LEARNING TO GROW

*A Volunteer Gardening Program to Involve New Audiences and Community Volunteers in Youth Development Activities.*

A District 11 4-H Program Development Committee Project, under the auspices of the Texas Agricultural Extension Service, Route 2, Box 589, Corpus Christi, Texas 78406-9704
A Volunteer Gardening Program to Involve New Audiences and Community Volunteers in Youth Development Activities.

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4-H MISSION

The Texas 4-H Program develops youth and adults, utilizing research-based information in creative, diverse, hands-on educational environments. Four-H maximizes each individual's potential through unique partnerships of youth, volunteers, university faculty and community supporters, resulting in exciting and innovative experiences which produce capable citizens to lead us into tomorrow.

4-H VALUES

We believe people are the single most important product of 4-H; therefore, we value the education and preparation of responsible, capable productive citizens.

Furthermore, we value:

- opportunities to belong, participate and contribute to diverse types of families and communities;
- progressive life skills (such as communication, decision-making, teamwork, and lifelong learning) through hands-on education in a nurturing environment;
- strong moral character and positive self-image through multi-generational, culturally diverse interactions; and
- programs designed to meet local needs through efforts of youth, volunteers, donors, professionals and 4-H alumni.

We believe 4-H builds competent, caring and productive citizens capable of living in a dynamic global society.

4-H VISIONS

Texas 4-H ... a dynamic, educational, youth-focused organization leading our state in empowering all individuals, families and communities to unleash their potentials and create positive life-shaping experiences.
The Learning to Grow Program

Organization and development of materials was coordinated by:

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References used for activities:


Cylinder Gardening, Texas Agricultural Extension Service Curriculum Guide, Harris County Cooperating.
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The Learning to Grow Program
Overview

This program is in cooperation with the Texas Agricultural Extension Service-District 11. Garden volunteers and participating community groups. Its purpose is to provide "hands-on" learning about gardening which some may otherwise never have the opportunity to experience. A twelve week outline and hands-on activities are also provided for instructional purposes.

Our climate provides a long growing season and the opportunity for two separate gardens in one year -- spring and fall. Each presents a different set of problems. However, most basic rules of gardening apply to both seasons.

The length of time needed to complete a course of study depends on whether or not a garden is in place. If the garden must be built, a time span of 14 weeks is required. If the garden bed is pre-existing, 12 weeks is required from planting to harvest. The planting of a spring garden should begin around February 15th while the fall garden is approximately September 1st.

The concept is to provide as much "hands on" learning experience as possible. Strive to keep the gardening information on the participants level.

Teachers will decide how much time will be allotted for sessions. We would encourage that one particular time be set aside each week for scheduling ease. There may be times when students, parents, teachers and Garden volunteers would be asked to participate in a special event.

The number of participants that can take an active role in the program is contingent on the number of volunteers involved. A maximum ratio of 1 volunteer to 8 participants is recommended.
The Learning to Grow Program

A District 11 Youth Gardening Project

Goals

• Expose Students to the benefits and pleasures of gardening.

• Provide basics of soil preparation, planting, watering, and general plant care.

• Elevate student interest and motivation in gardening as a hobby.

• Promote sound horticultural practices.

• Provide hands-on, real-life learning experiences which correlate with classroom studies.

Teacher/Parent Responsibilities

• Secure monies/supplies for project (can be done through fundraisers, donations, grants, and/or parent/business sponsors).

• Provide one class period a week for student work in the "Learning to Grow" Garden.

• Provide regular in-class instruction, according to provided curriculum.

• Coordinate weekly maintenance: watering, weeding, pest control.

• Coordinate with gardening volunteers, parents, and county agents.

• Maintain student discipline: authority figure other than garden volunteer must be present at all times when children are involved.
Garden Volunteer Responsibilities

- Serve as horticultural resource: site selection, garden design, supply list, gardening timeline, vegetable culture information, construction details.
- Serve as garden problem consultant on disease, insect, weed control for 14 weeks but not required to treat these problems.
- Teacher/parent instruction and trainings.
- Recruit and coordinate Garden volunteer force.
- Weekly, student hands-on instruction in the garden.
- Construct planting beds with parental help.

Use of Chemicals

Garden volunteers will NOT use chemicals on the garden. If use of chemicals is advisable, the teacher will be informed as to the chemical that can be used and advised to read and abide by ALL label instructions. Chemical application should not take place when students are present. The use of organics is preferred as a first choice.
INSTRUCTIONAL

UNITS
<table>
<thead>
<tr>
<th>Session</th>
<th>Classroom</th>
<th>Garden</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction to MGs/Wonder of Plants</td>
<td>1st Planting</td>
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<td>2</td>
<td>Soil Components and Preparation</td>
<td>2nd Planting, Scout Insects</td>
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<td>3</td>
<td>Plant Growth</td>
<td>Germination, Thinning</td>
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<td>4</td>
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<td>5</td>
<td>Plant Parts</td>
<td>Harvest, Thinning</td>
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<tr>
<td>6</td>
<td>Caring for the Environment</td>
<td>Weeding, Fertilizing</td>
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<tr>
<td>7</td>
<td>Garden Insects</td>
<td>Thinning, Fertilizing, Planting</td>
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<tr>
<td>8</td>
<td>Plant Diseases</td>
<td>Thinning, Fertilizing</td>
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<tr>
<td>9</td>
<td>Flowers, Pollination, &amp; Fruit</td>
<td>Harvest</td>
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<td>10</td>
<td>Composting</td>
<td>Harvest, Weeding, Scout</td>
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<td>Insects</td>
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<tr>
<td>11</td>
<td>Harvest Crops</td>
<td>Harvest, Compost Material</td>
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<tr>
<td>12</td>
<td>Putting the Garden to Bed</td>
<td>Harvest, Cover Beds</td>
</tr>
</tbody>
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SESSION 1
Introduction/ Plant Wonders

Class Preparation: Think how plants effect our lives--be prepared to give suggestions.

Materials: Actual plant products to be passed around.

1. Do appropriate (age, time-limit) in-class activity addressing the importance of plants.

2. Talk about plant products and how they impact our lives.
   * Plants are important for our physical and mental health.
   * What are some plant products that we use everyday?
     - First and foremost plants provide us with oxygen, a component necessary for life.
     - Directly-lettuce, apples, carrots, bananas, flour,
     - Indirectly-chickens eat corn, cattle eat grain that comes from plants (the sorghum grown in the fields in Texas feeds cattle), leather comes from cowhides.
     - Many of our clothes come from plant fibers such as cotton. Our homes are made of wood that comes from trees. Many medicines are derivatives of plants.
   * Horticulture- the science and art of growing fruits, vegetables, flowers, or ornamental plants (trees and shrubs).

3. Let Garden volunteers (GV) introduce themselves to your class. They will give a brief description of the Learning to Grow program.

4. Go outside and look for different plants. Visit the garden and have GV teach proper garden activity for the day.

Terms: Plant, horticulture, oxygen

Process Skills: communicating, drawing inferences, observing, applying defined terms

Activities: Mystery Match
Mystery Mission
Mystery Connection
Gas Gobblers
Plants In Your World

Mystery Match

OBJECTIVE: To be able to connect various objects with their plant or animal sources in nature.

TIME: 30 minutes

MATERIALS NEEDED: small plastic bags, construction paper, tape and objects listed below.

INSTRUCTIONS

This activity is designed to reinforce the concept that plants and animals are the source of things we use every day. In addition to providing us with oxygen and food, plants provide us with many things. To help children make some of the connections, gather a small amount of the following items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Source of</th>
</tr>
</thead>
<tbody>
<tr>
<td>cowhide</td>
<td>leather, jacket, tennis shoes</td>
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<tr>
<td>wheat</td>
<td>flour, bread</td>
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<tr>
<td>twig from a tree</td>
<td>paper, wood</td>
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<tr>
<td>apples</td>
<td>applesauce, juice</td>
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<tr>
<td>raw wool or wool yarn</td>
<td>rugs, clothing</td>
</tr>
<tr>
<td>cotton</td>
<td>jeans, sheets</td>
</tr>
<tr>
<td>peanuts</td>
<td>peanut butter</td>
</tr>
</tbody>
</table>

Before the activity begins, place the items separately in small plastic bags and staple them to a sheet of construction paper. Then tape some of the materials up where they do not belong. For instance, put the twig from the tree on the bread or sheets. Tape one item where it belongs, as an example to the children.

When the children arrive, be mysterious about the objects in the room. When they have settled down, tell them they are going to be finding out where these objects come from. Tell them that all the objects in the room are to represent where things come from in nature. Go around the room identifying objects in the plastic bags and tell children that only one is in the right place, next to the object it provides. It will probably be difficult for them to make the connection between these objects. You may want them to discover it through a process of elimination, beginning with source materials they are more familiar with, such as trees or wood. As you review each item, have children decide if it is the source of the object it is next to. If they agree that it is in the wrong place, have them move it to its correct spot.

When the source objects have all been connected to the materials they provide, encourage a discussion about the many ways we are dependent upon plants and animals for things we need. Children could also conduct a home inventory (see Activity Sheet — Mystery Mission) and draw up a list of all the different ways plants and animals are used in their homes.
Plants in Your World - Mystery Match

Mystery Mission

Home Inventory

Five things in my house made with wood are:

1. 

2. 

3. 

4. 

5. 

I found one fruit or vegetable in the kitchen. It was _________________.

Cotton is found in some of my clothes. Like my _________________.

Cotton is also used to make _________________. (Any item other than clothing).
Plants In Your World - Mystery Match

Mystery Connection

Match the plant or plant part that is the source for the things you use.

- Cotton
- Juice
- Peanut
- Jeans
- Apple
- Paper
- Tree
- Peanut Butter
Plants In Your World

Gas Gobblers

OBJECTIVES: To demonstrate the need for plants to supply oxygen to people and animals. To demonstrate the need for animals and people to supply carbon dioxide to plants.

TIME: 15 to 20 minutes

MATERIALS NEEDED: 4 bottles of blow bubbles, cloth or construction paper (red, brown and green) for making arm bands

INSTRUCTIONS

To begin, students should be divided into three groups – animals, plants and people. Designated “animals” should have a brown arm band. “People” should have red arm bands and “plants” should wear green arm bands. These may be made from cloth or construction paper.

Select four children to serve as bubble blowers. Two of these children should be wearing green arm bands designating them as plants. The other two children can be selected from either the animal or people group. The bubble blowers are instructed to stand on opposite sides of the room with the other children in the center. If played outside, the bubble blowers should stand on the four corners to make a square. The rest of the children will stand inside the square.

The teacher/leader should explain that plants, animals and people need each other to survive. Explain that plants give off a gas called "oxygen" that people and animals need to breathe and people and animals give off a gas called "carbon dioxide" that plants need to survive. Tell the children that you will be using the blow bubbles to represent the oxygen and carbon dioxide. You will let them know if the bubbles are oxygen bubbles or carbon dioxide bubbles. If they are oxygen, only the plant bubble blowers should blow their bubbles and the animals and people try to gobble up as much gas as they can by popping the bubbles. When the teacher/leader says that the bubbles are carbon dioxide, only the animals and people bubble blowers should blow their bubbles and the plants try to gobble up their gas by popping the bubbles. Change rather quickly from carbon dioxide to oxygen bubbles bubbles to keep the children involved. Keep an eye on the arm bands to make sure children are gobbling the right kind of gas. Plants for carbon dioxide and animals and people for oxygen.
SESSION 2
Soil Components and Preparation

Class preparation: Bring along soil samples or scout out an area on school grounds where students can dig.

Prepare set of gardening rules--no running, lay rake prongs face down.

Materials: Bring three sizes of something similar to compare sizes. Example: basketball, baseball, and a small rubber ball to simulate sand, silt, and clay.

Samples of sand, sandy-loam, clay.

