot nematodes, and T for tobacco mosaic virus.

Major insect problems are aphids, thrips, stink bugs, blister beetles, fruit worms, horn worms, leaf miners, and white flies.

Problems are blossom end rot (low soil calcium, lack of water), fruit cracking (excess water and high temperatures), sudden wilting (root damage from cultivation or drowning), blossom drop (low or high temperatures, poor nutrition), and sunscald (excessive pruning, no plant support, or loss of leaves to disease).

Varieties

I--indeterminate

D--determinate

Amelia—large-fruited with tomato spotted wilt virus resistance; D.

Better Boy—VFN hybrid; 8- to 12-ounce red fruit; 72 days; I.

Big Beef—large-fruited beef stake with good disease resistance; I; AAS 1994 .

Celebrity—VFNT hybrid; 7- to 8-ounce red globe; firm, flavorful fruit; D; 72 days; AAS 1984.

Cherry Grande—VF hybrid; large cluster of 1½-inch firm, round, red fruit; D; 60 days.

Floramerica—VF hybrid; 8- to 12-ounce red fruit; 76 days; D; AAS 1978.

Floradel—F; 8-ounce red fruit; 75 to 85 days; I; old variety; open-pollinated.

Marion—F; 6-ounce red fruit; 79 days; I; old; open-pollinated.

Mini Charm—miniature cherry tomato with indeterminate growth and abundant production.

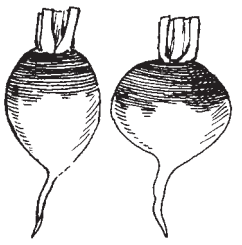
Mountain Spring—VF hybrid; early; resistance to cracking; D.

Park's Whopper—VFNT hybrid; large fruit; I; 70 days.

Super Fantastic—VF hybrid; 8-ounce red fruit; 70 days; I.

Sweet 100—hybrid; large clusters of 1-inch, round, red fruit; I; 65 days.

Turnips and Rutabagas



Turnips are grown for both leaves (greens) and roots in the spring and fall garden. For greens, it is not necessary to thin seedlings, and there are varieties just for greens. For roots, thin seedlings to 2 to 4 inches apart.

Rutabagas are a fall crop with planting recommended in August or early September. Roots require 4 to 6 weeks longer to mature than turnip roots. Thin rutabaga seedlings to at least 6 inches apart (12 inches preferred) in the row. Rutabaga leaves can be eaten.

Hot weather causes turnips to be strong-flavored or bitter and pithy. Black spots inside the roots indicate a need for boron. Dissolve 1 level tablespoon of household borax in 3 gallons of water and apply to 100 feet of row. Use less for shorter rows.

Major problems are aphids, leaf-eating worms, and leaf spots.

Varieties

All Top—hybrid; broadleaf turnip for tops only; dark green; 50 days.

American Purple Top—rutabaga; 4- to 5-inch diameter; spherical; purple-red crown; pale yellow flesh; 90 days.

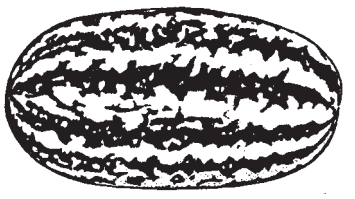
Just Right—hybrid; root and top type; white root; broad, serrated leaf; 60 days; AAS 1960.

Purple Top—old standard; root and top type; white globe root with purple crown; 57 days.

Seven Top—leaf type; cut leaf; dark green; 45 days.

Tokyo Cross—hybrid; root and top type; semi-globe; white root; early; 35 days; AAS 1969.

Watermelons



Most watermelon plants require a lot of space and quickly take over a small garden. Some varieties are described as having short vines. Those described as having bush-type plants may be disappointing.

Varieties are available that produce large or small, round or oblong, solid or striped fruit with red or yellow flesh, with seeds or seedless.

Plant when the soil is warm and all danger of frost has passed. Watermelon transplants in peat cups or plastic trays can be used, but they must be small (not yet vining) to avoid plant injury. Use transplants with seedless melons because the seed is small, expensive, and slow to germinate. For seedless melon transplants, plant the seeds with the rounded end down and the pointed end up.

Hot kaps, black plastic mulch, floating row covers, and plastic tunnels are ways to obtain earliness. Black plastic also controls weeds. You can use transplants or seeds in combination with black plastic mulch. With normal vining melons, plant several seeds in groups spaced about 6 feet apart. Thin seedlings to two plants in each group. With seedless melons, it is necessary to plant some standard melons close by to provide pollination. All watermelons are pollinated by bees and require about 45 days from pollination to maturity.

Disease problems are anthracnose, fusarium wilt, gummy stem blight, and bacterial wilt. Insect problems are striped and spotted cucumber beetles.

Varieties

Bush Charleston Gray—bush-type plant; 10- to 13-pound melons; red flesh.

Bush Jubilee—bush-type plant; 10- to 13-pound oblong fruit; red flesh.

Charleston Gray—30 pounds; oblong; light green; bright red flesh and dark seeds; some disease resistance.

Crimson Sweet—23 to 30 pounds; semi-round; distinct striping; thick, hard rind; sweet, red flesh; some disease resistance.

Jubilee—25 to 40 pounds; long; light green with dark stripes; red flesh with black seeds; some disease resistance.

Jubilee II—22 to 30 pounds; oblong; light green with dark green stripes; open-pollinated; firm, red flesh; sweet; some disease resistance.

Royal Jubilee—hybrid Jubilee type; elongated; 25 to 30 pounds; bright red flesh; resistant to fusarium and anthracnose.

Royal Sweet—20 to 25 pounds; hybrid; oblong; medium-green stripes; bright red flesh and small dark seeds; some disease resistance.

Planting

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fungi and bacteria enter and cause diseases. Some insects also transmit viruses, bacteria, and fungi that cause diseases. Controlling insects in the garden is an important method of disease control.

Staking and mulching. Control diseases like cucumber belly rot and tomato soil rot by growing plants on mulch and trellising or staking to keep fruit off the ground.

Watering. Water plants in late morning or early evening. Watering late in the evening leaves foliage wet longer, which helps diseases develop.

Harvesting and working in the garden. Do not harvest vegetables or work in the garden when plant leaves are wet.

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