Horticulture Handbook

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4-H Horticulture Handbook

If you like variety, you should love horticulture. In horticulture, we grow some plants for beauty, such as flowers, houseplants, ornamental shrubs, and trees. We also grow plants for food, such as vegetables, fruits, nuts, and herbs. We grow other plants for medicines, such as foxglove and periwinkle. Proper handling of plants requires a great deal of skill. This handbook will help you develop skills and knowledge in horticulture. The first section is for seniors only. The second section is for juniors and seniors. In the appendix you will find information on the horticulture judging contest.

Seniors Only

Plant Parts and Functions

Most plants have five main parts: leaves, stems, roots, flowers, and fruit.

Leaves. Leaves make sugars by a process called photosynthesis (photo = light, synthesis = putting together). This process takes place in green structures within the leaves called chloroplasts. Chloroplasts give plants their green color. No sugars can be made in the chloroplasts unless water, carbon dioxide, and light are all present. Leaves are arranged on the plant to "catch" as much light as possible.

Leaves have tiny pores, called stomata, which let in carbon dioxide from the air. As the carbon dioxide comes in, water (in the form of a gas) escapes. This escape of water from the plant is called transpiration. The plant can slow down the loss of water by closing its stomata.

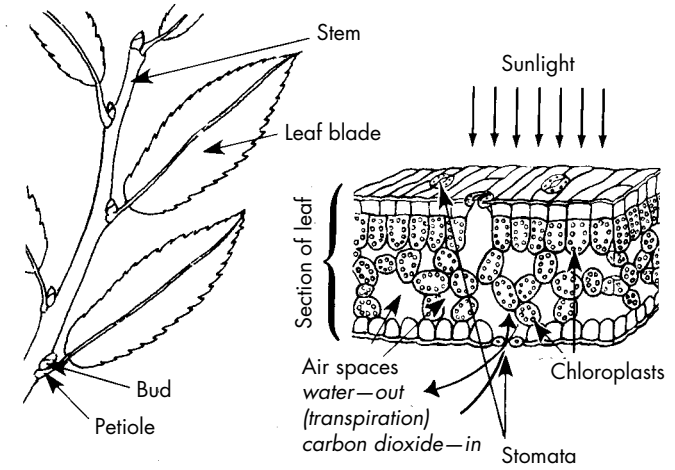


Figure 1. Stem and leaves.

Flowers. Flowers are often pretty, but their main purpose is to produce seed. Their colors and markings are designed to attract insects. The ovule will become a seed when it is fertilized by pollen. Some flowers can be fertilized by their own pollen (self-pollinating). Others require pollen from different flowers (cross-pollinating). Insects are often the agents for transferring pollen from one flower to another.

Some plants have different types of flowers on the same plant. For example, a cucumber plant has male flowers (flowers with no female parts) and female (flowers with no male parts). Such plants are called monoecious.

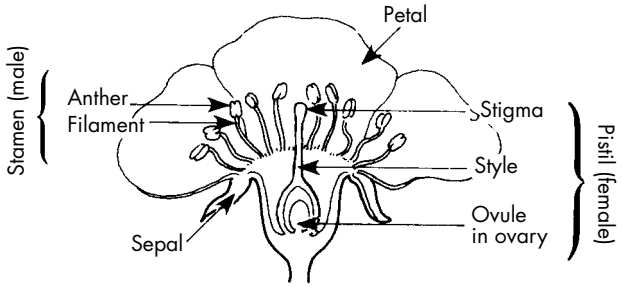


Figure 2. Parts of the flower.

Other plants are called dioecious because each plant will have only one type of flower. A male plant will produce only male flowers, and a female plant will produce only female flowers. An example of a dioecious plant is holly. Male plants will not have red berries, and neither will female plants unless male plants are nearby to pollinate their flowers.

Fruits. Fruits can take many forms and shapes, but they have only one common purpose. They are designed to scatter the seed inside them.

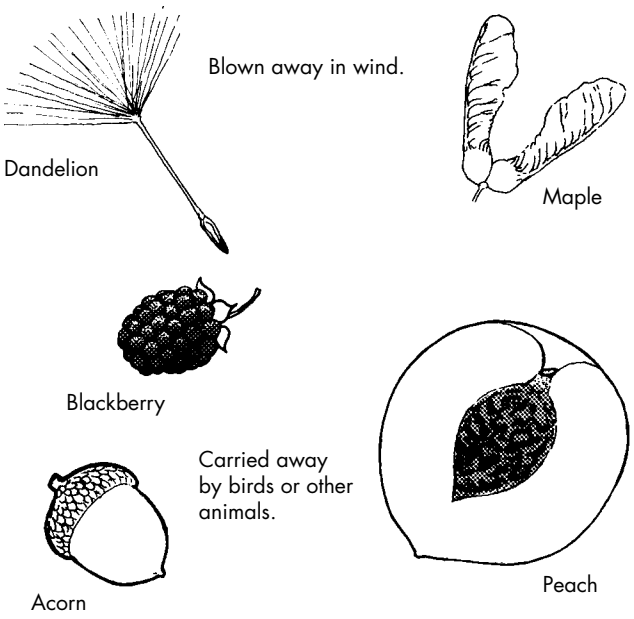


Figure 3. Fruit forms.

Stem. The stem supports the leaves so that they are in the light. It supports the flowers and fruits in a position to ensure pollination and seed dispersal. The stem also contains the transportation system. Sugars move from the leaves to the roots through the stem, and at the same time water and nutrients move from the roots to other parts of the plant.

Roots. Roots are tiny, branching string-like structures that grow down into the soil, taking up water and nutrients. They also steady the plant so it can position its leaves to catch light.

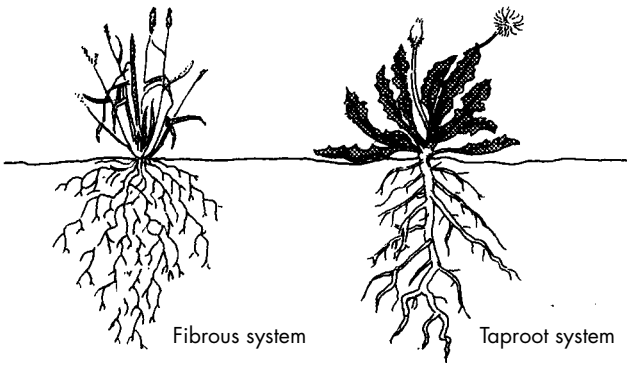


Figure 4. Roots (absorb water and nutrients).

Seed. Many plants begin life as a seed. When conditions are right, the seed will germinate and become a seedling. Young plants have only leaves, roots, and a stem. A plant is considered an adult when it flowers. When it forms seeds, the life cycle is complete. Many plants die immediately after forming seeds.

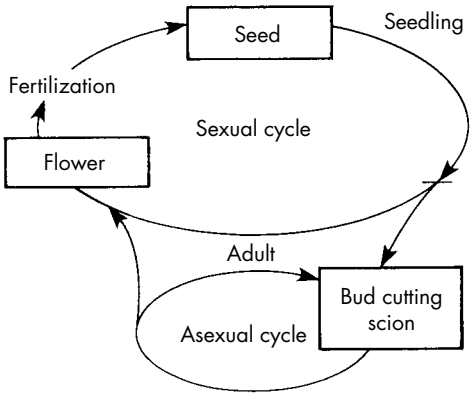


Figure 5. Life cycle of a plant.

Plant Environment

Temperature

There are three important temperatures for plants: a **minimum** temperature at which the plant will stop growing and injury will occur; a **maximum** temperature above which a plant will stop growing and permanent injury will occur; an **optimum** temperature somewhere between these two, where the plant grows best. In the range between minimum and optimum, the plant will grow faster as the temperature increases.

Some plants die if the temperature around them drops below freezing. For this reason, orange, lemon, or other citrus trees must be grown in areas without frost. Annuals that cannot stand freezing temperatures can be grown between the last frost in spring and the first frost in fall.

Plants that cannot live in freezing temperatures are often called tender plants. Some plants are so tender they can be injured by temperatures above freezing. This is called chilling injury, and it results from abnormal processes occurring in the plant. Crops such as cucumbers, tomatoes, various tropical fruits, and most tropical foliage plants can suffer from chilling injury.

Other plants are not damaged until freezing temperatures occur and ice forms within the plant and cells burst. The plants look water soaked from inside. Then they turn black and die. As long as ice does not form within the plant, freezing injury will not occur.

Many other plants are hardy and can withstand freezing temperatures by producing their own antifreeze, which prevents the water in the plant from freezing.

Some plants require a cold period before they develop normally. Bulbs such as daffodils and tulips require cold temperatures before they will grow and flower in the spring. Peach trees must experience a certain number of hours below 4.5 °C (40 °F) to flower and develop fruit normally the next season.

Seeds of some plants will not grow even under good growing conditions until they have been kept cold for

a period of time. Some seeds germinate best after they have been kept cold and moist. This process is called stratification.

When outside temperatures are too low, we grow plants in out-of-season greenhouses where we can control the temperature. Greenhouses are made of transparent material that lets light in so the plants can photosynthesize (make sugars). At the same time, greenhouses keep plants warmer than they would be outside. Other structures used in horticulture that have the same general features as a greenhouse but are smaller are hotbeds, coldframes, cloches, and hot caps.

Another way to modify temperature is with the use of mulch. A mulch is any material used to cover the surface of the soil. Black or clear plastic materials are used in spring to warm up the soil and permit early planting. Mulches in winter are used to keep the soil cold. (For more information on mulches, see sections on Garden Flowers and Vegetables.)

Light

The green plant is a solar (sun) collector transferring light energy into energy foods (sugars) for the plant. Plants respond to light intensity (brightness), quality (color), and duration (photoperiod or day length).

Light intensity or brightness affects the amount of photosynthesis that occurs. When light intensity is lowered, photosynthesis is reduced. Some plants will grow in areas of low light, such as the floor of a jungle. This is why tropical foliage plants grow so well indoors.

Grasses that are native to the plains generally require high light intensity. Sudden exposures of plants to high light intensity can cause leaf scorch or sun burning with symptoms of large brown, dead areas. High light intensity can also cause fading of flower color.

Light quality refers to the color of white light or to a part of the whole range of light. White light is made up of all the colors in the rainbow. Chlorophyll, which gives the plant its green color, absorbs light in the blue-violet and orange-red portion and uses it in photosynthesis. Ultraviolet light is important in the coloration of some fruits and the development of autumn color in leaves.