Relative Size of Soil Particles Handout

Soil is not Dirt Handout

Easy Gardening ... Soil Preparation Handout

Garden Rules Handout

1. Do soil activity (you can modify by bringing your own samples) and discuss components of soil.

Sand- (2mm to .05 mm) These are the largest, coarsest soil particles. The pore spaces between sand particles are large, allowing water and nutrients to drain through very quickly. Soil with a high proportion of sand feels gritty and crumbles easily.

Clay- (less than .002mm) Clay particles are extremely fine and cling together. Because there is relatively little pore space, water moves through very slowly. Because of the many small particles, there is a great deal of surface area to which nutrients can adhere.

Soil with a high proportion of clay feels heavy, slippery when wet, and will compact into a tight ball. Soil will form a ribbon when pressed between thumb and forefinger.

Silt- (.05mm to .002mm) Silt particles are in between the sizes of sand and clay particles. Their other properties are also between the previous two.

Soil mix with a combination of the three is best--a well-draining sandy loam.

2. Discuss garden rules and explain ramifications if not followed.

Terms: soil, sand, silt, clay, loam

Process skills: communicating, observing, classifying, drawing inferences, relating objects to other objects, applying defined terms.

Activities: Just Diggin' Around
RELATIVE SIZE OF SOIL PARTICLES

Clay

Silt

Fine sand

Medium sand

Largest sand particles
SOIL IS NOT DIRT

Soil is the top layer of the earth’s surface used to support plant life, animals, humans and the structures we build. Soil is composed of air, water, mineral matter and organic matter. There are many different kinds of soils and many terms used to describe a particular soil, soils, and their properties. Dirt is not a soil term! "Dirty" may be used to describe your hands once you’ve worked with soils.

Why should we learn more about soils? As one of the more important natural resources that exist, we are dependent on soils. Soils support the plants we need for food, clothing, shelter and beauty.

SOIL MIX TERMS:

artificial mix (soilless mix)- media used to grow plants. Contains no soil but a mix of peat moss, vermiculite and/or perlite.

fertilizer- organic or inorganic nutrient material added to media and soil to insure good growth.

humus- the stable fraction of soil organic matter that remains after the major portion of residues have decomposed. Humus provide nutrients, increases the water holding capacity of the soil, and provides food for microbial activity.

loam- a soil that exhibits the best properties of both sand and clay particles, considered very desirable.

organic matter- decayed or partially decayed plant and/or animal matter. Examples: peat moss, manure, compost, grass clippings, sawdust, plant residues. Organic matter is added to soils because it is used by soil microorganisms, it increases the soil's water holding capacity or improves drainage depending on the soil structure, it provides nutrients and makes a heavy soil more easy to work.

peat moss- organic material that was formed under wet swampy conditions. Peat moss improves soil structure and holds moisture.

perlite- form of volcanic rock heated at 2000 degree temperatures causing it to expand. A component of some artificial or soilless mixes, it is used to promote drainage.

plant nutrients- are elements needed by the plant. Carbon, hydrogen and oxygen are provided by air and water and are used by plants in large quantities. The macronutrients nitrogen, phosphorus, potassium, calcium, magnesium and sulfur are need in relatively large amounts because: 1) a soil may naturally be low in one or more of these elements, 2) these nutrients may be tied up and not readily available for plant use, and 3) because plants are constantly taking up and using these
nutrients to conduct essential plant processes. The micronutrients iron, boron, manganese, copper, zinc, molybdenum, and chlorine are needed by plants in smaller amounts.

vermiculite- a mica mineral heated at a very high temperature causing the granules to expand greatly. Used to improve the air movement in fine-textured soils (clay), used to hold moisture in coarse-textured soils (sand) and is a component of artificial mixes.

SOIL TERMS:

soil aggregate- a group or clump of soil particles.

heavy soil- very fine-textured soil, one that is hard to work, does not refer to weight, ie. clay soil.

light soil- coarse textured soil, easy to work, ie. sandy soil.

soil organisms- may be anything from bacteria, fungi to earthworms. Important to the soil because they conduct the biological activity needed to break down organic matter and nutrients into forms the plant can use.

soil particles- sand, silt, clay.

soil pH- a scale developed to indicate soil acidity (pH of 0-6.9), neutrality (7.0), or alkalinity (7.1-14.0). Most plants grow best in the pH range of 5.0-6.5.

soil tests- indicates the pH level and can be expanded to show the nutrient level. Nutrients usually tested for are Nitrogen (N), Phosphorus (P), Potassium (K). Soil testing is essential so that an accurate plant nutrient recommendation can be made.

soil structure- refers to the arrangement or groupings of soil particles. A sandy soil contains large particles and because of this it has a loose structure, not much clumping together allows for good aeration and drainage. A clay soil has fine particles that bind together tightly and hold lots of water. We can improve the structure of a soil. For example, the addition of organic matter will help hold moisture in a sandy soil. We can damage the structure by compaction, tillage, weathering.

soil texture- refers to the size of the soil particles and is used to name a soil by the percent of these particles in a soil. For example, when a soil's major component is sand, it's called a sandy soil. Sand which has a large particle size is a coarse-textured soil. A silty soil contains mostly silt and has a fine-texture and a clayey soil contains mostly clay and has a very fine texture.

top soil- the upper most layer of the soil, ranging in thickness of 2" to 18". Often used in lawns and gardens, it may or may not be fertile. There is no formal definition of "topsoil".
The soil is a storehouse for nutrients, organic matter, air and water plants need to grow. Soil also supports plants by providing a place to grow.

Properly prepared and cared for soil can be improved each year and will continue to grow plants forever. Uncared for soil will soon become suited only for growing weeds.

**Soil Types**

Texas gardeners must work with many different soils. Some are very sandy. Some are sticky clay and others are rocky and shallow.

Sandy soils do not hold enough water; in windy areas blowing sand can injure vegetables. Clay soils hold too much water and do not allow enough air to enter the soil.

Vegetables need a deep and well-drained soil with adequate organic matter. Good garden soil with proper moisture will not form a hard ball when squeezed in the hand. It also should crumble easily when forced between the fingers. It should not crack or crust over when dry. See figure 1.

![Figure 1](image)

**Soil Improvement**

Almost all garden soils can be improved. Soil additives are materials added to soil to improve its production. They are added to build up soil organic matter or to make soil more workable. Organic matter:

- Loosens tight clay
- Helps sand hold more water
- Makes soil easier to dig
- Adds some nutrients

Some common organic matter additives are:

- **Plant materials** – leaves, straw, grass clippings. Work into the soil several months prior to planting. Most gardeners add them during the winter.

  - **Manure** – add dry well ahead of planting. Fresh manure can damage plants. About 30-40 pounds of dry manure per 100 square feet usually is enough.

  - **Compost** – made of decayed plant materials. Work into the soil prior to planting.

  - **Sawdust** – compost before adding to the garden.

- **Green manure** – rye or oats. Plant in the fall and plow or spade under in the spring. These cannot be used if a fall garden is planted.

To do not add more than a 3-inch layer of organic material.

Most heavy clay soils benefit from the soil additive, gypsum. It adds some nutrients and helps make clay soil more workable. Spread about 3-4 pounds of gypsum per 100 square feet over garden soil after it has been dug in the winter. Work it into the soil or allow to wash in by rainfall.

Add sand to clay soil to make it more workable. Add organic material with the sand. Mix 2 inches of clean sand and 3 inches of organic material, such as leaves, with the soil. Do this during the winter.

**Tilling Soil**

The soil should be tilled as deeply as possible, at least 8-10 inches. Deep tilling loosens soil and lets vegetable roots go deeper. Turn each shovelful of soil completely over. See figure 2.
Till soil when it is moist, but not wet. Working soil when too wet can cause it to become rough. Spade the soil in the winter to prepare for spring planting. Winter temperature and moisture help mellow soil. This is especially important if the soil is being worked for the first time.

Add organic matter each year during soil preparation to build and maintain the soil. Be sure all plant material is turned under the soil. If organic material is added before planting a fall garden, it should be well-rotted such as compost.

Prior to planting time the soil should be raked clean and leveled. Remove all sticks, rocks and other material.

Row Preparation

In most Texas areas vegetables should be planted on raised beds. See figure 3. Raised beds:

- Allow water to drain away from plant roots
- Provide furrow for irrigation
- Allow air to enter soil
- Help plants through periods of high rainfall

If the garden is large enough, make rows 36 inches apart. Where space is a problem, some vegetables can be planted in rows closer than 36 inches, but more care is required during growing season.

Straight beds are nice but not necessary. In small gardens worked with a hoe, rake or other hand tools, straight beds are not as important.

If the garden is large and worked with a rototiller or garden tractor, the rows should be made as straight as possible.

Use a shovel or rake to pull the soil up into beds 8-10 inches high. Pack beds or allow them to settle prior to planting. Before planting, level the top of the bed and widen it to about 6-8 inches. Plant on top of the bed. See figure 4.

After completing the steps required to properly prepare soil for planting, gardening might seem anything but “easy.” With proper soil preparation, gardening will get “easier” every year.
GARDEN RULES

1. No running

2. No pushing or fighting

3. Lay all rakes, shovels and tools with sharp points down.

4. Clean all tools and put them back in their box.

5. Do your part and sit down when asked.

6. Use tools carefully.

7. No walking on garden timbers
Plant Friends

Just Diggin' Around

OBJECTIVE: To be able to identify the many components of soil.

TIME: 45 minutes

MATERIALS NEEDED: coffee can or other large jar, shovel, newspapers, stirrers, water, magnifying glasses

INSTRUCTIONS

The teacher/leader should begin by dividing the children into groups of about four or five. Take them outside, dividing the groups all over the playground or park area. Have each group fill their jars approximately half full with soil. Help the children dig down to get soil from more than just the surface layer.

Give each group a newspaper and have them spread their soil out onto the paper. Have each group look through their soil for leaves, worms, twigs, rocks and other soil components. Discuss the different discoveries of each group. Ask the children some questions about their soil:

- How did the soil feel?
- What color was it?
- Did you find any animals in the soil?

Have each group put all of their soil back into their jars and fill the jar with water. Have the children stir the mixture with paint stirrers to thoroughly mix. After stirring have the children leave the jars undisturbed for a while so that the particles will settle. Ask the children some questions about their soil:

- Is anything floating on the top of the jar?
- What do you see in the bottom of the jar?

This would be a good time for the teacher/leader to talk about the heavier particles going to the bottom first and the lighter particles will be on the top. The teacher/leader might want to talk about other things in nature that move soil. These might include animals, wind, plants and man.
SESSION 3
Plant Growth

Class Preparation: Consider what plants need to grow—sun, light, water, nutrients. How do plants use these things.

Materials: Worksheets
Samples of different fertilizers
What do Plants need to Grow Handouts
Germination of a Seed Handout

1. Do plant growth activity.

2. Explain how plant growth can be charted on the life of the plant. Distribute sheet.

3. Go to the garden and see what has germinated and is beginning to grow.

Terms: garden, seeds, grow, nutrients, fertilizer.

Process skills:
observing, communicating, measuring, drawing inferences, applying defined terms, investigating.

Activities:
What do Plants Need to Grow?
Seed Growth Viewing
Sunshine Fun
Catch and Keep Raindrops
Leaning to the Light
Picture Yourself as a Plant
Zip and Grow
The Radish Carpet
WHAT DO
PLANTS
NEED
TO GROW?
WHAT DO PLANTS NEED TO GROW?

P - Place - pot, cylinder, container

L - Light - sun

A - Air - oxygen, carbon dioxide

N - Nutrients - nitrogen, phosphorous, potassium

T - Thirsty - water

S - Soil
SEED GROWTH VIEWING

Materials Needed:

1. 4 Glass pint jars or drinking glasses.
2. Seeds
3. Paper Towels

Line jars with several thicknesses of paper toweling. Put about 1 inch of water in the bottom of the glass and watch the paper soak up the water. Place seeds between the moist paper and the glass. Stuff crumpled paper towels into the center of the jar to keep seeds pressed against side of glass. Refill water as needed to keep about 1" of water in the bottom of the glass.

Place one in a window, one on a shelf or desk in regular light but not in direct sun, and one in a cabinet. Watch as the seeds germinate - you can actually see the roots emerge! Observe the difference in growth in those placed in light, shade, and dark.
GERMINATION of a SEED
KEEPING A PLANT JOURNAL

Record keeping is an important part of any scientific study and can be a fun part of gardening.

What to look for:

😊 How the seeds sprout and grow.
😊 When you water and fertilize
😊 Number of leaves and flowers
😊 Changes that occur
😊 Plant height
😊 Disease and insect problems
😊 Taste
# PLANT JOURNAL

**NAME**

<table>
<thead>
<tr>
<th>DATE AND TIME</th>
<th>NOTES</th>
<th>DRAWING</th>
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Plant Friends

Sunshine Fun

OBJECTIVE: To create a sunshine mobile that illustrates the importance of the sun in producing food, heat and light.

TIME: 45 minutes

MATERIALS NEEDED: yellow and orange construction paper, old magazines and newspapers, yarn, crayons, scissors and glue

INSTRUCTIONS

The teacher/leader should begin this activity by drawing a picture of a sun on the board. Have the children brainstorm about all of the things that the sun provides in their lives. These ideas can be used to help give the children ideas in creating their mobile.

To construct the mobile, have the children cut a large circle from the construction paper to create the sun. They can alternate colors of construction paper to form sunrays radiating from their large circle. Next have the children cut out pictures from magazines or newspapers that show things that are provided by the sun. They can use the ideas that were generated during the brainstorming. In addition, the children might want to create their own drawings or pictures. These pictures can be glued to a piece of construction paper and attached by a string to the sun. The children can have many pictures dangling from their sun. These mobiles can be made for the children to take home or could be attached to a bulletin board. If displayed on a bulletin board, tissue paper can be put behind the sun to give it more shape before it is stapled down.
Plant Friends

Catch and Keep Raindrops

OBJECTIVE: To understand the need for plants to get water.

TIME: 30 minutes

MATERIALS NEEDED: flour sifter, shallow paper box, three 5 gallon containers (depending on the size of the group), hose and sprinkler if rain doesn't occur or coffee can with different size holes punched in bottom

INSTRUCTIONS

Step 1 Discuss with the children plant needs. When they mention water, ask them where plants get water. Encourage them to name off different water sources. When the group mentions rain, ask them what size and shapes are raindrops. This step can follow with a weather report on T.V. or radio.

Step 2 Fill three to five containers with finely sifted flour and level the tops with a ruler. Cover the top of the containers with paper to protect the flour.

Step 3 Select a child to be a “raindrop catcher” for each container. Instruct rain protected raindrop catchers to go to different locations for raindrop catching such as next to a building, under a shrub or out in the open. These locations should be close by.

Step 4 Each “catcher” should be instructed to remove the protective cover for a slow count of 5. If it is misting or light rain, have “catchers” count to 10.

Step 5 Bring containers inside and allow drops to harden without moving them. When dry, sift drops out of flour with sifter.

Step 6 Put pellets on black paper and discuss the shapes and sizes of the raindrops.

Rain can be simulated with perforated coffee cans, sprinkler cans, etc.
Plant Friends

_Leaning to the Light_

OBJECTIVE: To conduct an experiment illustrating the importance of light to plants.

TIME: 15 to 30 minutes initial set up; 10 to 15 minute discussion after experiment

MATERIALS NEEDED: a growing plant (if any bean plants from previous experiments are still alive, use them; if not, borrow a small potted plant from someone), a box large enough to contain your potted plant, sunny window, knife, index card and someone to help you

INSTRUCTIONS

Place your plant inside the box. With your helper, carefully cut a 2 x 2 inch hole in one side of the box with the knife. Place the box in a sunny window. Allow the plant to grow inside the box for several days. Be sure to water the plant. Then, remove the plant from the box and observe some of the changes that occurred. Ask the children what happened? Is the plant trying to grow toward the light? Is the plant leaning towards the hole and pointing in the direction of the light? This is called "phototropism." Additional information on phototropism can be found in an encyclopedia or plant book.
Plant Friends

Picture Yourself as a Plant

OBJECTIVE: To develop an understanding of plant needs through creative arts and dramatic role.

TIME: 20 to 30 minutes

MATERIALS NEEDED: paper and coloring materials

INSTRUCTIONS

Help children better understand the needs of plants by having them:

1. Role play.
2. Tell a story.
3. Draw a picture of different plant situations you present to them.

Some examples include:

How would you feel if you were a plant . . .

- with too much water,
- with not enough water,
- with too much sunlight,
- planted too deep, or
- not planted deep enough?

What happened to plants the year of the flood?

What happened to plants the day the sun didn't shine?

What happened to plants the day the sun didn't set?

Be sure to give the children positive reinforcement for the work they have done.
Learning Experience 2

Plant Projects

Zip and Grow

OBJECTIVE: To plant seeds and/or transplant into zip-lock type plastic bags and produce a plant.

TIME: 10 to 15 days

MATERIALS NEEDED: plastic bags — sandwich or larger size depending on the type of seed or transplant (zip-lock or twist-tie bags work best), moistened soilless growing media mix, scissors, transplants: vegetables — tomato, lettuce, radish, spinach; herbs — parsley, basil, chives, oregano, mint; others — petunias, begonias, perslane, perlwinkle, Swedish Ivy, wandering jew, pothos, coleus and many others

INSTRUCTIONS

The teacher/leader should begin by giving each child a plastic bag. Each child should fill their bag with the soilless growing media. If it is a zip-lock bag, fill the bag all the way to the top. If the bag is a twist-tie type, fill the bag two to three inches from the top. Close the bag and lay it down flat on a table. Now the bags are ready for the plants.

Have the children cut a small "X" on the topside of the bag that will be big enough to plant the transplant. The "X" can be smaller if seeds are used instead of transplants. On the underside of the bag, several small holes should be made with a fork in order to provide drainage. Be sure to lay the bag on its side with the drainage slits facing downward. Now, have the children select the transplant of their choice and plant it into the bag. The care and culture of these grow bags is similar to that of any plant. Occasionally, water, fertilize and protect the plants from insects and disease. Put the zip and grow bags in a sunny location in your classroom and house and allow the children to watch the plants grow and develop.
Plant Projects

The Radish Carpet

OBJECTIVE: To plant, nurture and harvest radishes grown in a container.

TIME: 1 month

MATERIALS NEEDED: cake pan (9" x 13" or larger), soilless growing media, 1/2-inch mesh hardware cloth (screen), radish seeds, water, fertilizer (20-20-20)

INSTRUCTIONS

To begin this activity, the teacher/feeder will need to punch several holes in the bottom of the cake pans to provide adequate drainage for the plants. It would be excellent if the class or project group could be broken into pairs and each pair had a cake pan to plant. If this is not possible, then one can be done for the whole class to take care of and to watch grow.

Fill the cake pan with the soilless growing medium to within about 1/2-inch of the top of the pan. Now, plant the seeds in the medium, being careful to only lightly cover them with growing medium. Planting should be approximately 1/2-inch to 1 inch apart. Cover the planted tray with a piece of 1/2-inch mesh hardware cloth (screen). Within three to five days, the seedlings will emerge from the growing medium and the hardware cloth screen. It will be important that the children water the radish carpet periodically and fertilize if necessary. In about three to four weeks, the radishes should be mature and ready to harvest. Simply lift up the hardware cloth screen and the bottom of the screen will be covered with the “radish carpet.” Wash off the radishes and cut up to serve to the children either alone or in a salad. If you have enough radishes, allow each of the children to take a radish home to eat.
SESSION 4
Weeds

Class Preparation: Become familiar with the types of weeds that plague our gardens.

Materials: Samples of weed leaves, or seeds (dandelion if available).

1. Discuss what is a weed? How are they harmful? How do you get rid of them?

Weeds. Weeds are plants with many adaptations that help them compete with other crops. The term "weed" is very subjective. A plant is labeled a weed when it grows where we don't want it. Depending on one's perspective, a field of onions can be an unwanted nightmare or a valuable cash crop. Lantana can be a weed in a corn field or a pretty wildflower in open pastures.

Adaptations that help different weeds compete so fiercely and survive include:

* ability to grow in poor soil or in other harsh conditions
* hairy leaves to reduce moisture loss
* strong taproots or complex root systems that develop shoots each year
* ability to reproduce sexually and asexually
* production of enormous quantities of seeds
* seeds lasting into the winter to be dispersed by winds
* highly efficient seed dispersal mechanisms

2. Visit the garden and distinguish between seedlings and weeds.

Terms: seedling, weed

Process skills:
observing, classifying, communicating, drawing inferences, applying defined terms.

Activities:
SESSION 5
Plant Parts

Class Preparation: Research the different plant parts and their functions-roots, shoots, leaves, fruits, and seeds.

Materials: Bring examples of fruits and seeds
Plant Parts Handouts
- What Do Leaves Do?
- What Do Stems Do?
- What Do Roots Do?
- What Do Fruit Do?
- What is Photosynthesis?

1. Discuss the plant parts— actual plant, posters, etc.
2. Do selected plant part activity.
3. Visit garden and note what plants are doing.

Terms: plant parts, roots, shoots, leaves, seeds, fruits.

Process Skills:
manipulating, observing, classifying, communicating, drawing inferences, relating objects to other objects, applying defined terms.

Activities:
What Part of a Plant?
Plant Parts Charade
Parts of a Bean Plant
Dyed Celery
Leaf Pictures
Plant People
A PLANT PLAN
WHAT DO LEAVES DO?

- Most of the food the plant needs is made in the leaves.

- Leaves are like factories changing energy from the sun plus water and carbon dioxide into sugars used by the plant to make proteins and carbohydrates needed for plant growth. This process is called photosynthesis.

- Leaves release oxygen and water.
WHAT DO STEMS DO?

- Stems are the above ground portion of the plant that supports the leaves, buds and flowers.

- Stems have the xylem and phloem that carry the water, minerals and food from place to place. The xylem and phloem are like little straws or tubes that these materials flow through. Xylem carries the water and minerals and phloem carries the sugars made in the leaves.
WHAT DO ROOTS DO?

- Roots are the below ground portion of the plant that helps anchor the plant and keep it from falling over.

- Roots take in water and minerals.

- Some plants use the roots to store food like carrots and radishes.
WHAT DOES FRUIT DO?

- The fruit is the reproductive part of the plant where seeds form.

- In some cases the fruit and seed are the same thing, like corn, wheat or pecans.

- The part of the plant we eat is often the fruit, like tomatoes, squash and peppers.
WHAT IS PHOTOSYNTHESIS?

- Photosynthesis is what happens when light hits the green parts of the plants.

- Photosynthesis takes place in the chlorophyll. Chlorophyll is what makes plants green.

- Photosynthesis uses energy from the sun to change water and carbon dioxide into sugars used by the plant to make needed food.

PHOTOSYNTHESIS

Energy from the sun + carbon + water = Simple sugars

Oxygen

Water

Sunlight

Carbon dioxide

Simple sugars
Plants We See

What Part of a Plant?

OBJECTIVE: To understand the different parts of a plant and how they work.

TIME: 20 minutes

MATERIALS NEEDED: poem, "What Part of a Plant?" color sheet and crayons

INSTRUCTIONS

This activity allows the students to compare the parts of the plant to their own bodies. To help the children learn the function of various plant parts the teacher/leader will read the poem to the children and will encourage them to call out the missing word in each verse.

After the teacher/leader has read the poem one time, read again and have the children act out the parts corresponding to each verse. For example:

Verse 1: Have children curl up in a ball on the floor and be very quiet. Suddenly, the children can spring up quickly sprouting to say Hi!

Verse 2: Have children stand with legs apart and move legs apart as if they were growing. Children may sway like they were in the breeze and can imagine drinking water through their toes.

Verse 3: Have children hold arms close to their sides and gradually have them stretch up toward the sky. Have children wiggle fingers as if their hands were nests with birds in them.

Verse 4: Children can make tight fists and slowly open their "buds" and stretch them into the sky. They can wiggle their hands and fingers like they are fluttering in the breeze.
What Part of a Plant?