The duration of light each day (photoperiod or day length) is important in the development of some plants. For example, some plants such as chrysanthemums will not flower until fall because the day length is short in fall. Such plants are called short-day plants. During long days they will grow, but they will not flower.

Other plants are long-day plants. They will flower when the days are long as in summer but will grow and not flower in short days.

Many plants are day neutral, which means day length does not influence when they flower. A common example of a day-neutral plant is the tomato, which will bloom and fruit with favorable temperatures during any day length.

A horticulturist can make a long-day plant flower in winter by supplementing natural light with artificial light or a short-day plant flower in summer by covering it with some dark shade cloth to shorten the day length.

Water

Water is important for normal plant growth. Water provides the plant's rigid structure. Water moving into the plant causes it to expand and grow. Water evaporating from the leaf cools the leaf. Water dissolves nutrients from the soil so they can be transferred to the plant, and water is also necessary for photosynthesis.

Lack of water can cause serious problems. The plant will lose its rigid structure and wilt. Because water is no longer moving into the plant, the plant cannot grow. The plant cannot cool itself and may increase in temperature to dangerous levels. The plant cannot take up the nutrients it needs without water.

Plants that grow in areas where there is little water have special structures to help the plants save water.

Plants can be given too much water. Sudden flooding of the soil can cause the roots to die because water fills the air spaces, cutting off the oxygen supply to the roots. Roots cannot live long without oxygen.

The amount of water a plant needs depends on light, temperature, and the humidity of the air around the plant. The higher the temperature and the greater the light intensity, the greater will be the plant's need for water.

Air

Four main parts of air are important to the plant: carbon dioxide, oxygen, nitrogen, and water.

Carbon Dioxide. Carbon dioxide occurs in very, very small amounts in the air, but it is essential for photosynthesis.

Oxygen. Oxygen is needed by all the parts of the plant, but the root system is most likely to suffer from an oxygen shortage. A good soil will have 50 percent pore space. This pore space can contain either air or water. When the space contains about half air and half water, there is a good balance, but when all the pore space becomes filled with water, as when you overwater a houseplant or when there is a drenching rain, the soil becomes saturated and there is not enough oxygen for the plant roots. If the soil stays too wet for several days, it can cause root death, and then diseases and rots will set in more easily.

Nitrogen. Nitrogen is important for some plants. Nitrogen-fixing bacteria live on the roots of certain plants.

These bacteria take up nitrogen from the air, and the plant does not need to be given nitrogen in fertilizer.

Water. Water in the air is important because if affects the amount of water the plant will lose in transpiration. Air does not usually hold as much water as it could (less than 100 percent relative humidity). This means it acts like a drying agent, constantly removing water from plants.

Nutrients

Sixteen elements are necessary for most plants to grow normally. Ten elements are used in relatively large amounts, and they are called major elements or macronutrients. These major elements are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, and iron.

The other six elements are used by plants in small amounts and are called trace elements, minor elements, or micronutrients. Even though these minor elements are needed in small amounts, they are essential to normal plant growth. These micronutrients are boron, copper, zinc, manganese, chlorine, and molybdenum. A fertilizer is any material, either organic or chemical, that provides one or more of these 16 essential elements.

Plant nutrients that most often need replacing in the soil are nitrogen, phosphorus, and potassium. Fertilizers that contain all three are called complete fertilizers. Nitrogen and potassium are soluble in water and are easily carried away by heavy watering or rainfall.

Phosphorus is not very soluble in water and needs to be added to the soil less often. Unlike other nutrients that move dissolved in water to the root, phosphorus is usually taken up by the root's growing to where the phosphorus is. Therefore, plants with a very small root system may not have enough phosphorus. This is why new transplants are treated with a starter solution that has high levels of phosphorus in it.

The ability of the plant to take up nutrients from the soil and use them for its growth depends partly on the pH of the soil. Soil pH refers to the acidity or alkalinity of the soil. A 14-point scale is used to measure pH. Seven is neutral; below 7 is acid, and above 7 is alkaline (basic).

An acid soil is sometimes called a sour soil; basic soil is sometimes called a sweet soil. Plants usually prefer a slightly acid soil with a pH near 6.5. At a pH of 6.5, all elements can be taken up by the plant if they are present in the soil. If the pH goes up too high or down too low, some of the essential elements will be less available to the plant.

You can increase the pH of an acid soil by adding limestone or dolomite (limestone that contains magnesium). If a soil pH is too high (alkaline), it can be lowered by adding an acid-forming material such as sulfur to the soil.

Plant Propagation

Plants can be propagated (multiplied) in many ways. With a little knowledge about plants and some experimenting, people have been able to modify plants and create new forms. Two types of plant propagation are sexual and asexual.

Sexual Propagation

Sexual propagation involves the production of seeds and is nature's way of introducing variety into plant material. However, when we buy a packet of flower seed, we want all of the seeds to grow into flowers that look alike. To produce a population of seedlings that are similar requires a controlled breeding program, which is not covered in this manual.

A seed is produced by fertilizing the female part of a flower with pollen from the male part. Seeds are a resting and survival stage in the plant's life. Seeds can survive conditions that kill plants. Basically, a seed consists of three things: an embryo, which is a young plant at its most immature and in its simplest form; a food supply that maintains the embryo during the resting period and provides energy after germination; and a seed coat that protects the other parts.

The embryo consists of a young root system, or radicle; the young shoot system, or plumule, which carries the seed leaves, or cotyledons; and the hypocotyl, which is the junction between the root and shoot systems.

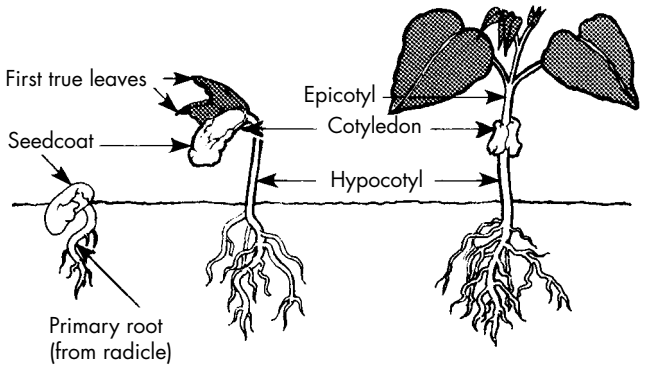


Figure 6. Germination of a bean seed.

Some seeds need special treatment to germinate. One such treatment is stratification. To stratify seeds, cover them in some damp material, such as damp peat moss, and keep them in a refrigerator at about 4.5 °C (40 °F) for about 3 months. After this treatment, the seeds are ready to germinate. Examples of seeds that germinate better after stratification are pecan and dogwood seeds.

To germinate, seeds require moisture, warmth, and oxygen. Because a seed needs oxygen as well as moisture, it is important not to keep the seeds too wet. On the other hand,

the seeds must not dry out. Most seeds germinate best between 18.5 °C (65 °F) and 24 °C (75 °F). Most seeds will germinate well in light; however, some seeds, such as periwinkle, pansy, and verbena, germinate best in the dark.

Asexual Propagation

In asexual propagation, vegetative parts of the plant (stem, root, or leaf) are used to produce a new plant. Most fruit and nut trees are propagated asexually, using a bud or a twig from a tree that produces exceptionally good fruit or nuts. When this bud or twig becomes an adult tree, it has the same qualities as the "mother" tree. By propagating asexually (cloning), we reproduce the "mother" plant.

Plants may be asexually propagated from many different plant parts. Specialized roots, stems, and leaves that occur naturally make asexual propagation easy. The roots of sweet potato and dahlia readily produce new plants. Rhizomes, corms, runners, and tubers are all specialized stems used in asexual propagation.

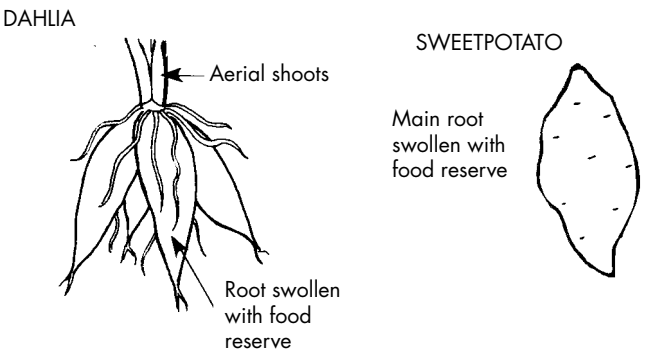


Figure 7. Specialized roots.

A rhizome is a stem that grows horizontally near the soil surface. In some plants, the rhizome is underground. Normally, a rhizome stores food. Plants that are often propagated by rhizomes are iris, turfgrasses, banana, and bamboo. In grasses, rhizomes are called sprigs.

Corms look very similar to bulbs and are often confused with them. However, structurally they are very different. A corm consists of a stem that is swollen as a food store. It is shorter and broader than a bulb. The leaves of the stem are modified as thin, dry membranes that enclose the corm and protect it against injury and drying. Examples of corms are crocus and gladiolas.

A runner is a stem that arises from a crown bud and creeps over the ground. Examples of plants having runners are strawberry and airplane plants.

A tuber is a swollen underground stem that stores food. An example of a tuber plant is the Irish potato.

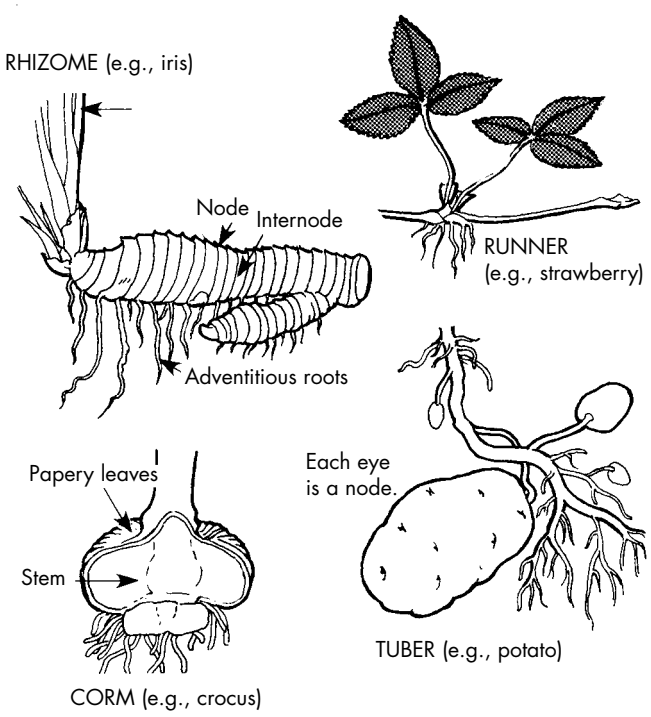


Figure 8. Specialized stems.