What part of a plant
Is in the bag, so tiny and small
You must look real hard to see me at all
People put me into the ground and
I wait there without making a sound
When the ground is warm and the sky is blue
I spring from my sleep to say "hi" to you
To make a new plant I am what people need
Do you know what I am, I am the plant's ______seed______.

What part of a plant
With feet would grow and grow
Deep into the earth they would go
They would hold me in place when the winds blow
Reaching deeper and deeper as far as they can go
Down into the ground my feet would crawl
Pulling up water just like a soda straw
Best of all I wouldn't need boots
For these new feet would be my ______roots______.

What part of a plant
With arms would stretch and grow
Reaching out to the sun as far as they could go
Stretching and stretching up high in the sky
They would be a perfect place for birds to stop by
Holding things up is what my arms would do
Supporting birds nests, bee hives and people too
These special arms either fat or trim
Are known as my branches or my ______limbs______.

What part of a plant
Is covered with buds all about
Every spring my buds would sprout
In the summer they would flutter in the air
Providing cool shade everywhere
And in the fall I have been told they have colors of orange,
red and gold
These green food makers that blow in the breeze are known
to all as my ______leaves______.
PLANT PARTS CHARADE

Materials needed:
1. Six brown lunch or small grocery bags
2. Vegetables as listed - one from each group

<table>
<thead>
<tr>
<th>Food</th>
<th>Part of Plant Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot, radishes, or turnips</td>
<td>Root</td>
</tr>
<tr>
<td>Celery, kohlrabi, asparagus, broccoli</td>
<td>Stem</td>
</tr>
<tr>
<td>stems</td>
<td></td>
</tr>
<tr>
<td>Lettuce, spinach, onion</td>
<td>Leaves</td>
</tr>
<tr>
<td>Broccoli, squash, cauliflower</td>
<td>Flower</td>
</tr>
<tr>
<td>Tomato, peppers, cucumbers</td>
<td>Fruit</td>
</tr>
<tr>
<td>Popcorn, peas, peanuts, sunflower seeds</td>
<td>Seed</td>
</tr>
</tbody>
</table>

Activity:
Without students watching, place fruits and vegetables in individual bags and close tops.

Divide class into six groups, giving each group a bag with the food inside.

Each team should attempt to identify their own bag’s contents without looking. Team members can feel outside of bag, smell, shake, weigh, etc.

Once all groups have identified the contents of their bag, each group must act out the food while the rest of the class guesses from their clues what food they are portraying.

Teams will then discuss what part of the plant each played.
PARTS of a BEAN PLANT

True Leaves

Stem

Stored Food (cotyledons)

Roots
PARTS of a SEED

Seed Coat

Embryo

Seed Coat

Seed Leaves (cotyledons)
Materials needed:
1. Large piece of celery with a few leaves attached.
2. Two glass beakers or jars
3. Food coloring - two colors, preferably red and blue
4. Water

Take a large piece of celery and cut from the bottom up a few inches to make two legs. Put one leg in red-colored water and the other in blue or plain water. Observe the celery for the next week. This will show how a plant consumes water and distributes it throughout the rest of the plant.

Periodically, during the observation period, slice off the end of the celery so you can see that the "strings" in celery are actually conducting tissue.

Finish slicing the celery through lengthwise to make two pieces. Leave one piece in the water and take the other piece out of the water and allow it to dry out. This will demonstrate how much of a plant consists of water.
Materials needed:

1. Film negative with large, definite image (or piece of shaped foil)
2. Paper clips
3. Large leaf plant

Clip film negative securely to a leaf in the sunshine. Leave it in place for about a week. Carefully remove negative and you will see that the part of the leaf that was "shaded" by the dark part of the negative will be pale and the clearer part will have left an image on the leaf. The pale area is caused because the leaf couldn't make food in the dark.
Plants We See

Plant People

OBJECTIVE: To use plants in a decorative and creative way.

TIME: 30 minutes

MATERIALS NEEDED: Plastic pantyhose eggs or plastic Easter eggs, potting soil, grass seeds, curly cress seeds, markers and a 1-inch tall box lid with 2-inch circular holes cut in it

INSTRUCTIONS

The teacher/leader will prepare the eggs by drilling a hole in the bottom of both halves for drainage. Have the children draw faces on 1/2 of the egg (open end up) and fill them with potting soil. Have the children plant and water either grass seed for straight hair, or curly cress seed for a curly look. Have the children place their “plant people” in the box lid holder and wait for their hair to grow. When the hair is 1/2 to 1-inch tall, the children may want to cut and style the hair on the “plant people.”

The teacher/leader may want to emphasize:

- The germination of the seeds.
- The fast or slow growth of the seeds.
- The straight versus curly characteristics of the grass.
FIGURE

Plant People

Supplies

MARKER

SOIL
FLOWERING SEEDS

“MR.” & “MRS.”

BUTTONS
CONSTRUCTION PAPER
CLOTH OR RIBBON
SESSION 6
Caring for Our Environment

Class Preparation: Think of reasons how everyone can take care of the environment and why it is important.

Materials: Things that show we care about nature—watering can, bird feeders, etc.

1. Discuss why and how everyone can be helpers in the environment.

2. Have the students do the coloring sheet.

3. Go to the garden and ask the students how they can help the environment.

Process Skills:
manipulating, observing, classifying, communicating, drawing inferences, investigating.

Activities:
Caring Is For Everyone
Mother Nature, May I?
Plants and Nature's Helpers

Caring Is for Everyone

OBJECTIVE: To identify the ways people show they care for the environment.

TIME: 20 minutes

MATERIALS NEEDED: "Caring Is for Everyone" coloring page, crayons

INSTRUCTIONS

The teacher/leader will discuss how people in the community care about their surroundings. Focus on things the children see everyday that show people care. The teacher/leader will then give each a child a "Caring Is for Everyone" coloring page to color. The children will be told to color the people who are showing that they care. All of the pages can then be displayed in the classroom and the activities discussed. The children who identified all of the caring actions can be recognized appropriately. All children should be recognized for their efforts.
"Caring Is for Everyone"
Plants and Nature's Helpers

Mother Nature, May I?

OBJECTIVES: To play a rendition of the game "Mother May I?" To recognize ways that living things are dependent on each other and the earth to survive.

TIME: 15 to 20 minutes

MATERIALS NEEDED: none

INSTRUCTIONS

Play the game "Mother May I?." One child will serve as Mother Nature. If the group is very large, you may want to have half the group observe while the others participate. The children should line up opposite Mother Nature about 10 yards away. Mother Nature begins with a direction regarding the number and kind of steps their classmates can take (scissor steps, hops, jumps, giant steps, small steps, etc.). The children must wait and ask, "Mother Nature, May I?" before moving. If a child forgets and moves without asking, he or she must return to the starting point. When a child correctly asks, "Mother Nature, May I?", the Mother Nature learner either responds, "Yes, you may" or requires that all children answer a question first.

The teacher/leader could call out the Mother Nature questions when needed. For example, Mother Nature could begin by directing children to take three hops forward. Children should ask, "Mother Nature, May I?" The leader could respond, "Only if you can tell me more about nature." The teacher/leader will then issue a question (see below). Children then take turns listing answers to the question. Each one should list a different item or idea so the teacher/leader will want to take turns beginning on one side and then on the other for first responses. This will prevent the same children from having to come up with a final response. When the children answer correctly, they move forward. The teacher/leader and any youth who are observing will need to monitor the progress of the players. Catch those who move without asking and send them back to the starting point. When one child advances to where Mother Nature stands, he or she may tag Mother Nature and take on the role. When Mother Nature has been tagged and replaced, have observers change positions with the players and go through the game again.

Following are some examples of questions to ask to players during the game.

- Name one thing you can do to make your neighborhood look pretty.
- List one thing that makes your neighborhood look ugly.
- You eat candy after lunch on the playground. There is not a trash can nearby. What do you do with the wrapper?
- What can you pick up that is made of aluminum?
- Your dad takes a nap and forgets the sprinkler is going in the front yard. The water is running down the curb. What do you do?
SESSION 7
Garden Insects

Class Preparation: Think of good and bad insects and why humans consider them to be bad or good.

Materials: Pictures of different insects/insect book
Magnifying glass
Insect Damage Handout

1. Do insect-friend or foe activity.

2. Go to the gardens and look for insects. Find insects and have Garden Volunteer identify them. Then destroy "pests" by picking them off and squashing them or show students beneficial (helpful) insects such as a ladybug.

Terms: insect, beneficial, harmful.

Process Skills:
manipulating, observing, classifying, communicating, drawing inferences, relating objects to other objects, applying defined terms.

Activities:
Who Am I?
Insect Damage

- Locust
- Shoot Moth Larva
- Twig Gall
- Leaf Gall
- Mealybug
- Sawtooth Caterpillar Egg Mass
- Apple Tree Canker Beetle
- Blotch Leaf Miners
- Serpentine Leaf Miners
- Adult
- Larva
- Wood Borer
- Root Feeding White Crab
WHO AM I?
(An Insect Identification Game)

Materials Needed:

1. Activity Sheet: "Good Guys/Bad Guys - Who Am I?"
2. Tape or Pins

Cut out picture/information squares for each insect - one square per student. Have students line up and attach one square to each student's back. Student should not know the identity of the insect on his/her back.

Students circulate around the room talking with other students trying to discover which insect is on his/her back. They may not ask the other students directly, but may ask questions such as "Am I a Good Guy or Bad Guy?" and "What kind of damage can I do?" Other students may give clues from the information on the picture square.

Game is over when everyone in the room has correctly guessed the name of the insect on his/her back.
BAD GUYS - WHO AM I? GAME

- I feed on leaves.
- Watch out-I can spit a tobacco-like juice.
- I have large back legs to help me jump.
- I'm a grasshopper!

I'm a bad guy.

- I'm green or yellow or sometimes black.
- I'm small, like the size of a pin head.
- I suck the juices out of the plants.
- I'm an aphid!

- My soft body is easy to squash.
- I leave a slimy trail wherever I go.
- I carry my home on my back.
- My home is called a shell.
- I am a snail!

I'm a bad guy.

- Sometimes I'm fuzzy, sometimes I'm not.
- I eat plant's leaves.
- I change into a butterfly or moth when I grow up.
- I'm a caterpillar!

I'm a bad guy.

- I live in the soil.
- I feed on the roots of plants.
- I'm white with a rusty colored head.
- When I grow up I change into a beetle.
- I'm a grub worm.

I'm a bad guy.

- I'm very tiny; you need a microscope to see me.
- I have eight legs so I'm not an insect.
- I suck juices out of plants.
- I'm a spider mite!

I'm a bad guy.
GOOD GUYS - WHO AM I? GAME

| I am black or brown and hairy. | I have a hard shell to protect me. |
| I fly at night.             | I feed on small insects.            |
| I eat small insects.        | I'm red with black spots or black with red spots. |
| I'm a flying mammal.        | I'm a lady bug!                     |
| I hang upside down when I sleep. |                                               |
| I'm a bat.                  |                                               |

I'm a good guy.

| I live in the soil.           | I have insects for breakfast, lunch and dinner. |
| I eat compost and mulch.      | I build a trap to snare my prey.                |
| I help keep the soil loose and fluffy. | My trap is built out of silken threads. |
| I am long and shiny like a snake. | I have eight legs.                             |
| I'm an earthworm!            | I'm a spider!                                   |

I'm a good guy.

| I'm shaped like a stick.     | I spend my day traveling from flower to flower. |
| I sit on a leaf and wait for other insects to come by. | I feed on nectar and pollen.                   |
| I catch them with large front legs. | Watch out - I have a stinger to protect myself. |
| When I sit on a leaf some people think I'm praying. | I live with my friends in a home called a hive. |
| I'm a praying mantis!        |                                               |

I'm a good guy.

I'm a good guy.
SESSION 8
Plant Diseases

Class Preparation: Read background data on diseases in the garden.

Materials:  Magnifying glass
            Moldy bread
            Easy Gardening -- Disease Control

1. Discuss human diseases (the common cold, measles, etc.) with students and ask them how they feel when they’re sick. Relate that to when a plant has a disease— they don’t grow, fruit production is reduced and sometimes they even die. Discuss ways to prevent disease— only watering the soil and not the leaves, staking the tomatoes to keep fruit off ground and prevent rotting, planting on raised beds.

2. Show moldy bread and explain how this is a disease organism, specifically a fungus.

Terms: disease, fungus, root rot, symptoms, root knot nematode, leaf spot, wilt.

Process Skills:
  manipulating, observing, communicating, drawing inferences, relating objects to other objects, applying defined terms.

Activities:
  Disease Symptoms Coloring sheet
A good home gardener recognizes symptoms of plant diseases quickly and takes steps to prevent or control them. Diseased plants do not grow normally. Diseased plants may have one or more of the following symptoms: stunted, wilted, spots on leaves, stems or fruit; decayed fruit, decayed areas on the stems, distorted leaves, rapid death of leaves, and discoloration of leaves and fruit. Foliage symptoms on plants infected with a bacterium or fungus will normally develop first on the older leaves. Virus symptoms develop on the younger leaves.

Causes of Plant Diseases

Plant disease-causing organisms are divided into four groups — viruses, bacteria, fungi and nematodes. Viruses are very simple forms of life. They are often spread to healthy plants by insects or on one’s hands during normal gardening practices.

Bacterial cells are much larger than virus particles, but they are still too small to see with the naked eye. Bacterial cells move in the water film on the leaf surface or in the water surrounding plant roots or soil particles. They are most often spread by splashing water.

Fungal spores are larger than bacterial cells but are not visible without a microscope. Fungi are like small plants. Most plant diseases caused by fungi are most severe during periods of moderate temperatures and when water is retained on the leaves or fruit for an extended period of time. Many fungi are spread by wind, splashing rain and equipment.

Nematodes are small, worm-like animals which live in the soil. They feed on plant roots, causing stunted plants. Root knot is the most damaging nematode in the home garden. It causes galls or knots on susceptible plants such as tomatoes, cucumbers, squash, beans and many other vegetables.

When Do Diseases Occur?

Plant diseases are worst when light rain showers or heavy dews have fallen and when temperatures are mild. During these times, watch your garden closely for signs of disease.

Signs of Plant Diseases

Plant diseases are evident in many ways. They attack all parts of the plant, as shown in Figure 1. Plants can get diseases from the time the seed is placed in the soil until the vegetable is eaten. It is important to identify disease symptoms quickly, so that control practices can be taken to prevent unnecessary loss.

Disease Control in the Garden

Fertilize and water plants properly to keep them strong. Healthy plants do not get diseases as easily as weak ones.

It is best to irrigate the garden by running water between the rows or by trickle irrigation. Irrigate a garden by running water between the rows. Do not sprinkle leaves; this only encourages more disease problems. If you must sprinkle plants, do so before 10 a.m.

Avoid planting vegetable varieties in areas where the same vegetable or vegetable from the same plant family were planted in the last 24 months. Rotations to avoid are:

- tomatoes, eggplant and potatoes
- squash, cucumber, pumpkin, melons
- cabbage, broccoli, cauliflower, mustard, turnips and collards

It is best to plant on a raised bed. This will allow excess water to move out of the root area and prevent many root diseases and fruit rots.

*Extension plant pathologist, The Texas A&M University System
When possible train vegetables to grow upright using cages or trellises. This will keep the fruit from contacting the soil and reduce fruit rots.

Plant productive disease resistant varieties when available. Resistant varieties may reduce the need for the use of crop care products on a regular schedule or in some cases their use may eliminate the need completely.

In some cases, crop care products may be required to control plant diseases during the year. These products should be used with caution and only when needed. Read and follow the label carefully. Although several products are approved for use in the garden, some of the copper-containing products and sulfur are considered to be organic-based products. However, they are not always the most effective. Before using any crop care product, make sure the vegetables that you are spraying are listed on the label.

**Nematode Control**

Nematodes in the soil are best controlled using a combination of practices that will reduce the nematode population to numbers that will not cause significant plant damage. The following practices can be used to reduce nematode numbers:

- Plant nematode resistant varieties
- Plant non-host plants in rotation with susceptible varieties
- Till the soil during the summer months to remove soil moisture (must be done after plants have been removed)
- Cover the soil with clear plastic and leave in place for 6 to 8 weeks during June, July, August or September
- Plant Elbon rye during the fall and early winter

Gardeners using one or more of these practices can reduce the population of nematodes in the soil. You can almost never completely eliminate nematodes. This means that each year you will need to take steps to control this pest.

Currently no crop care chemicals are recommended for use in the home garden for nematode control.
Disease Symptoms

- Powdery Mildew
- Fruit Rot
- Wilt
- Conk
- Shoot Blight
- Leaf Spots
- Crown Gall
- Root Knots
- Root Rot
SESSION 9
Flowers, Pollination, and Fruit

Class Preparation: Read background data on pollination and fertilization. Determine fruit types (or if even a fruit) for vegetables in garden-- tomatoes, peppers, beans, broccoli.

Materials: Bring examples of fruits and seeds
Flowering Parts Handout

1. Discuss the pollination process.
2. Determine how insects and birds are pollinators and why that is important.
3. Visit the garden and see what plants require pollinators to produce the edible portion of the plant.

Terms: pollination, fertilization, style, stigma, ovary, stamen, anther, pollen, sepal, petal.

Process Skills: Observing, classifying, communicating, drawing inferences, relating objects and events to other objects and events, applying defined terms, investigating.

Activities: Flowering, Pollination and Fertilization Worksheet 3-5
Flower Parts

Petals- brightly colored to attract pollinators

Sepals- green leafy structures surrounding the petals, which protect the developing bud.

Stamen- male part of flower
   anther- pollen is produced here.
   filament- stemlike structure that holds up anther.

Pistil- female part of flower
   stigma- sticky substance on platform which catches pollen.
   style- tubelike structure that holds up stigma.
   ovary- contains the egg.

Complete flowers have all parts- petals, sepals, pistils, stamens.
Incomplete flowers lack one of the four flower parts.

Perfect flowers have both pistils and stamens. (Beans, tomatoes)
Imperfect flowers are either male or female. (Cucumber)

Pollination ensures a mixture and diversity of genes.

Because plants can’t walk and move to find a mate they have developed special characteristics to attract pollinators. A flower advertises to lure hungry bees, birds, moths, butterflies, and beetles into acting as pollen-carrying helpers between flowers.

Attractors:
   * aromatic nectar
   * bright colors- hummingbirds like red and orange
   * shapes accommodating to pollinators-- tube good for hummers
   **"tracks" to guide pollinators
*lightweight, petalless flowers for wind pollination
*structures that mimic other pollinators.

Pollinators:
- Bees: Mainly attracted to nectar and pollen. Developed sense of smell.
- Butterflies: Nectar feeders.
- Moths: Night feeders, flowers they pollinate are more visible at night white and pale flowers, very fragrant at dusk.
- Flies: Attracted to unpleasant odors.
- Beetles: Beetles often eat flower parts but flowers depending upon them for pollination are large so some will be left.
- Birds: Color most attractive.
- Bats: Important pollinators in tropical areas. Strongly odored flowers.
- Wind: Most have no petals. Have long stamens and long, feather stigmas and styles. Grasses and many trees.

Highway to Nectar: Flowers often have lines or honey guides that help lead bees and other pollinators to nectar. Some of these guides can be seen by bees but not by us—since bees can see ultraviolet light, a part of the spectrum not visible to humans.
FLOWERING POLLINATION AND FERTILIZATION

1. Bees feed on nectar and pollen.
2. pollination occurs when bees transfer pollen to stigma.
3. Pollen tube grows down to egg.
4. Fertilization occurs when egg and pollen cells unite.
   Ovary enlarges and seeds form.
SESSION 10
Composting

Class Preparation: Read background data. Think what can be put in a compost from a garden.

Materials: Finished compost
Leaves, egg shells, grass clippings, dirt, orange peels
Easy Gardening -- Composting

1. Do the kids and composting activity. Construct a pop bottle Compost.
2. Visit the garden and pull weeds.
3. Use weeds and other materials to start the Learning to Grow compost bin.

Terms: compost, humus, soil organisms, ventilation, bacteria, fungi.

Process Skills:
manipulating, observing, classifying, communicating, drawing inferences,
relating objects and events to other objects and events, applying defined terms, investigating.

Activities:
Pop Bottle Compost
Trash to Treasure
Songs
EASY GARDENING...COMPOSTING

B. Dean McCraw*

As a home gardener you are probably interested in making your vegetables as comfortable as possible, and vegetables are most comfortable in a soil with lots of organic matter. Every home garden soil benefits from the addition of organic matter each year. This replaces some of the nutrients removed by growing vegetables, but more importantly, it improves the soil’s physical characteristics, making it more workable. Organic matter also improves the soil’s water and nutrient-holding capacity.

People have home gardens to save money, and compost is the least expensive soil additive available. It can be prepared from materials usually available in your own backyard.

Compost is simply plant material that has gone through a natural decomposition process. If prepared properly, compost reaches 160° F. or more. This destroys most weed seeds, insect eggs and disease organisms and results in a relatively pest-free product to mix with the garden soil (figure 1). Finished compost is soft and pliable and smells like freshly plowed soil.

Materials

Use any plant material to make compost. Some examples of compost materials and treatment methods follow:

- Grass clippings. Mix green, fresh clippings with soil or dry plant material such as leaves. A thick layer of fresh clippings usually compacts when it settles. This prevents air from entering the pile and slows or prevents the composting process. Grass clippings are relatively high in nitrogen and make good compost.

- Dry leaves. These are plentiful in the fall and often can be found in bags by the curb waiting for the garbage collector. Most leaves compost faster and more thoroughly if shredded before adding to the pile. If you do not have a shredder, place the leaves in a row on your yard and cut them up with a rotary lawn mower. Rake the chopped leaves and add them to the compost pile.

- Sawdust. Always compost sawdust before adding to a garden soil. It is low in nitrogen and thus breaks down slowly. Add extra nitrogen to speed breakdown. Sawdust is plentiful at sawmills in many areas especially in East Texas.

- Kitchen scraps. Fruit and vegetable trimmings and leftovers are good items for the compost pile. Do not use animal products such as grease, fat and meat trimmings since they break down very slowly, attract rodents and other pests and have an unpleasant odor.

- Gin trash. This makes good compost but be sure the farmer did not use arsenicals on the cotton. Arsenic can carry over and cause vegetables to grow poorly. Your county Extension agent can tell you if arsenicals are used in your area.
Other materials, which can be used, include sod removed from the lawn, hay, weeds, shredded newspaper and hedge clippings. Large twigs break down slowly so do not use them. Bone meal is a good addition to the compost pile because it is high in nitrogen.

Compost Requirements

To prepare compost, organic material, microorganisms, air, water and a small amount of nitrogen fertilizer are needed. Organic material is leaves, grass clippings, etc., added to the pile. Microorganisms are small forms of plant life, which break down the organic material. A small amount of garden soil or manure provides sufficient microorganisms. The nitrogen, air and water provide a favorable environment for the microorganisms to make the compost. Air is the only part which cannot be added in excess. Too much nitrogen can kill the microbes; too much water causes insufficient air in the pile.

Enclosure

Leave the compost pile free standing if adequate room is available. Less room is required if the pile is enclosed (figure 2). Wire fencing, cement blocks, bricks or scrap lumber make a good enclosure. Leave an opening on one side so the compost can be turned with a fork and to allow air to enter the pile. Most gardeners put the pile in a secluded area of the yard near the garden. For best results, the pile should be at least 4 feet square and 5 feet tall after settling.

Building the Pile

The most common method of building a compost pile is in layers (figure 3).