Specialized leaves are used in asexual propagation. Bulbs consist of swollen leaves on a short stem. Examples of bulbs are tulips, onions, and lilies.

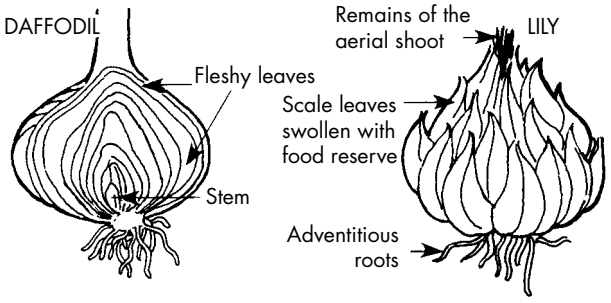
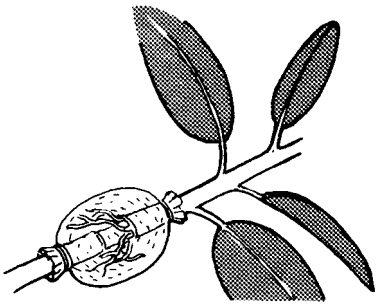


Figure 9. Specialized leaves (bulbs).

Asexual propagation can also occur artificially by using different plant parts.

Root Cuttings. Some plants can be propagated from roots. To produce a new plant from a root cutting, there must be a shoot bud present or it must be possible for the cutting to form one. The ability of root cuttings to form these buds depends on the time of year. The dormant (resting) season is usually best–late summer and early fall. Blackberries can be propagated from root cuttings.

Stem Cuttings. Many houseplants, shrubs, and blueberries are propagated by stem cuttings. A root system must be formed on a stem either before or after that stem has been removed from the parent plant. Roots can be formed on stems in two ways: by layering and by stem cuttings. With layering, the stem is allowed to produce roots before it is cut from the parent plant.



A ring of bark is removed. Moist peat moss is placed over the treated area and covered with black plastic until roots form.

Figure 10. Air layering.

With stem cuttings, roots are formed after the stem is severed from the parent plant.

The main difficulty in producing new plants from stem cuttings is keeping the stems alive while they form new roots. The ability of a stem to produce roots depends on its age, its genes, and its physical condition. Some plant stems root better when the wood is soft and actively growing, but other plant stems root best from mature wood. Cuttings taken while plants are actively growing are called softwood cuttings. Hardwood cuttings are those taken after the wood is mature.

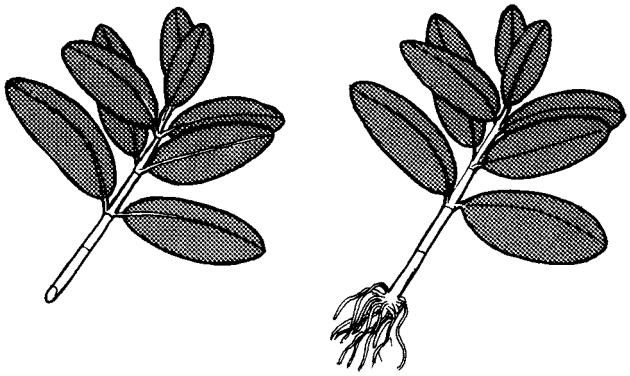


Figure 11. Stem cutting.

Water is necessary to keep the cutting alive. Although the cutting has no roots, the leaves continue to give off water. You can keep the cutting from drying out while it forms roots by using a mist system or by keeping the air around the plant at a high humidity (plastic bag cover).

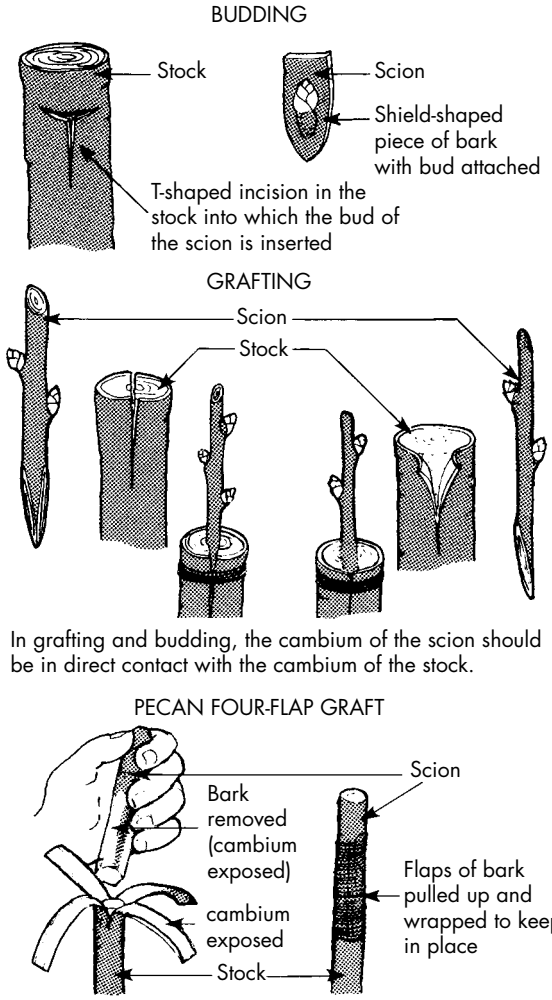
Light is also important because it is necessary for the leaves to make the sugars that will be used to form roots. A good air temperature for rooting is 18.5 °C (65 °F), and a good soil temperature for rooting is 24 °C (75 °F). You can apply substances called hormones to the base of the stem to help start roots. The most common rooting hormones are called naphthaleneacetic acid (NAA) and indolebutyric acid (IBA).

Leaf Cuttings. Some plants will develop plantlets on their leaves if you cut the leaf. You can propagate African violets and begonias from leaf cuttings.

Grafting and Budding. Grafting and budding consist of inserting or attaching a part of one plant onto another so both parts continue to grow. In grafting, you attach a short twig from a desirable variety with two or more buds (called a scion) to a seedling. This seedling is called the stock and forms the root system for the new plant. The scion becomes the top, fruit-bearing part of the plant.

In budding, you insert the bud from a desirable variety into a cut or slit in the bark of the stock. The bud develops into the whole top of the plant. You must match scions and buds with stocks according to their ability to grow together.

In grafting and budding, the single most important condition is that the growing area, the cambium layers, of both the stock and the bud or the scion are in good contact with each other. This area is where the graft or bud union will take place. Grafting and budding are used in the propagation of many fruit and nut trees as well as some ornamentals.



In grafting and budding, the cambium of the scion should be in direct contact with the cambium of the stock.

Figure 11. Stem cutting.

Training and Pruning

The purpose of training and pruning is to make a plant more attractive or to improve its yield of desirable fruit. Training involves placing branches into positions to create a desirable growth pattern. Training starts early and provides the basic framework of branches. Trees and large shrubs will retain this main framework throughout their lives. The framework must be strong and the branches well spaced. Training at the right stage of growth and making the correct cuts are necessary for success.

Some plants commonly trained in Mississippi are tomatoes, muscadines, and peaches. To train a tomato plant to a trellis system, build a trellis by setting support posts in the ground about 20 feet apart. The tops of the posts should be 5 to 6 feet above the soil surface. Stretch a heavy wire between the tops of the posts. Use only tomato varieties with an indeterminate growth habit. These varieties continue to grow and produce flower clusters all season under good growing conditions. Plant your tomatoes under the wire about 1 foot apart. Tie a piece of twine loosely to the base of each plant and stretch it up, tying it to the wire overhead. As the plants grow, twist them around the twine. Remove all side shoots on the tomato plants before they are 4 inches long. These side shoots will arise in the leaf axils (joint between leaf and main stem).

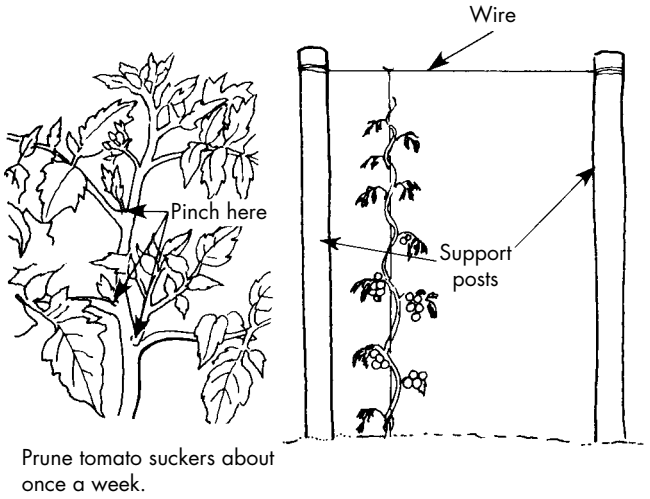


Figure 13. Pruning and training tomato plants.

Pruning is the removal of any part of a plant to encourage it to grow, flower, and fruit. Early pruning or training creates the basic framework for later growth of the plant; subsequent pruning maintains a balanced shape and improves fruiting qualities. You can also use pruning to remove damaged or diseased parts. In the landscape, you can prune to control size or to alter completely the natural shape of a plant.

Before pruning a plant, you must know something about its flowering and fruiting habit. Prune a plant that produces flowers on old wood just after it flowers. Prune a plant that produces flowers on new wood in winter before new growth starts.

At the end of the shoots of most woody plants there is a bud (a condensed shoot) called a terminal bud. Farther down on the shoot are lateral buds (usually found between a leaf and the stem). When you remove the terminal, the lateral buds will begin to grow. This fact is basic to all pruning. When pruning any plant, cut back to a selected bud that will grow to produce a shoot in the direction and in the position you want.

Juniors and Seniors

Houseplants

Anyone can grow attractive houseplants by observing a few simple rules. All houseplants need light, water, heat, and nutrition to keep them healthy, but not all houseplants are alike in how much of these they need.

Light

Some plants do well on a sunny windowsill but quickly fade in a shady corner; others will grow in light shade but cannot survive strong sunlight. Here are some general rules about light: foliage houseplants (plants grown for their pretty leaves) require bright light without direct sunlight; plants with variegated (multicolored) leaves need more light than all-green ones; flowering plants generally need some direct sunlight; and cacti and succulents have the highest light requirement of all. There are many exceptions to these general rules.

Artificial light can replace natural daylight. This means houseplants can be grown away from windows. Ordinary incandescent light bulbs are not suitable for plants because they give off too much heat. It is best to use cool, white fluorescent light tubes. Place plants within 12 inches of fluorescent fixtures.

Water

Without water, a houseplant will die. On the other hand, more houseplants die from overwatering than any other single cause. Too much water prevents air from getting to the roots.

Never allow watering to become a regular routine. How often a plant should be watered depends on its kind and size, the size of its pot, its environment, and the time of the year.

Fleshy-leaved plants can tolerate much drier conditions than thin-leaved varieties. The larger the leaf surface and the more rapidly the plant is growing, the more water it will need.

As temperature and light intensity increase, so does the need for water. Plants in small pots need more frequent watering than those in large containers. Plants in clay pots need watering more often than those in plastic containers because clay pots are porous and water evaporates from them more easily.

As a general rule for watering, remember that roots need air as well as water.

Temperature

Few houseplants will grow well at temperatures above 24 °C (75 °F). Nearly all will flourish if the temperature is kept within 13 to 24 °C (55 to 75 °F). Most plants grow well in rooms that are a little too cool for human comfort.

Humidity

Central heating in winter can produce air as dry as the Sahara Desert. Very few plants actually like such conditions. Many foliage plants and most flowering plants will suffer unless you increase the humidity around the leaves. Humidity can be increased in a number of ways: (1) Group plants so the air trapped between them will have a higher relative humidity than the air around a single plant. (2) Place your houseplants in a pebbled tray that has about 1 inch of gravel. Keep the bottom of this layer wet, but do not let the bottom of the pot rest in water.

Nutrients

All plants need nitrogen, phosphate, and potash, together with small amounts of trace elements to grow strong and healthy. Regularly give houseplants nutrients when they are growing or flowering. When they stop growing and go through a rest period, it is time to stop giving them nutrients.

Garden Flowers

Colorful garden flowers fit into almost any landscape. Garden flowers can be classified as annuals, biennials, and perennials.

Annuals. Annuals grow from seed, flower, produce seed, and die in one growing season. Annual flowers may sometimes be referred to as hardy or tender annuals. Hardy annuals tolerate cool temperatures and even frost. These can be seeded outdoors very early in the spring. Tender annuals require warm soil and air temperatures to do well. Plant tender annuals outdoors after all danger of frost is past.

Biennials. Biennials complete their life cycle in 2 years. The first year is vegetative growth; flowering occurs in the second year. A true biennial dies after flowering.

Perennials. Perennials last for many years. The tops may die back to the soil each year, but the roots last from year to year.

Perennials are long lasting and do not need much care. Before selecting perennials for your garden, study which plants do well in your area and when they flower. Most perennials bloom in spring and early summer. However, flowering times can vary from one variety to the next.

Bulbs

Spring-flowering bulbs include daffodils, tulips, and hyacinths. Spring bulbs are best planted in the late fall so they can become well rooted before the soil freezes. As a general rule, planting depth should be four times the height of the bulb between the soil surface and the growing tip. The soil for spring bulbs should be well drained. Southern gardeners often have difficulty growing spring-flowering bulbs because their soils do not get cold enough. To overcome this, you can store bulbs for 45 to 60 days in a refrigerator before planting. This will improve flower quality and increase the length of flower stems.

Flowers from Seed

You can grow both annuals and perennials from seed. Annual seeds are fairly easy to germinate. Perennial seeds can be more difficult to germinate because some seeds require special treatment. (Seniors, see section on sexual propagation.)

You can start annual flowers indoors and then transplant them outdoors when weather conditions are suitable. Most annuals can be started 6 to 8 weeks before it is safe to plant them outdoors.

Artificial potting mixes are excellent for sowing seed because they are well drained, well aerated, and free from diseases. After sowing, keep the seeds moist and warm. When leaves appear above the potting mix, make sure the seedlings get enough light.

Flower Garden Care

Mulches are used in flower gardens to slow weed growth, save moisture, and regulate soil temperature. Winter mulches are applied after soil temperature has dropped. The mulch will keep the soil cool and prevent temperature fluctuations, which can cause premature growth.

Several good mulch materials are straw, pine needles, hardwood leaves, and pine bark. These mulches generally are weed-free, loose, and easy to remove. Spread them several inches deep. Remove winter mulches just before new shoots begin to grow through them.

During the growing season, keep flower gardens fertilized, watered, pruned, and free of pests. Flower gardens

need about 1 inch of water per week. A good soaking once a week is better than several light waterings.

Remove unsightly plants or prune those that are crowding others. Keep seed heads picked. Most annuals and many perennials that flower in summer stop flowering if they are permitted to set seed.

Remove weeds because they compete for light, water, and nutrients. Watch for insects and diseases. Prevent spread of diseases by either removing affected parts of the plant or by applying recommended pesticides.

Woody Ornamentals

Before you buy a shrub or tree for your garden, ask yourself if you want the leaves to stay on all year round. If you do, choose an evergreen. However, some of the most beautiful flowering shrubs are deciduous (lose their leaves in fall).

Choose your tree or shrub according to your growing conditions. Some trees and shrubs will grow almost anywhere, but most of them have their own particular likes and dislikes. For example, chalky soil (soils with a high pH) can be a problem for plants such as azaleas and camellias.

Another problem for most shrubs and trees is poor drainage. Some varieties cannot stand even short periods of waterlogging and must have free-draining soil.

Many plants can be damaged if exposed to harsh north and east winds during winter and early spring. Do not choose a plant that requires protection unless you can put it close to a wall or to other shrubs that will serve as a wind break.

Trees and shrubs are packaged for sale in several forms. They can be grown in containers, in which case they are suitable for planting any time of the year. They can also be balled and burlapped. This is the traditional way to buy evergreens. You can plant trees or shrubs that are balled and burlapped from late fall through winter to early spring. Some deciduous trees and shrubs are sold with their bare roots wrapped in moist packaging. This is a very popular way to buy deciduous shrubs. These are suitable for planting between October and March.

The roots of container-grown plants do not have to be disturbed when the plant is moved from the garden center to your garden. However, be sure the root system hasn't become too large for the container. If roots curl around the inside of the container and grow out of the bottom, the plant is pot bound. Pot-bound plants are not good choices.

Balled and burlapped plants are grown in a field and dug with a ball of soil around the roots. This ball of soil is wrapped with burlap and held in place with twine or nails. Because they are so heavy, balled and burlapped plants are usually grown close to the area where they are being sold.

When planting balled and burlapped plants, handle them carefully. Do not pick up the plant by the trunk. This can damage the root system because the roots cannot support the weight of the soil ball. Roots can be damaged severely if the soil ball is dropped or cracked. The root system is the least hardy part of the plant and must be protected from freezing.

Figure 14. Forms of packaging for trees and shrubs.

Deciduous trees, shrubs, roses, blackberries, and strawberries are often sold with bare roots. They may be grown in the field and then lifted from the soil in late fall or early winter. The disadvantage of bare-root plants is that if the root system is exposed to the air, it can dry out very rapidly. Bare- root plants should be planted immediately after they are purchased. If this is not possible, protect the root system with moist straw, paper towels, etc., and cover with plastic. Store plants near but not below 0 °C (32 °F).

Planting Trees and Shrubs

Never dig planting holes when the soil is waterlogged. Dig the planting hole two to three times the diameter of the soil ball or spread of the roots in the case of bare-root plants. The depth of the planting hole should be equal to the depth of the soil ball or the primary roots on a bare-root plant.

The most important rule is that the soil should be at exactly the same level on the stem as it was in the nursery.

If the plant is too deep, the feeder roots suffocate and die because of lack of oxygen. If it is too high, the upper part of the root system dries out and dies.

Staking

Stake trees and shrubs when there is danger of the tops' being blown about by high winds. Staking controls the movement of the top so the new roots will not be twisted and torn before they can provide a firm anchor. Hold the plant to the stakes by securing wires attached half-way up the plant. Prevent rubbing by using protective material around the wires where they contact the plant. Plants rarely need staking for more than 1 year.

Pruning

Most plants need pruning sometime during their life. Pruning is done to control size, to improve form, or to remove diseased parts. (Seniors, see section on Training and Pruning for more information.)

Protecting the Plant

The greatest single cause of damage to trees in the landscape is from lawn equipment. The best way to protect the plant from lawn equipment is to control the weeds at the base with herbicides or a thick layer of mulch.

On young trees, sunscald can be a problem in winter. On cold, sunny days, the sun will warm up the trunk of the tree. The bark is so thin that cells just beneath the bark will begin to divide. When the sun goes down and the temperature drops rapidly, the cells freeze and die. The damage does not show up until late spring or summer, when the bark begins cracking and peeling. Sunscald is not found on mature trees because their thicker bark protects against sudden changes in temperature.

Rabbits, mice, and deer can be a problem in winter months. They eat the bark when other food sources are limited. Vinyl tree protectors around the trunk will help to protect it.

Fertilizing

The best way to make sure your trees and shrubs have enough nutrients to keep them healthy is to have your soil tested by the Mississippi State University Extension Service and to follow their recommendations.

Turf

A quality lawn is one of the strongest elements in any landscape design. It can be both beautiful and functional. A turf will prevent soil erosion by wind and by water, keeping the home cleaner. The grass, by giving off water in a process called transpiration, will keep the air cooler around your home.

Turf grasses are often divided into two groups: warm-season and cool-season grasses. The common warm-season grasses are bermuda, carpetgrass, centipede, St. Augustine, and zoysia. Examples of cool-season grasses are bent, bluegrass, fescue, and rye.

Usually people in central and south Mississippi will grow warm-season grasses. These grasses are low growing, creeping, and spreading. They require temperatures of 26.5 to 35 °C (80 to 95 °F) for best growth. They tolerate close mowing and generally form a thick, dense turf. Warm-season grasses become dormant during winter and stay brown until spring.

In north Mississippi, some cool-season grasses can be grown. The best temperatures for cool-season grasses are 15.5 to 24 °C (60 to 75 °F). They are slower growing than warm-season grasses. They tend to form clumps growing from a central crown. Cool-season grasses do not tolerate close mowing. They have a smaller root system and cannot tolerate drought conditions.