- With this method, place a layer of coarse material such as tree branches on the ground. This allows air to move beneath the pile.
- Next add a 6- to 8-inch layer of organic material such as shredded leaves or grass clippings.
- Then add a 1-inch layer of manure or rich garden soil. This provides ample organisms for breakdown. If manure is used, no additional nitrogen is needed. If soil is used, add 1 cup of garden fertilizer with the soil.
Repeat these layers and keep the pile moist (figure 4). Stir the pile weekly during the summer and monthly during the winter. The compost pile should be at least 4 feet in diameter to provide the best composting environment.

About 90 to 120 days are required to prepare good compost by the layer method. If you have room, make three piles so you will have one ready to use, one being filled and one “working” (figure 5).

Keep the pile moist but not waterlogged.

Add a 3-inch layer of compost to your garden before breaking the soil each spring and fall to develop and maintain a good soil environment for your vegetables.

Use the compost soon after it is ready or cover it with plastic to keep excess rainfall from washing out some of the plant nutrients.
Composting is based on the biological process of decomposition. What turns plants and animals into compost? Microscopic bacteria and fungi, which feed on dead tissue, are the important organisms.

What affects the composting process? The amount of moisture and air, temperature, amount of bacteria and fungi, and the nature of the decomposing material are all critical. The presence or absence of air (oxygen) is one of the most important factors in composting. The practice of composting allows air and moisture to speed the natural process of biodegradation. In a backyard composting system, it is customary to run a pole or stick through the compost heap regularly or to turn the material with a shovel to allow air circulation.

Making a compost column lets you see and experiment with this process, and witness nature's world of recycling.

Materials Needed
1. Three 2-liter plastic beverage bottles.
2. Hot tap water, knife, scissors, marking pen, needles or paper clips for poking holes, candle, clear tape, netting or mesh fabric, rubber bands.
3. Organic materials for composting, such as vegetable or fruit kitchen scraps, leaves, newspapers and grass clippings.

Procedure
Remove the bases from two bottles, and the labels from all three, by pouring about two cups of hot tap water into the bottles. (Columns can also be made from bottles that don't have removable bases.) Replace the cap, tilt the bottle so the water softens the heat-sensitive glue, peel off the label and twist off the base. Pour out the water and draw cutting lines around the bottle. Your teacher will help you make incisions with the knife and to cut and assemble the column as illustrated.

Most columns will require air holes for ventilation. These can be poked into the plastic with a sharp needle or paper clip that has been heated in the candle flame under your teacher's supervision. Alternatively, larger holes can be cut into the sides with the knife and covered with fine mesh fabric held in place with tape. Be sure to use extreme care in using sharp instruments. A piece of mesh fabric over the lower end allows for drainage. Refer to the illustration. Add ingredients for composting through the top of the column.

Explorations
The possibilities for compost column explorations and discoveries are endless. There is no limit to what can be put inside, or the conditions under which the column can be kept. In addition to simply observing changes, you can design experiments which explore the effects of variables on your column. On the back of this sheet are two ideas.
• Newspaper Digester. Make two columns, and use a balance or postal scale to weigh out two equal quantities of newspaper (about ½ pound will do). Shred or cut the paper into strips and loosely pack one column with paper only. Mix about a half cup of garden soil to the other batch of paper and loosely pack the second column. Pour equal amounts of pond or rainwater into each column, and wait several hours for it to seep through. If none comes out the bottom, add more in equal amounts until about a half cup drips into the reservoir. Schedule a rainstorm to occur in the column every few days, pouring the drippings back through the column. Which column decomposes faster and why?

• Compost Tea. Compost columns can be used to generate a liquid fertilizer called “compost tea.” Try making several columns using different ingredients whose drippings will differ in color and chemistry. Use this liquid to water and fertilize identical sets of seedlings to see how different brands of “tea” affect plant growth.

Adapted from the Bottle Biology Resources Network, University of Wisconsin Madison Post Office Box 67, Madison, WI 53706, (608) 263-3045
used with permission
Contact the Bottle Biology office for help with questions or for information about other activities.
Plants and Nature’s Helpers

Trash to Treasure

OBJECTIVE: To discover how trash can be turned into treasures.

TIME: varies from 10 minutes to 2 hours

MATERIALS NEEDED: used objects (several listed below) that children could bring from home or collect them

INSTRUCTIONS

The teacher/leader can display the various recycled objects and discuss why it is important to reuse and recycle the objects.

Listed below are samples of objects and what they could be used for:

<table>
<thead>
<tr>
<th>Object</th>
<th>Treasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass jars</td>
<td>Can be decorated to make pencil/pen holders</td>
</tr>
<tr>
<td>Popsicle sticks</td>
<td>Make into people, houses, etc.</td>
</tr>
<tr>
<td>Grass clippings/leaves</td>
<td>Use as mulch around plants</td>
</tr>
<tr>
<td>Rubber tires</td>
<td>Make into container planters — a 2 x 3 foot board can be nailed to tire as a base. Holes can be drilled through the board for drainage.</td>
</tr>
<tr>
<td>Plastic 2 or 3 liter bottle</td>
<td>Make into terrariums or bird feeders</td>
</tr>
<tr>
<td>Toilet paper holder</td>
<td>Make into a necklace holder. Cardboard holder may be covered with fabric, buttons or colored for decoration. A ribbon can be drawn through the center and tied. Necklaces can be put on holder and then it may be hung on doorknobs, nails or hooks.</td>
</tr>
<tr>
<td>Aluminum cans</td>
<td>Class/club money-making project. Children also get to see where to take cans to be recycled.</td>
</tr>
<tr>
<td>Newspapers</td>
<td>Can be used as firestarter</td>
</tr>
</tbody>
</table>
The teacher/leader can have learners identify other ways the items may be reused or recycled. Encourage children to always think of ways to reuse old items and allow children the opportunity to make an example of a recycled product using materials provided to them.
Where Is There Space For Waste?
(Tune: Where Oh Where Has My Little Dog Gone?)
Words by June Briney
(Encourage students to change words or make up additional verses!)

Where oh where is the space lor waste?
Where oh where can we put it?
Landfills, incinerators, or loss in haste,
Oh Where oh where can it go?

With students at ___ (name of school) doing their part
That is the best solution!
Boys and girls are lending their heart
To solve the world’s pollution!

The 3R’s ... Recycle, Reuse, Reduce
(Tune: Merrily We Roll Along)
Words by Jerry Briney
(Encourage students to change words or make up additional verses!)

Merrily we dump our trash,
Dump our trash, dump our trash,
Terribly we fou! our land
For everyone to see

Each of us must do his part,
Do his part, do his part,
Working together will restore our land
When we reduce the mess!

Now we can sort our trash,
Sort our trash, sort our trash,
So the truck can take it back
And let it be reused!

If we fail to recycle now,
Recycle now, recycle now,
We may end up in a garbage barge
O'er the deep blue sea!

Bring Back Good Writing
(Tune: My Bonnie Lies Over the Ocean)
Words by Jerry Briney
(Encourage students to change words or make up additional verses!)

I'm writing, yes writing descriptions.
Telling all that I see.
About garbage over the landscape
And pollution that's easy to see.

Bring back, bring back,
Oh bring back good writing to me! to me!
Bring back, bring back,
Oh bring back good writing to me.

First, I am stating the problem
With descriptions of all of its parts.
Each part we finish in toto.
Before the summary starts.

Bring back, bring back good writing to me!
Oh bring back good writing to me!
I make sure my words aren't the same,
And quotes I try to avoid.
My adjectives make it sound good
And similes I want to include.

Bring back, bring back,
Oh bring back good writing to me! to me!
Bring back, bring back,
Oh bring back good writing to me!
### This Land Is Your Land
by Woody Guthrie

**Chorus**

F  C  
This land is your land, this land is my land,  
G  C  
From California to the New York island,  
F  C  
From the redwood forest, to the gulf stream waters.  
G  C  
This land was made for you and me.

As I was walking that ribbon of highway,  
I saw above me the endless sky way;  
I saw below me that golden valley,  
This land was made for you and me.

I've roamed and rambled, I've followed my footsteps  
To the sparkling sands, of her diamond deserts  
And all around me a voice was sounding  
This land was made for you and me.

As the sun came shining and I was strolling  
And the wheat fields waving and the dust clouds rolling  
As the fog was lifting a voice was calling  
This land is made for you and me.

### This Dump Is Your Dump
by Steve Schuch

**Chorus**

This dump is your dump, this dump is my dump,  
It's time to think how we manage our junk  
From Washington's forests to her wetland waters,  
Recycling can work for you and me.

As I was walking the Texas highways, I  
saw beside me garbage in my way;  
The cans and bottles and wrappers waving,  
Recycling can work for you and me.

There was a time we thought it didn't matter  
it dumps kept growing bigger and fatter  
But we are growing a litter wiser now.  
Recycling can work for you and me.

The sun came shining as I was strolling  
Collecting cans to keep recycling rolling,  
Selectmen dancing, everyone chanting.  
Recycling can work for you and me.

No matter how far you pay to haul it  
No matter how small you try to maul it.  
The simple truth is that there is no way.  
Recycling can work for you and me.

### Art and Advertising

1. Have upper level students write out the lead sheets for the various versions. Collaborate with an art class to provide illustrations for the written music. Have these efforts published in the school newspaper.

2. Explore the melodic and rhythm patterns in the two-song melodies. Ask: "Is three-four (Waltz) time easier to learn and sing than common time?" Identify some of the key melodic and rhythmic phrases in the songs. Name other songs that have similar phrasing. Have upper level students transcribe the chord structure or transpose the songs into different keys.

### History

1. Research the history of some other folk song melodies that have been used extensively as broadsides. Some good examples are: The Girl I Left Behind Me, Yankee Doodle, Old Dan Tucker, Wait For The Wagon.

### Bibliography

Song: What Does Your Garbage Say About You?

Do you like to go on picnics?
What kind of toothpaste do you see?
Was there a parade in town today?
Do you read the evening news?
Do you chew a lot of bubble gum?
There's one way to find out,
We can learn a lot about you
by what you throw out.

What does your garbage say?
What does your garbage say?
What can we tell about you
by what you throw away?

What did you eat for breakfast?
Did you burn the toast?
What kind of shampoo do you use the most?
What does your garbage say?
It says a lot about you.

(Speak) We throw out 2 hundred and 20 million tons of trash every year.
That's 5 pounds of trash for each of us everyday, and all that trash
tells us a lot about the way we live.

What does your garbage say?
What does your garbage say?
What can we tell about you
by what you throw away?

Do you recycle cans?
Are your tires flat?
Do you drink milk, do you have a cat?

What does your garbage say?
It says a lot about, a lot about you,
and garbage never lies!

Words taken with permission from the video: The Rotten Truth.
(To order the video, call 1-0800-822-1105 - cost is $18.45 each)
SESSION 11
Harvest Time

Class Preparation: Research the nutritional value of selected veggies. Think of ways to prepare different vegetables. Think of proper ways to harvest. Think of different ways to prepare veggies.

Materials: Baskets for collecting vegetables.
Examples of prepared vegetables (canned green beans, tomatoes, etc.)
Food Guide Pyramid Poster
A Daily Food Guide for Variety and Balance Handout
Tips to Achieve 5 A Day Handout
Eat Smart with Fresh Fruits and Vegetables
Food Guide Pyramid Handout
Produce Nutrition Handout
Drying Fruits and Vegetables Handout

1. Discuss different vegetables and nutrients they provide. Example: carrots high in vitamin A which is good for vision.

2. Visit garden and harvest as many vegetables as possible. Properly wash vegetables. Make a salad for class to share.

4. Add vegetables from the grocery store and explain the importance of the farmer and how his hard work provides food for us even when we fail in our backyard gardens. Explain how different vegetables come from different parts of the country and world due to climate and soils.-- Avocados from Mexico and California, Potatoes from the Midwest, etc.

Terms: vegetable, vitamin, gardener, harvest, salad, farmer.

Process Skills:
manipulating, observing, classifying, communicating, drawing inferences, relating objects and events to other objects and events, applying defined terms, investigating.