Establishing a New Lawn

Warm-season grasses are best established in late spring or summer. Establish cool-season grasses only in the fall. Before planting, prepare your site. Clean up the area. If you need to, slope or grade your property, making sure you save your top soil. Spread fertilizer and lime onto the site as indicated by a soil test. Next, till in the fertilizer and lime. Follow that by hand raking to finish the grade or slope. Now you are ready to plant.

You can start a lawn in three ways: sodding, seeding, or planting small pieces called sprigs or plugs. Some grasses can be started by only one method. With others, there are choices.

When seeding, use top-quality seed that is fresh and certified for purity and percentage germination. The seed of many turf grasses are extremely small and difficult to plant. To prevent waste and assure even spreading, you can mix these seeds with sand before planting. For best results, mix five parts moist sand with one part seed in a dry container. After planting, cover grass seed with 1/8 inch of soil. To do this, scarify (rake) the planted area lightly with a yard rake. Seed germination will be more rapid if you water the planted area immediately after planting and keep it moist during germination. Covering the lawn with clean straw will help keep the young grass seedlings from drying out. This layer of straw should be thin enough so that you can see about 50 percent of the soil.

Starting a lawn by seed may not always be possible. In these cases, grasses must be propagated asexually by sodding, plugging, or sprigging. Sod should be 3/4 to 1 inch thick. Lay the pieces of sod as a solid mass or in strips 2 to

4 inches wide spaced 1 foot apart. Keep it moist until it is well established.

In plugging, cut the sod into 2- to 4-inch round plugs, and place these plugs about 1 foot apart.

Sprigging is the planting of individual plants. You get these by tearing apart pieces of established sod. The spacing is governed by how fast the grass spreads, by how fast you want coverage, and by the amount of planting material you have available.

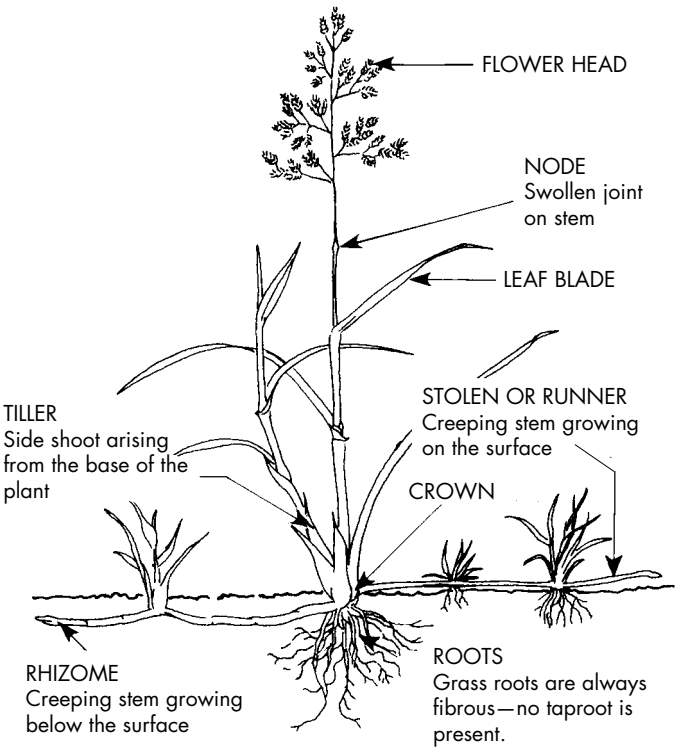


Figure 15. Typical grass.

Maintenance

Once you establish a lawn, you must maintain it by mowing, watering, feeding, and weeding. Turf grasses need sunlight. A thick covering of leaves left on the lawn for several weeks may result in dead grass. In the fall, rake leaves once a week. Do not wait until all the leaves have fallen to remove them.

Mowing. Mowing the lawn properly will do more for quality than will anything else. Mowing keeps down unsightly growth and builds up a vigorous, fine-quality grass turf. The secret for success is to keep the grass long enough to prevent the roots from being starved but short enough to be attractive. This height must not vary much during the growing season. As a rule of thumb, no more than one-third to one-half of the leaf blade should be removed at any one time.

Watering. Water your lawn to a depth of 3 to 6 inches to encourage a deep root system. You can water any time of the day if diseases are not a problem. If diseases are a problem, water in the early morning. Sprinkling every day or two is a bad practice. It leads to the spread of certain weeds and causes the grass to have a shallow root system.

Turf grasses must be properly fertilized to maintain color, thickness, and health. A well-fed grass will recover more quickly from stress and be more aggressive against weeds. To decide what nutrients are needed for your lawn, have a soil sample tested. Grasses use nitrogen more than any other nutrient. Nitrogen stimulates leaf growth. Apply nitrogen in the spring and in the summer but not in the late fall. Grass should be dry and the soil moist when you add fertilizer. Never add fertilizer to a lawn when it is raining. If rain does not fall for 2 days after application, then water the treated lawn thoroughly to carry the fertilizer down into the soil.

Weeding. Control weeds first by promoting a healthy, vigorous turf that won't allow weeds to grow and second by the proper use of control chemicals called herbicides.

Vegetables

Fresh vegetables are part of a healthy diet. What better way to get fresh vegetables than to grow them yourself. You can harvest them at their best; you can eat them within hours of picking; you can grow the best-tasting varieties that may not be sold in the grocery store. Vegetable gardening can save money and give you useful exercise. The best time to plan your vegetable garden is in winter, when seed catalogs are sent by mail and when shops display seed packets. Make a list of vegetables you want to grow. Choose a site for your garden that is level and in full sun. Vegetables grow best in a deep, loose, rich, and well-drained soil. Improve poor soil by mixing in compost, undecomposed peat moss, straw, manure, and commercial fertilizer.

Crop Rotation

Do not grow a vegetable in the same spot year after year. If you do, two problems arise:

1. Pests and diseases that live in the soil and feed on the crop will increase.
2. Some soil nutrients will be lost from the soil more than others.

Crop rotation will prevent these problems. Divide your vegetable garden into three or four plots. Plant vegetables that are related to each other in one plot one year, and then move them to another plot the next year. Move them each year so you do not grow the same vegetable on the same plot for 3 or 4 years. Some vegetables, such as asparagus, are permanent crops and cannot be included in this plan. If you grow some permanent crops, leave a strip of land at one end of the plot for this purpose.

Soil Preparation

Soil should be a good place for roots to grow. Soil should hold plenty of water and air, and it should not crust easily. Do not work soil that is too wet. Squeeze a ball of soil in your hand and then let go. If it crumbles, then it can be worked. If the soil stays in a hard ball, it is too wet to work. It will remain hard and cloddy all year if you work it in this condition.

Prepare soil at least 6 inches deep. Turn under any sod. Use a garden spade, plow, or rototiller. Next, apply the recommended amount of fertilizer to the soil surface. Work the fertilizer into the top few inches of the soil with a hand cultivator. Now prepare the seedbed. Use a garden rake in a push-pull fashion to produce a smooth, level seedbed. A seedbed should look like coarse bread crumbs. The larger the seed, the coarser the crumb structure can be.

Deciding when to plant a vegetable depends on how frost-hardy the vegetable is and when frosts occur in your area. Vegetables are classified according to their resistance to frosts and cold. Two general groups of vegetables are cool-season and warm-season crops.

Cool-season crops are divided into two subgroups: hardy and half-hardy. You can plant hardy vegetables 2 to 3 weeks before the last killing frost in spring. Here are examples of hardy crops: broccoli, cabbage, collards, mustard, onion, spinach, and turnip.

Half-hardy vegetables can withstand light frosts, and their seeds germinate at low temperatures. Plant these vegetables about the time of the last killing frost. Here are examples of half-hardy vegetables: beets, carrots, cauliflower, Irish potato, and lettuce.

Warm-season vegetables are divided into two subgroups: tender and very tender. These vegetables cannot withstand any frost. Do not plant them until the danger of frost is gone and the weather and soil have warmed. These are examples of tender crops: beans, corn, and tomatoes. Examples of very tender crops are cucumbers, cantaloupe, okra, pepper, pumpkin, squash, sweetpotato, and watermelon.

Sowing Seed

Mark the rows by stretching a heavy cord between two stakes. Straight rows help the appearance of your garden and permit better spacing of plants. With a stick, trowel, or the edge of the hoe, make a drill (groove) in the soil to the depth recommended for the vegetable to be sown. Feel the soil at the bottom of the drill. If it is dry, water gently from a watering can. Sow seed thinly along the row. Mix fine seed with sand before sowing. Cover the seed by gently replacing the soil with the back of a rake. If the weather is dry, cover the surface with newspaper to retain moisture. Do not water. Water can cause the soil to crust. Remove newspaper as soon as seedlings appear.

Tender crops, such as tomato and pepper, are often started indoors and transplanted to the garden. Plants started indoors should be hardened off before they are planted in the garden. Hardening off means introducing the young plants to new, less favorable growing conditions. This will slow down their rate of growth. To harden off plants, you may give them cooler temperatures, reduce watering, or reduce the amount of fertilizer they receive. Do not let the young plants become so hardened off that they stop growing. They are slow to recover from this, and you lose all the advantages of starting your crop early.

To transplant into the garden, mark the rows and then dig holes twice as big as the soil ball on the plant. If the next few days are very sunny, cover the transplants to protect them. If there is danger of frost, cover the plants at night with paper boxes, hot caps, or newspapers. Do not allow the cover to touch the plant.

Weed Control

Weeds compete for water, nutrients, and light. Some of them harbor insects and diseases. Control weeds with a mulch or with cultivation or with both. When cultivating, shave off the weed just below the soil surface with a sharp hoe. Do not chop. Deep cultivation will damage the young tender roots of your crop. Mulches to control weeds can be synthetic or organic. Organic mulches are commonly used in small gardens. You can apply partially decomposed hay, straw, cobs, bark, or grass clippings 4 to 6 inches deep when the plants are 6 inches tall. Organic mulches keep the soil loose, keep moisture in, and increase humus, which is good for plant growth.

A common synthetic mulch is black polyethylene (plastic). Plastic mulches are often used in spring because they warm the soil, permitting early planting and promoting rapid growth.

Irrigation

Vegetables need plenty of water, particularly during germination and early growth, flowering, and seed or fruit development. Vegetables need 1 to 1½ inch of water per week from rain or irrigation. Any irrigation should be applied in a single watering. When irrigating with an overhead spray, you can place straight-sided pots over the area being watered to determine how much water is being applied. If the water level in the pot is 1 inch deep, you have applied 1 inch of water to your garden.

Composting

You can build a compost bin of cinder blocks, old fence panels, or rough boards, or you can just pile the compost on the ground. Leaves, old sod, lawn clippings, straw, and kitchen and garden refuse all make good materials for composting.

When the pile is about 6 inches deep, add one-half pound or a cup full of commercial fertilizer to each 10 square feet of soil surface. Next add an 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. Decomposition is faster in warm weather. You can hasten decomposition by turning the pile weekly to keep all of it moist.

A pile started in the fall should be ready by the end of the next summer. If well prepared and decayed, the compost will have few diseases or insects.

Disease and Insect Control

Help prevent insects and diseases by using disease-free seeds/plants and disease-resistant varieties and by practicing crop rotation. Some diseases can be controlled by fungicides. Success depends on (1) selecting the right fungicide, because not all fungicides will control the same diseases; (2) applying fungicide early; (3) covering the whole plant with spray; and (4) applying spray regularly.

Not all insects in your garden are pests. Some feed on other insects that are pests. Before using chemicals in your garden, make sure you have a pest problem. Insects and mites that cause problems in the garden may be held in check by parasites, by predators, or by diseases. If you must use chemicals, follow the directions carefully.

Insecticides can kill beneficial insects such as bees. When you apply insecticides, be careful not to poison beneficial insects.

Pollination

Pollination is the transfer of pollen from the anther to the pistil in a flower. In crops where the leaves and roots are eaten, pollination is not important. In vegetables where the developing fruit or seed are eaten, pollination is necessary.

For some vegetables, pollen must be carried from one flower to another by wind or by insects. For example, corn pollen is carried by wind as it falls from the tassel (male flower) to the silks of the ears (female flower). Squash, pumpkins, melons, and most cucumbers are insect-pollinated. Honeybees or bumblebees transfer pollen from the anther of the male flower to the pistil of the female flower. Beans, peas, and tomatoes are self-pollinated. This means the transfer of pollen takes place usually within the same flower and without the assistance of wind or bees.

Fall Gardening

In many cases, a fall garden is a carryover from the summer garden. Tomato plants, okra, pepper, and eggplant, if cared for during the summer, will continue to produce until frost kills them. Plan your fall garden as you plan your spring and summer garden. If you don't have room for cool-season vegetables (hardy and half-hardy) in spring, include them in your fall plan. Many cool-weather vegetables will grow and produce better in fall than in spring because they will be maturing as the weather cools.

Fruits and Nuts

Climate

Climate is very important in determining where certain fruits and nuts will grow. Deciduous fruits grow mainly in areas where there is frost during part of the year. Tropical and subtropical fruits are mostly evergreen and cannot grow where temperatures reach freezing.

Climate also determines which varieties will grow in an area. For example, peach varieties common to Mississippi would begin to grow before winter is over in the Northeast. Their blossoms would freeze and there would be no fruit.

Climate also influences which pecan varieties are best to grow in an area. Pecan scab is a problem in the Southeast because it is so humid. Southeastern pecan growers choose varieties resistant to this disease.

Soils

Fruits and nuts are grown on many soil types. Most fruit trees prefer deep soils with good drainage so that a deep and extensive root system can develop. Some of the small fruits such as blueberry and strawberry require good drainage but do not require the soil depth that a peach or a pecan tree would require. Soil pH is also important, as some fruits are limited to acid soils, while others may grow well on both acid and alkaline soils.

Propagation

Almost all fruit plants are produced by vegetative propagation so that plants will be uniform in size, maturity, yield, fruit quality, and other characteristics. Asexual propagation by budding, grafting, cuttings, and other means produces plants identical in looks and in genetic makeup. (Seniors, see section on Plant Propagation.) Root stocks for many fruits have been developed to overcome certain soil problems, climatic differences, and soilborne pests. Some trees are grown on a dwarfing root stock, which keeps the whole plant small. An orchard with small trees is easier to spray, prune, and harvest.

Planting and Spacing

Fruit orchards are normally planted so the trees will not crowd each other when they are mature. Strawberry fields may contain 30,000 plants per acre, yet pecan orchards may have as few as 16 trees per acre. Because most fruit crops are long lived, the spacing chosen for planting will be there for years to come. The grower can remove alternate trees and rows if he has planted too closely. The spacing must be wide enough between rows to permit passage of equipment used in cultivation and harvest.

Pruning and Training

The majority of fruit crops are allowed to grow naturally, but some require extensive training before they reach the desired size and shape. Once the crop is trained, it must be pruned to keep its desired shape and size. Grapes are commonly trained on a wired trellis.

Pruning increases fruit size and quality. It reduces the overall amount of fruit set. Some crops, such as peaches, require additional fruit removal so the remaining fruit will be large and of good quality.

Water

Fruit trees need about 50 inches of water per year, either as rainfall or as irrigation. Apply water at a rate that will penetrate the soil without runoff. Trees should receive about 1 to 1½ inch of water weekly during the growing season either as rainfall or irrigation.

Nutrition

Fruit trees are commonly fertilized annually, but sometimes they are fertilized two or more times per year. It makes little difference when the fertilizer is applied, but it should be applied at about the same time each year. Determine the amount of any nutrient you apply by soil testing or by tissue analysis. Once visible symptoms of a nutrient problem occur, it is too late to correct the problem that season.

Weed Control

Control weeds by cultivating, by mowing, or by using chemicals called herbicides. Cultivation damages root systems and dries out the soil. Mowing keeps the weeds down but does not kill them. Many orchards are kept weed free by herbicides. Competition for water and nutrients is eliminated, and because the orchard soil is never disturbed, root damage is also eliminated.

Insect and Disease Control

Insect and disease control are important for increased yields and fruit quality. Growers of all major commercial fruits follow regular schedules for spraying pesticides. Spraying at the right time is as important as using the right material.

Glossary

Acid Soil – A soil that has a pH of less than 7.0.

Adventitious – Set of buds developing in internodes or on roots, or on roots developing along stems or on leaves.

Alkaline Soil – A soil that has a pH of more than 7.0.

Annual – A plant that completes its life cycle within 1 year of germination.

Anther – Male part of flower that produces pollen.

Biennial – A plant that completes its life cycle in two seasons.

Bud – A condensed shoot or flower.

Conifer – A tree or shrub that bears cones.

Clone – A group of plants originating from a single individual and reproduced by vegetative means such as by cutting, layering, or grafting.

Corm – A stem that is swollen with food reserves.

Crown – The bottom part of a plant from which the roots grow downward and the shoots arise.

Deciduous – A plant that sheds its leaves annually.

Dioecious – Male and female flowers occur on separate plants.

Evergreen – A plant that retains its leaves in a living state during the winter.

Fertilization – 1. Fusion of pollen with ovule. 2. Application of a fertilizer.

Foliage – The leaves of a plant.

Fruit – A mature ovary with seeds.

Grafting – The process of joining a stem or bud of one plant onto the stem of another.

Growing Medium – Natural or synthetic material in which the root system is grown.

Hardening Off – The process of gradually introducing a plant raised under optimum conditions to an environment it will have to withstand outdoors.

Hardy – A plant that will withstand frosts.

Insecticide – A chemical used to control insect pests.

Internode – The part of the stem between one node and another.

Monoecious – A plant that bears separate male and female flowers on the same plant.

Node – The point on a stem at which a leaf or bud is attached.

Ovary – Portion of pistil containing ovules.

Ovule – Female part of flower that will develop into seed when fertilized.

Perennial – A plant that lives indefinitely.

Photosynthesis – The conversion of light energy, water, and carbon dioxide to sugars in the presence of chlorophyll.

Photoperiod – The length of the daylight.

Pistil – The female organ of a flower consisting of the stigma, style, and ovary.

Pollen – The yellow dust produced by anthers.

Pollination – The application of pollen to the stigma of the flower.

Propagation – The multiplication of plants.

Pruning – The removal of parts of a plant to improve it.

Rhizome – A horizontally creeping underground stem that produces shoots and roots.

Rootstock – The host plant onto which a cultivated variety is budded or grafted.

Runner – A shoot that grows along the soil surface, rooting at intervals.

Scarification – A treatment used on hard-coated or flesh-covered seeds to allow them to soak up water for germination.

Scarifying – The vigorous use of a rake or rake-like tool to remove thatch from a lawn.

Seeds – Mature ovules.

Stamen – The male organ of a flower consisting of the anther and filament.

Stigma – The part of the female organ of the flower that catches the pollen.

Stolon – A shoot at or below the soil surface that produces a new plant at its tip.

Stratification – The exposure of seeds to cold, moist conditions for several months in order to get them to germinate.

Style – The part of the female organ of the flower that connects the stigma to the ovary.

Tender – Damaged by frost or low temperatures.

Tiller – A side shoot arising from the base of the plant.

Transplanting – Movement of a plant from one site to another.

Tuber – A swollen underground stem.

Turf – A ground cover of grass.

Appendix

General Contest Information

Junior (District Level)

Each county may enter one or two individual contestants or a team of three or four contestants. The top three scores from individual team members will be accumulated to give a team score.

1. Contestant should bring these items:
   a. Form 166 4-H Contest Entry and Score Form (typed)
   b. Pencil with eraser

2. The contest consists of three parts:
   a. Judging – (150 points)
      Judging four plates of specimens from each of three classes (1. vegetables, 2. flowers or ornamentals, and 3. fruit), using Extension Horticulture Judging Form. (See section on Judging.)
   b. Identification – (250 points)
      Identifying 25 specimens from the list for Juniors. In general, the more common the plant or plant product, the more difficult the specimen will be. Specimens can consist of plant parts (fresh or preserved), plant products, seeds, or pictures.
   c. Knowledge – (250 points)
      Answering 25 objective-type questions (multiple choice and true-false) on the material in this handbook from the Houseplants section to the end.

Senior (State Level)

Each county may enter one or two individual contestants or a team of three or four contestants. The top three scores from individual team members will be accumulated to give a team score.