Activities:
Veggie Mobile
Above, Below, Watch the Veggies Grow
The Choo-Choo Song
Vegetable Song
### A Daily Food Guide for Variety and Balance

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Major Dietary Contributions</th>
<th>Suggested Daily Servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breads, cereals and other</td>
<td>Provide starch, thiamin, riboflavin, niacin and iron. Whole grains also provide fiber, folic acid, magnesium and zinc.</td>
<td>6 to 11 (Include several servings per day of whole-grain products.)</td>
</tr>
<tr>
<td>grain products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Whole grain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Enriched</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Contribute many nutrients as well as dietary fiber. Citrus fruits, melons and berries are excellent sources of vitamin C. Deep yellow fruits are high in vitamin A. Fruits also add color, flavor, texture and sweetness to the diet.</td>
<td>2 to 4</td>
</tr>
<tr>
<td>- Citrus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>Supply fiber, some starch or protein; also provide many vitamins and minerals.</td>
<td>3 to 5 (Include all types regularly; use dark green leafy vegetables, dry beans and peas several times per week.)</td>
</tr>
<tr>
<td>- Dry beans and peas (legumes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Starchy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat, poultry, fish and</td>
<td>Provide protein, niacin, thiamin, vitamins B₁, B₁₂ (animal foods only), iron, phosphorus and zinc.</td>
<td>2 to 3 (Total 5 to 7 ounces lean)</td>
</tr>
<tr>
<td>alternates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(eggs, dry beans and peas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk, cheese and yogurt</td>
<td>As the best sources of calcium in U.S. diets, they provide protein, riboflavin, vitamins B₁, B₁₂, A, thiamin and if fortified, vitamin D.</td>
<td>2 for adults; 3 for teens and women who are pregnant or breast-feeding; 4 for teens who are pregnant or breast-feeding.</td>
</tr>
<tr>
<td>Fats, sweets and alcohol</td>
<td>These foods are calorie-dense, not nutrient-dense. Fats provide 9 calories per gram; sugars, 4 calories per gram and alcohol, 7 calories per gram.</td>
<td>Avoid too many fats and sweets. If you drink alcoholic beverages, do so in moderation.</td>
</tr>
</tbody>
</table>

(Home and Garden Bulletin 232-1, USDA-HNIS, 1986)
TIPS TO ACHIEVE 5 A DAY

- Realize that a portion size for vegetables is just one-half cup produce cooked one broccoli spear or one-third 10-ounce package frozen broccoli. For raw vegetables, one cup is a serving.

- One medium apple, orange, banana or similar-sized fruit, one-half cup diced fruit such as grapes or pineapple, 1/4 cup fruit such as raisins, 3/4 cup pure fruit or vegetable juice.

- Think 5 A-Day as a small addition to your daily meal plan.

- Try adding produce (i.e. add green pepper, celery, onion and apple) to your favorite tuna salad mixture.

- Add extra vegetables to your sandwiches such as layering roast beef or turkey with sauteed mushrooms, onions and green peppers and add fat free coleslaw flavored with citrus.

- Try vegetarian type of sandwich layering warm spinach, mozzarella cheese, sliced tomatoes and sauteed onions on English muffin.

- Try one of the top five best sources of beta-carotene:
  - pumpkin
  - baked sweet potatoes
  - medium carrot
  - frozen spinach
  - butternut squash

Other good sources are: cantaloupe, kale, mixed vegetables, lima beans, snap beans, green peas, apricots and broccoli.

- Prepare more stews, vegetable versions of chili and pastas or rice.

- Serve either fresh fruits in season, frozen or canned in water or "lite" syrup as additions to sandwiches or salads or as desserts. Cover fresh fruits with orange, lemon or lime juice.
• Try one of the top five best sources of Vitamin C:
  • sweet red pepper
  • navel orange
  • Kiwi fruit
  • grapefruit juice
  • cantaloupe

Other good sources include Brussels sprouts, strawberries, broccoli, tomato juice and cauliflower.

• Increase fiber-rich varieties such as mangoes, blackberries, figs, okra, cruciferous vegetables (broccoli, cauliflower and Brussels sprouts).

• Remember people eat only half the 5 A Day recommended servings of vegetables and get only 12 grams of fiber which is about one-half of the 20 to 35 grams recommended. Research has shown that people in many parts of the world make fruits and vegetables an integral part of the diet, tend to suffer less from various cancers as well as from coronary heart disease.

**AMERICAN CANCER SOCIETY NUTRITION GUIDELINES**

1. Avoid obesity.
2. Cut down on total fat intake.
3. Eat more high-fiber foods such as whole-grain cereals, fruits, and vegetables.
4. Include foods rich in vitamins A and C in your daily diet.
5. Include cruciferous vegetables in your diet.
7. If you drink, keep alcohol consumption moderate.

Prepared by Mary Kinney Bielamowicz, Ph.D., R.D., L.D., C.H.E., Professor and Nutrition Specialist, Texas Agricultural Extension Service, Department of Animal Science, Human Nutrition Section, Texas A&M University, College Station, TX, September, 1993.
EAT SMART
WITH FRESH FRUITS AND VEGETABLES

AMERICAN CANCER SOCIETY
EAT SMART WITH FRESH FRUITS AND VEGETABLES

The fresh produce described below are featured on the American Cancer Society’s “Reduce Your Cancer Risk” poster. They were chosen because they are (1) good sources of fiber, (2) good sources of vitamins A and C, or (3) in the cabbage family (cruciferous vegetables). Research indicates that a diet high in these factors may help reduce the risk of some kinds of cancer.

The nutritional description of the produce follows the guidelines of the U.S. Food and Drug Administration (FDA), and tells the percentage of the U.S. Recommended Daily Allowance (RDA) of vitamins present in each of the foods. Because there are no U.S. RDA’s for fiber, we define a good source of fiber as one gram or more.

APPLE Available Year Round
Whether Macintosh, Delicious, or any other of the dozens of varieties, the apple is the all-American fruit. Select those with good color, a fresh, bright appearance, and firm to the touch. Refrigerate. Serve cooked or raw. The versatile apple can be a snack, main course, side dish or dessert.
Nutritional assessment for one medium apple (4.8 oz): 80 calories/13% RDA Vitamin C/ good source of fiber.

APRICOT May – August
Pick plump, fairly firm, golden-yellow apricots for snacking or fresh fruit salad. They can last up to three weeks in the refrigerator.
Nutritional assessment for three apricots (3.75 oz): 50 calories/ 55% RDA of Vitamin A and 17% RDA Vitamin C.

ARTICHOKE Available Year Round
This tasty vegetable is fun to eat. Both the ends of the leaves and the heart of the artichoke are edible, equally enjoyable as a cold or hot dish. Choose compact heavy, plump artichokes -- green with some color variations in fall or winter. Cook by steaming or boiling, and serve by dipping in either yogurt dip or lo-cal salad dressing.
Nutritional assessment for one large artichoke (12 oz): 25 calories/ 10% RDA of Vitamin C/ good source of fiber.

AVOCADO Available Year Round
The avocado is both elegant and versatile. Stuffed with seafood or egg salad it makes a perfect luncheon entree or dinner appetizer. Cut it up to liven tossed salads, or mash it with tomato and onion to make a guacamole dip. Choose an avocado free from bruises, but slightly soft to the touch. Ripen at room temperature.
Nutritional assessment for one-half avocado (3 oz): 153 calories/ 10% RDA Vitamin A/ 11% RDA Vitamin C/ good source of fiber.
BELL PEPPER  Available Year Round
Raw or cooked, bell peppers are a delicious and healthful addition to any menu. In addition to putting them in tossed salads, they can be an ingredient for spaghetti sauce, meatloaf, or soup. A stuffed pepper may have meat or vegetarian fillings. Choose firm and glossy peppers.
Nutritional assessment for one pepper (5.25 oz): 25 calories/ 130% RDA Vitamin C/ good source of fiber.

BROCCOLI  Available Year Round
This star of the cruciferous (cabbage family) vegetables is both delicious and nutritious. Choose green or purplish-green colored broccoli -- never yellow. After brief steaming or boiling, broccoli can be served with sauces, or lemon, or plain. It is also a good candidate for Chinese-style stir frying. Raw broccoli is delicious with all kinds of dip.
Nutritional assessment for one stalk (5.3 oz): 30 calories/ 10% RDA Vitamin A/ 240% RDA Vitamin C/ good source of fiber.

BRUSSELS SPROUTS  October -- March
Looking like “baby cabbages”, Brussels sprouts are another of the crucifer family. Shop for firm, compact sprouts with good green color, and cook them by boiling, steaming or sautéeing. Sprouts can also be seasoned by adding sliced almonds or poppy seeds.
Nutritional assessment for 5 sprouts (3.5 oz): 40 calories/ 15% RDA Vitamin A/ 108% RDA Vitamin C/ good source of fiber.

CABBAGE  Available Year Round
This nutritious crucifer is equally popular raw or cooked. For the best quality cabbage, choose a heavy compact head without signs of discoloration. Raw cabbage is popular as cole slaw. Cooked cabbage is perfect with corned beef, or as sauerkraut. And to decrease the aroma of cooking cabbage, drop a whole walnut into the cooking water.
Nutritional assessment for 1/6 head (6 oz): 30 calories/ 140% RDA Vitamin C/ good source of fiber.

CANTALOUPE  May -- October
Popular as dessert or appetizer, cantaloupe is one of the favorites of the melon family. Shoppers should look for cantaloupes with a slightly golden under-color and netting which stands out prominently. Touch the stem end and it will feel slightly soft when ripe. Also a ripe melon gives off a distinctive sweet aroma. Some of the more unusual uses of a cantaloupe are as a pureed topping or as a cold soup.
Nutritional assessment for ½ small cantaloupe (6 oz): 50 calories/ 100% RDA Vitamin A/ 110% RDA Vitamin C/ good source of fiber.

CARROT  Available Year Round
The versatile carrot is one of the most popular snack foods. In addition, they are at home in many soups and stews. They are even used for dessert -- in the popular carrot cake. Shoppers should look for carrots that are firm and bright orange in color. If they become wilted, they can be crisped up in cold water.
Nutritional assessment for one medium carrot (2.8 oz): 40 calories/ 330% RDA Vitamin A/ good source of fiber.
CAULIFLOWER
Available Year Round
Another crucifer vegetable that is as popular raw as it is cooked, the cauliflower should be selected for its white color and heavy firm body. Refrigerate. But, before using, place it head down in cold water with a teaspoon each of vinegar and salt to crisp the cauliflower and draw out any insects. Serve raw in salad or with a dip. Cooked cauliflower lends itself to all kinds of sauces.
Nutritional assessment for 1/4 of a small head (5.3 oz): 25 calories/ 160% RDA Vitamin C/ good source of fiber.

CELERY
Available Year Round
Crunchy celery is delicious stuffed with tuna fish or other filling, used for dips, or as a plain low calorie snack. Cooked celery is found in soups and stews, and can be creamed or braised for a vegetable side dish. Look for fresh, crisp, clean stalks that are thick and solid.
Nutritional assessment for two large stalks (4.25 oz): 20 calories/ 15% RDA Vitamin C/ good source of fiber.

GRAPEFRUIT
Available Year Round
Whether it's yellow or pink, grapefruit is a refreshing treat, and not just for breakfast. Serve it as an appetizer. Mix it with greens and, perhaps, some avocado, in a salad. Or sprinkle on brown sugar, pop it under the broiler, and serve it for dessert. Shop for heavy grapefruit that is firm and smooth textured. Especially avoid bruised fruit.
Nutritional assessment for ½ grapefruit (4.2 oz): 38 calories/ 69% RDA Vitamin C.

ICEBERG LETTUCE
Available Year Round
Best quality lettuce has a "springy-firm quality" when pressed by the fingers. Core, rinse, and thoroughly drain it before storing in an airtight container in the refrigerator. Then it's ready to use in salads, sandwiches, or in stir fry dishes. Also try other kinds of lettuce such as Romaine, Boston, or redleaf.
Nutritional assessment for ¼ head (4.75 oz): 25 calories/ good source of fiber.