1. Contestant should bring these items:
   a. Form 166 4-H Contest Entry and Score Form (typed)
   b. Pencil with eraser

2. The contest consists of these parts:
   a. Judging – (200 points)
      Judging four plates from each of four classes (1. vegetables, 2. flowers, 3. ornamentals, and 4. fruit), using Extension Horticulture Judging Form. (See section on Judging.)
   b. Identification – (350 points)
      Identifying 35 specimens from the list for Seniors. In general, the more common the plant or plant product, the more difficult the specimen will be. Specimens can consist of plant parts (fresh or preserved), plant products, seeds, or pictures.
   c. Knowledge – (350 points)
      Answering 35 objective-type questions (multiple choice and true-false) on all the material in this handbook.

Judging

In each class to be judged, the four plates will be numbered from 1 to 4. Decide which of the four plates is best. Enter the number of the best plate in the box labeled First Place. Decide which of the three remaining plates is best. Enter its number in the box labeled Second Place. Continue until all four plates are ranked. Complete this same procedure for each class.

Use the point scales given below to determine which characteristics to look for in judging and to determine the relative importance of each characteristic.

Ornamentals

Cut Flowers	Point Scale
Condition	30
Form or shape	20
Stem and foliage	20
Color	15
Size	15
Total	100

Pot Plants (Flowering)	Point Scale
Cultural perfection	40
Flower bearing	20
Size	20
Color of blooms	10
Size of blooms	10
Total	100

Pot Plants (Nonflowering)	Point Scale
Cultural perfection	60
Size of plant	20
Size of foliage	10
Color of foliage	10
Total	100

Shrubs	Point Scale
Condition	30
Form or shape	20
Size	10
Color	10
Density	20
Root system	10
Total	100

Vegetables, Fruits, and Nuts

	Point Scale
Condition	35
Color	10
Size	10
Shape	10
Maturity	20
Variety	15
Total	100

Explanation of Terms

(desirable characteristics)

Condition – fresh; clean; blemish free; insect and disease free; no cuts or bruises; no wilted parts.

Color – bright, clear, brilliant, uniform, and typical.

Cultural perfection – plants should have color typical of variety; soil loose, not packed; level in pot and ¼ to ½ inch below rim; plant symmetrical.

Density – enough branches to form a nicely shaped plant without gaps in foliage.

Flower bearing – maximum number of mature flowers, plenty of immature flowers, no overmature flowers.

Foliage – clean, fresh, brilliant color.

Maturity – prime condition for beauty or for eating.

Shape – uniform; symmetrical; typical of plant type.

Size – uniform within class; plant parts in correct proportion to each other.

Variety – all specimens in a class should be one variety.
Horticulture Judging (Each Class = 50 points)

Horticulture Judging
(each class = 50 points)

NAME _____ COUNTY _____

VEGETABLE (Juniors and Seniors)
_____ First Place _____ Second Place _____ Third Place _____ Fourth Place _____

FRUIT (Juniors and Seniors)
_____ First Place _____ Second Place _____ Third Place _____ Fourth Place _____

FLOWER OR ORNAMENTAL (Juniors and Seniors)
_____ First Place _____ Second Place _____ Third Place _____ Fourth Place _____

FLOWER OR ORNAMENTAL (Seniors Only)
_____ First Place _____ Second Place _____ Third Place _____ Fourth Place _____

Leave for judges to fill in score.	SCORE:
Vegetable	1. _____
Fruit	2. _____
Flower or Ornamental	3. _____
Flower or Ornamental	4. _____
Total	_____

Sample Multiple Choice Questions

1. Most houseplants die because
   (a) they do not receive enough light
   (b) they are attacked by insects
   (c) they are overwatered
   (d) they dry out

2. Mulches are used in flower gardens to
   (a) slow weed growth
   (b) save moisture
   (c) regulate soil temperature
   (d) all of the above

3. The purpose of pruning is to
   (a) control size
   (b) improve form
   (c) remove diseased parts
   (d) all of the above

4. In a fall garden you may grow
   (a) tender crops
   (b) hardy crops
   (c) cool-season crops
   (d) all of the above

5. Almost all fruit plants are produced
   (a) by vegetative propagation
   (b) from seed
   (c) by sexual propagation
   (d) to give a variety of sizes, yields, and fruit qualities

Sample True-False Questions

(from Senior section)

1. Mulches can only be used to warm up the soil.
2. Some plants such as chrysanthemums will normally flower in the fall because temperatures are cooler then.
3. A rhizome is a specialized root used in asexual propagation.
4. While roots are forming on a stem cutting, you should reduce transpiration by keeping the cutting in the dark.
5. All shrubs should be pruned in the winter before new growth starts.

NJHA Horticulture Contest Identification Answer Sheet

Name _____ State _____ Contestant # _____

A - Flowers & Indoor Plants		B - Landscape Ornamentals		C - Fruits, Nuts, and Berries		D - Vegetables	
A1 African Violet	1. _____	B1 Arborvitae	1. _____	C1 Almond	1. _____	D1 Artichoke (Globe/Jerusalem)	1. _____
A2 Ageratum		B2 Ash		C2 Apple		D2 Asparagus	
A3 Amaryllis	2. _____	B3 Azalea/Rhododendron	2. _____	C3 Apricot	2. _____	D3 Basil	2. _____
A4 Bachelor Button		B4 Basswood/Linden (*Tilia* sp.)		C4 Avocado		D4 Bean	
AS Begonia	3._____	B5 Beech	3._____	CS Banana	3._____	D5 Beet	3._____
A6 Canna		B6 Birch		C6 Blackberry		D6 Broccoli	
A7 Celosia	4._____	B7 Boxwood	4._____	C7 Black Walnut	4._____	D7 Brussels Sprouts	4._____
A8 Chrysanthemum		B8 Camellia		C8 Blueberry (*Vaccinium* sp.)		D8 Cabbage	
A9 Coleus	5._____	B9 Cedar (*Cedrus* sp.)	5._____	C9 Brazil Nut	5._____	D9 Carrot	5._____
AlO Columbine		Bl0 Cottonwood/Poplar		C10 Butternut		D10 Cauliflower	
All Coral Bells (*Heuchera* sp.)	6._____	Bll Crapemyrtle (*Lagerstroem* Ia sp.)	6._____	C11 Cherry	6._____	D11 Celery	6._____
A12 Cosmos		Bl2 Dogwood		C12 Chestnut		D12 Chives	
A13 Cranesbill (*Geranium* sp.)	7._____	B13 Elm	7._____	C13 Coconut	7._____	D13 Corn	7._____
A14 Crocus		B14 English Ivy		C14 Coffee		D14 Cucumber	
A15 Daffodil	8._____	Bl5 Euonymus	8._____	C15 Cranberry	8._____	D15 Dill	8._____
A16 Dahlia		B16 Fir		C16 Currant		D16 Edamame (Edible Soybean)	
A17 Daylily	9._____	B17 Forsythia	9._____	C17 Date	9._____	D17 Eggplant	9._____
A18 Dianthus sp.		B18 Ginkgo		C18 Elderberry		D18 Garlic	
A19 Dracaena	10._____	B19 Hawthorn	10._____	C19 English Walnut	10._____	D19 Horseradish	10._____
A20 Dumbcane/Diffenbachia		B20 Hemlock		C20 Fig		D20 Kale	
A21 Ficus sp.	11._____	B21 Hibiscus sp.	11._____	C21 Filbert	11._____	D21 Kohlrabi	11._____
A22 Geranium (*Pelargonium* sp.)		B22 Holly		C22 Gooseberry		D22 Leek	
A23 Gladiolus	12._____	B23 Honey Locust	12._____	C23 Grape	12._____	D23 Lettuce	12._____
A24 Hollyhock		B24 Hydrangea		C24 Grapefruit		D24 Muskmelon	
A25 Hosta	13._____	B25 Juniper	13._____	C25 Guava	13._____	D25 Mustard	13._____
A26 Hyacinth		B26. Lilac		C26 Kiwi		D26 Okra	
A27 Impatiens (*I. walleriana, I. hawkeri*)	14._____	B27 Magnolia	14._____	C27 Kumquat	14._____	D27 Onion	14._____
A28 Iris		B28 maple		C28 Lemon		D28 Parsley	
A29 Lily (Easter, Asiatic, Oriental)	15._____	B29 Nandina	15._____	C29 Macadamia Nut	15._____	D29 Parsnip	15._____
A30 Marigold		B30 Oak		C30 Mango		D30 Peas	
A31 Nasturtium	16._____	B31 Periwinkle (*Vinca* sp.)	16._____	C31 Mulberry	16._____	D31 Pepper	16._____
A32 Pansy		B32 Photinia		C32 Nectarine/Peach		D32 Potato (Irish)	
A33 Peony	17._____	B33 Pine	17._____	C33 Olive	17._____	D33 Potato (Sweet)	17._____
A34 Peperomia		B34 Pittosporum		C34 Orange		D34 Radish	
A35 Petunia	18._____	B35 Planetree (*Platanus* sp.)	18._____	C35 Papaya	18._____	D35 Rhubarb	18._____
A36 Philodendron		B36 Potentilla		C36 Pear		D36 Rosemary	
A37 Purple Coneflower (*Echinacea* sp.)	19._____	B37 Redbud (*Cercis* sp.)	19._____	C37 Pecan	19._____	D37 Sage	19._____
A38 Rose		B38 Spirea		C38 Persimmon		D38 Spinach	
A39 Salvia	20._____	B39 S[rice	20._____	C39 Pineapple	20._____	D39 Squash	20._____
A40 Schefflera		B40 Sweetgum		C40 Pistachio		D40 Swiss Chard	
A41 Sedum sp.	21._____	B41 Viburnum	21._____	C41 Plum	21._____	D41 Thyme	21._____
A42 Snakeplant/Sansevieria		B42 Willow		C42 Pomegranate		D42 Tomatillo	
A43 Snapdragon	22._____	B43 Wisteria	22._____	C43 Raspberry	22._____	D43 Tomato	22._____
A44 Tulip		B44 Yew (*Taxus* sp.)		C44 Shagbark Hickory		D44 Turnip	
A45 Zinnia	23._____	B45 Yucca (*Yucca* sp.)	23._____	C45 Strawberry	23._____	D45 Watermelon	23._____
	24._____		24._____		24._____		24._____
	25._____		25._____		25._____		25._____
# of Flowers and Indoor Plants Correct _____		# of Landscape Ornamentals Correct _____		# of Fruits, Nuts, Berries Correct _____		# of Vegetables Correct _____	

Plant List for Identifying and Judging *Vegetables*

Plant Name/Type	Foliage/Plant	Flower	Fruit, Nut, or Edible Portion	Seed or Pit	Seedpod or Storage Organ
Artichoke (Globe/Jerusalem)	X	X	X	X	
Asparagus	X		X	X	
Basil	X	X	X	X	
Bean	X		X	X	
Beet	X		X	X	
Broccoli	X	X	X		
Brussels sprouts	X		X		
Cabbage	X		X		
Carrot	X	X	X	X	
Cauliflower	X		X		
Celery	X		X	X	
Chives	X		X	X	
Corn	X	X	X	X	
Cucumber	X		X	X	
Dill	X	X	X	X	
Edamame (edible soybean)	X	X		X	X
Eggplant	X	X	X	X	
Garlic	X	X	X		
Horseradish	X	X		X	X
Kale	X		X		
Leek	X		X		
Lettuce	X		X	X	
Muskmelon	X		X	X	
Mustard	X		X		
Okra	X	X	X	X	
Onion	X	X	X	X	
Parsley	X		X	X	
Parsnip	X		X	X	
Peas	X		X	X	
Pepper	X		X	X	
Potato (Irish)	X	X	X		
Potato (Sweet)	X	X	X		
Radish	X	X	X	X	
Rhubarb	X		X	X	
Rosemary	X	X			
Sage	X		X		
Spinach	X		X	X	
Squash	X		X	X	
Swiss chard	X		X		
Thyme	X	X			
Tomatillo	X	X	X	X	
Tomato	X	X	X	X	
Turnip	X		X		
Watermelon	X		X	X	

Plant List for Identifying and Judging *Fruits, Nuts, and Berries*

Plant Name/Type	Foliage/Plant	Flower	Fruit, Nut, or Edible Portion	Seed or Pit	Seedpod or Storage Organ
Almond	X		X	X	
Apple	X		X	X	
Apricot	X	X	X	X	
Avocado	X		X	X	
Banana	X	X	X		
Blackberry	X		X		
Black walnut	X		X		
Blueberry	X	X	X		
Brazil nut			X	X	X
Butternut	X		X	X	
Cherry	X		X	X	
Chestnut	X		X	X	
Coconut	X		X	X	
Coffee	X	X	X	X	
Cranberry	X		X		
Currant	X		X		
Date	X		X	X	
Elderberry	X	X	X		
English walnut	X		X		
Fig	X		X		
Filbert	X		X	X	
Gooseberry	X		X		
Grapefruit	X		X	X	
Guava	X	X	X	X	
Kiwi	X		X		
Kumquat	X		X		
Lemon	X		X		
Macadamia nut	X		X		
Mango	X		X	X	
Mulberry	X		X		
Nectarine/Peach	X	X	X	X	
Olive	X		X	X	
Orange	X		X		
Papaya	X	X	X	X	
Pear	X		X		
Pecan	X		X		
Persimmon	X		X	X	
Pineapple	X		X		
Pistachio	X		X	X	
Plum	X		X	X	
Pomegranate	X	X	X		
Raspberry	X		X		
Shagbark	X		X	X	
Strawberry	X		X		

Plant List for Identifying and Judging *Flowers and Indoor Plants*

Plant Name/Type	Foliage/Plant	Flower	Seed or Pit	Seedpod or Cone	Storage Organ
African violet	X	X			
Ageratum	X	X	X		
Amaryllis	X	X			X
Bachelor button	X	X	X		
Begonia	X	X			
Canna	X	X			X
Celosia	X	X	X		
Chrysanthemum	X	X			
Coleus	X	X			
Columbine	X	X	X		
Coralbell	X	X			
Cosmos	X	X	X		
Cranesbill	X	X		X	
Crocus	X	X			X
Daffodil	X	X			X
Dahlia	X	X	X		X
Daylily	X	X		X	X
Dianthus	X	X	X		
Dracaena	X				
Dumbcane/Dieffenbachia	X				
Ficus	X		X		
Geranium	X	X		X	
Hollyhock	X	X	X	X	
Hosta	X	X		X	
Hyacinth	X	X			X
Impatiens	X	X	X	X	
Iris	X	X		X	X
Lily (Easter, Asiatic, Oriental)	X	X			X
Marigold	X	X	X		
Nasturtium	X	X	X		
Pansy	X	X	X		
Peony	X	X		X	X
Peperomia	X	X			
Petunia	X	X	X		
Philodendron	X				
Purple coneflower	X	X	X		
Rose	X	X	X	X	
Salvia	X	X			
Schefflera	X	X			
Sedum	X	X			
Snakeplant/Sansevieria	X	X			
Snapdragon	X	X	X		
Tulip	X	X			X
Zinnia	X	X	X		

Plant List for Identifying and Judging *Landscape Ornamentals*

Plant Name/Type	Foliage/Plant	Flower	Fruit, Nut, or Edible Portion	Seed or Pit	Seedpod or Cone
Arborvitae	X			X	X
Ash	X			X	
Azalea, Rhododendron	X	X		X	
Beech	X			X	X
Birch	X			X	X
Boxwood	X				
Camellia	X	X			X
Cedar	X				X
Cottonwood/Poplar	X			X	X
Crapemyrtle	X	X	X	X	
Dogwood	X	X	X		
Elm	X			X	
English	X				
Euonymus	X			X	X
Fir	X			X	X
Forsythia	X	X			
Ginkgo	X		X	X	
Hawthom	X		X		
Hemlock	X			X	X
Hibiscus	X	X		X	X
Holly	X		X		
Honey locust	X			X	X
Hydrangea	X	X			
Lilac	X	X		X	X
Linden	X	X		X	
Magnolia	X	X		X	X
Maple	X			X	
Nandina	X	X	X		
Oak	X			X	
Periwinkle	X	X			
Photinia	X	X			
Pine	X			X	X
Pittosporum	X			X	X
Planetree	X			X	X
Potentilla	X				X
Redbud	X	X		X	X
Spirea	X	X			
Spruce	X			X	X
Sweetgum	X				X
Viburnum	X	X	X		
Willow	X				
Wisteria	X	X		X	
Yew	X		X	X	
Yucca	X	X	X	X	

4-H Horticulture Junior List – *Vegetables*

Item	Plant	Bloom	Fruit/Root	Seed
1. Artichoke/globe or Jerusalem	X	X	X	X
2. Asparagus	X		X	X
3. Basil	X			
4. Bean	X			X
5. Broccoli	X		X	
6. Cabbage	X	X	X	
7. Carrot	X		X	X
8. Cauliflower			X	
9. Celery	X			X
10. Chinese cabbage	X		X	
11. Collard	X			
12. Corn	X	X	X	X
13. Cucumber	X	X	X	
14. Dill	X	X		X
15. Garlic	X	X	X	
16. Lettuce	X			X
17. Muskmelon	X		X	X
18. Mustard	X			X
19. Okra	X	X	X	X
20. Onion	X		X	X
21. Parsnip	X		X	
22. Pepper	X		X	
23. Potato (Irish)	X	X	X	
24. Potato (Sweet)	X	X	X	
25. Radish	X		X	
26. Spinach	X			X
27. Squash	X	X	X	X
28. Tomato	X		X	X
29. Turnip	X		X	
30. Watermelon	X	X	X	X

4-H Horticulture Junior List – *Fruits and Nuts*

Item	Foliage/Plant	Bloom	Fruit/Nut*	Seed/Pit
1 Almond	X		X	
2. Apple	X		X	X
3. Apricot	X		X	X
4. Avocado	X		X	X
5. Banana	X	X	X	
6. Blackberry	X		X	
7. Black walnut	X		X	
8. Blueberry	X		X	
9. Cashew	X		X	
10. Cherry	X		X	X
11. Chestnut	X		X	
12. Coconut	X		X	
13. Elderberry	X	X	X	
14. Fig	X		X	
15. Grape	X		X	X
16. Grapefruit	X		X	X
17. Kiwi fruit	X		X	X
18. Mango	X		X	X
19. Mulberry	X		X	
20. Nectarine	X		X	X
21. Orange	X		X	
22. Peach	X		X	
23. Pear	X		X	X
24. Pecan	X		X	
25. Persimmon	X		X	X
26. Pineapple	X		X	
27. Plum	X		X	X
28. Pomegranate	X	X	X	X
29. Raspberry	X	X	X	
30. Strawberry	X	X	X	

4-H Horticulture Junior List – *Flower and Indoor Plants*

(Parts of plants that could appear on contest)

Item	Foliage/Plant	Flower	Seed/Pod	Bulb/Corm/Rhizome
1. African violet	X	X		
2. Ageratum	X	X		
3. Amaryllis	X	X		X
4. Bachelor button	X	X		
5. Begonia	X	X	X	
6. Canna	X	X	X	X
7. Celosia	X	X	X	
8. Chrysanthemum	X	X		
9. Cockscomb	X	X		
10. Coleus	X			
11. Crocus	X	X		X
12. Cyclamen	X	X		X
13. Daffodil	X	X		X
14. Dahlia	X	X		X
15. Daylily	X	X		
16. Dumbcane/Diffenbachia	X			
17. Geranium	X	X		
18. Gladiolus	X	X		X
19. Gloxinia	X	X		
20. Iris	X	X		X
21. Marigold	X	X	X	
22. Pansy	X	X		
23. Petunia	X	X		
24. Philodendron	X			
25. Rose	X	X		
26. Salvia	X	X		
27. Snakeplant/Sansevieria	X			
28. Tulip	X	X		X
29. Zinnia	X	X		

4-H Horticulture Junior List – *Woody Ornamentals*

Item	Foliage/Plant	Flower/Bloom	(Fruit/Cone/Seed/Pod)
1. Arborvitae	X		X
2. American planetree (sycamore)	X		X
3. Ash	X		X
4. Azalea-Rhododendron	X	X	
5. Barberry	X		X
6. Birch	X		X
7. Boxwood	X		
8. Camellia	X	X	X
9. Crape myrtle	X	X	X
10. Dogwood	X	X	X
11. Elm	X		X
12. Euonymus	X		
13. Forsythia	X	X	
14. Hawthorn	X		X
15. Holly	X		X
16. Honey locust	X		X
17. Hydrangea	X	X	X
18. Juniper	X	X	X
19. Magnolia	X	X	X
20. Mahonia	X		X
21. Maple	X		X
22. Oak	X		X
23. Pachysandra	X		
24. Pittosporum	X		
25. Privet	X		X
26. Redbud	X	X	X
27. Spirea	X	X	
28. Spruce	X		X
29. Viburnum	X	X	X
30. Willow	X		X

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