KALE
Available Year Round
When shopping for this green leafy crucifer vegetable, look for fresh and young heads -- avoiding those with coarse stems and dry or yellowing leaves. Younger leaves are more tender and can be used for salads. Older and larger leaves are better for cooking. A sprinkling of vinegar enhances the kale's flavor.
Nutritional assessment for one cup of raw kale (2.4 oz): 33 calories/ 120% RDA Vitamin A/ 134% RDA Vitamin C/ good source of fiber.

KIWI FRUIT
Available Year Round
These egg-shaped brown fuzzy fruits that originated in New Zealand are the latest international gourmet treat. Now available everywhere in the U.S.A., the pale green fruit of the kiwis is delicately delicious and healthful to eat. One warning: don't try to add them to a gelatin dessert. Kiwis contain an enzyme that prevents gelatin from setting.
Nutritional assessment for two kiwis (5.3 oz): 90 calories/ 230% RDA Vitamin C/ good source of fiber.
KOHLRABI
Available Year Round
Both the bulb and the tops of this "cabbage turnip" are edible. The tops can be treated like any fresh greens, and the bulbs can be boiled, steamed, or stir fried; or served raw in salads or with dips. When shopping for kohlrabi, select the smaller plants. The large bulbs can have a bitter taste.
Nutritional assessment for one cup of sliced kohlrabi (5 oz): 38 calories/ 145% RDA Vitamin C/ good source of fiber.

ONIONS
Available Year Round
In addition to being a tasty addition to all kinds of dishes, both cooked and raw, the onion is nutritionally valuable and will last a long time if stored in a cool, dry place. However, avoid buying onions that are crackly dry, or soft, or onions that have spots from sunburn, mold, or decay.
Nutritional assessment for one medium onion (5.3 oz): 65 calories/ 15% RDA Vitamin C/ good source of fiber.

ORANGE
Available Year Round
Fruit for snacking and juice for drinking are the two most popular uses for oranges, with an emphasis on being served at breakfast. But with a little imagination there are many other uses for oranges such as in salads and in various main dishes.
Nutritional assessment for one orange (4.6 oz): 62 calories/ 116% RDA vitamin C.

PAPAYA
April -- June & Mid-October -- Mid-December
Papayas are often purchased before fully ripe. A mostly-green papaya will ripen in 5-7 days at room temperature. Half-green, half-yellow fruit will ripen in 2-4 days. When ripe (yellow-orange in color) a papaya will last for a week in the refrigerator. Use as snack fruit or in fruit salads. It makes a delicious main course when filled with seafood or meat salad, or a dessert when filled with ice cream.
Nutritional assessment for ½ papaya (5.3 oz): 80 calories/ 160% RDA Vitamin C/ good source of fiber.

POTATO
Available Year Round
There is probably no more versatile vegetable than the potato, and it is not a high calorie food unless loaded with butter and sour cream. Choose potatoes that are firm and smooth, and avoid those with wrinkled or wilted skins or soft dark areas. Do not refrigerate, but store in a cool, dark, well-ventilated place. Serve boiled, steamed, baked, riced, or mashed.
Nutritional assessment for one medium potato (5.3 oz): 110 calories/ 50% RDA Vitamin C/ good source of fiber.

PRUNES
Available Year Round
This dried fruit should be refrigerated in an airtight container. They make a handy snack or can be combined with fruit juices and spices for a tasty dessert. Pop them in the blender as part of a breakfast drink, use them in baked goods, or with meats and fowls to make main dishes.
Nutritional assessment for ¼ cup (2 oz): 140 calories/ 20% RDA Vitamin A/ good source of fiber.
SPINACH
Available Year Round
Raw spinach is a perfect salad green and lightly cooked spinach is an excellent side vegetable. Be careful to select spinach with fresh, crisp leaves. When cleaning, a little salt in the water helps get rid of the soil that has a tendency to stick.
Nutritional assessment for one cup raw spinach (2 oz): 12 calories/ 68% RDA Vitamin A/ 26% RDA Vitamin C.

STRAWBERRY
February -- September
This delicate fruit should be eaten within a few days after purchase. Select berries that are firm, dry, plump and fully colored with the cap stem attached. A stained strawberry box may mean that the berries inside are soft. Do not wash or remove stems until ready to use.
Nutritional assessment for one cup of strawberries (5.3 oz): 45 calories/ 140% RDA Vitamin C.

SWEET POTATO
August -- April
Look for sweet potatoes that are thick, chunky, and taper toward the ends. Do not refrigerate. There are dozens of uses for this vegetable: in main dishes such as soufflés, stews, and casseroles; in soups, bread, biscuits, and muffins; and in such desserts as pies, puddings, cakes and cookies.
Nutritional assessment for one medium sweet potato (4.5 oz): 136 calories/ 522% RDA Vitamin A/ 50% RDA Vitamin C/ good source of fiber.

SWISS CHARD
April -- November
This crucifer can be viewed as two vegetables in one. Cook the leaves as greens and the stems as celery. Swiss chard is delicate and should be cooked by steaming -- never boiling. As a raw vegetable it makes a good salad.
Nutritional assessment for two leaves (3.5 oz): 18 calories/ 63% RDA Vitamin A/ 48% RDA Vitamin C.

TOMATO
Available Year Round
Most supermarket tomatoes are not fully ripe. If set in a ripening bowl or a ventilated paper bag and stored at room temperature, they will ripen and be a welcome addition to salads and main dishes. The tomato is also popular as a base for sauces and soups.
Nutritional assessment for one medium tomato (5.3 oz): 35 calories/ 40% RDA Vitamin C/ 20% RDA Vitamin A/ good source of fiber.

WINTER SQUASH
August -- March
Acorn squash (dark green with yellow-orange under color) and butternut squash (buff to light tan) should be selected for their smooth hard rind. Lightweight squash may be dry or stringy. Cook by baking or steaming, or try stuffing squash with a meat mixture for a tasty main dish. Winter squash can be stored from 30-50 days if kept at 50°.
Nutritional assessment for one cup raw squash (4 oz): 43 calories/ 94% RDA Vitamin A/ 23% RDA Vitamin C/ good source of fiber.
"Eating 5 fruits and vegetables a day is one of the most important choices you can make to help maintain your health"... National Cancer Institute

<table>
<thead>
<tr>
<th>Produce</th>
<th>Nutritional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household Serving Sizes</strong></td>
<td><strong>Serving Size</strong></td>
</tr>
<tr>
<td>Apple</td>
<td>1 med. apple</td>
</tr>
<tr>
<td>Asparagus</td>
<td>5 spears</td>
</tr>
<tr>
<td>Avocado</td>
<td>1/3 med. avocado</td>
</tr>
<tr>
<td>Banana</td>
<td>1 med. banana</td>
</tr>
<tr>
<td>Bell Pepper</td>
<td>1 med. pepper</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1 med. stalk</td>
</tr>
<tr>
<td>Cabbage</td>
<td>1/12 med. head</td>
</tr>
<tr>
<td>Carrots</td>
<td>1 med. 7 in. long 1 1/4&quot; diameter</td>
</tr>
<tr>
<td>Celery</td>
<td>2 med. stalks</td>
</tr>
<tr>
<td>Cherry</td>
<td>21 cherries: 1 cup</td>
</tr>
<tr>
<td>Cucumber</td>
<td>1/3 med. cucumber</td>
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<tr>
<td>Grape</td>
<td>1/2 cups grapes</td>
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<tr>
<td>Grapes</td>
<td>1/2 med. grapefruit</td>
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<tr>
<td>Green Bean</td>
<td>3/4 cup cut beans</td>
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<tr>
<td>Green Onion</td>
<td>1/4 cup chopped</td>
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<tr>
<td>Honeydew</td>
<td>1/2 med. melon</td>
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<tr>
<td>Iceberg Lettuce</td>
<td>1/6 med. head</td>
</tr>
<tr>
<td>Kiwi Fruit</td>
<td>2 med. kiwi fruit</td>
</tr>
<tr>
<td>Leaf Lettuce</td>
<td>1/2 cups shredded</td>
</tr>
<tr>
<td>Lemon</td>
<td>1 med. lemon</td>
</tr>
<tr>
<td>Lime</td>
<td>1 med. lime</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>5 med. mushrooms</td>
</tr>
<tr>
<td>Nectarine</td>
<td>1 med. nectarine</td>
</tr>
<tr>
<td>Onion</td>
<td>1 med. onion</td>
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<tr>
<td>Oranges</td>
<td>1 med. orange</td>
</tr>
<tr>
<td>Peach</td>
<td>2 med. peaches</td>
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<tr>
<td>Pear</td>
<td>1 med. pear</td>
</tr>
<tr>
<td>Pineapple</td>
<td>2 slices, 3&quot; diameter 3/4&quot; thick</td>
</tr>
<tr>
<td>Plum</td>
<td>2 med. plums</td>
</tr>
<tr>
<td>Potato</td>
<td>1 med. potato</td>
</tr>
<tr>
<td>Radishes</td>
<td>7 radishes</td>
</tr>
<tr>
<td>Strawberries</td>
<td>8 med. berries</td>
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<tr>
<td>Summer Squash</td>
<td>1/2 med. squash</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>kernals from 1 med. ear</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>1 med. 5&quot; long, 2&quot; diameter</td>
</tr>
<tr>
<td>Tangerine</td>
<td>2 med. 2 3/8&quot; diameter</td>
</tr>
<tr>
<td>Tomato</td>
<td>1 med. tomato</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1/16 med. melon; 2 cups diced</td>
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</tbody>
</table>

*contains less than 2% of the U.S. RDA of this nutrient. Source: U.S. Food and Drug Administration
Drying Fruits and Vegetables at home
Drying Fruits and Vegetables at Home

Drying is one of the oldest methods of food preservation known to mankind. It also is one of the simplest methods. It requires only basic equipment. Any special equipment that is needed usually can be made at home at little to moderate cost.

Successful drying depends upon the removal of enough moisture from the food to prevent spoilage. This must be done as fast as possible at a temperature that does not seriously affect the flavor, texture and color of the food. If the temperature is too low at the beginning, the food may undergo undesirable microbiological changes before it dries adequately. If the temperature is much too high and the humidity too low, the water-filled cells of the food may expand and burst or the food may harden on the surface. This makes it more difficult for the moisture to escape and the food to dry properly.

Fruits and vegetables contain certain enzymes that are responsible for their maturation, or their becoming ripe. These enzymes cause color and flavor changes, some of which may become more extensive when food surfaces are cut and exposed to air. The changes continue during drying and storage unless the enzyme activity is retarded or stopped. Therefore, pretreatment such as antioxidant coating, blanching, and/or sulfering may be recommended.

Home drying, if done properly, can work well for many fruits and vegetables. There are, however, many variations in recommendations for treatment before drying, for methods of drying, for temperatures and length of drying time, and for conditioning prior to storage. You may have to use the “trial and error” approach in finding out which drying technique works best for your situation. (Canning and freezing are surer methods of food preservation because uniform procedures, based on research and widespread use, are recommended for these methods.)

Whatever method you use, keep these facts in mind:

- Cleanliness and safety are important throughout the process.
- The quality of the finished product can be no better than that of the raw material from which it is made.
- The flavor of dried fruits and vegetables will be different from their fresh, canned or frozen counterparts.

General Preparation

Foods selected for drying should be of the highest quality possible — fresh, sound, and at the “right” stage of maturity. Prepare the food immediately after gathering and begin the drying at once, continuing until the food has dried adequately.

Wilted or inferior material will not make a satisfactory dried product. Immature produce lacks flavor and color. Over-mature produce may be tough and fibrous, or may have become soft and/or mushy.

Wash or clean all fresh produce thoroughly to remove any dirt or spray. Sort and discard any defective food. Decay, bruises or mold on any piece may affect an entire batch of food being dried. Peel, pit and/or cut the food into uniform sized pieces. A stainless steel knife helps to prevent foods from discoloring. Before drying, remove any excess moisture from a pretreated food by spreading the food on paper toweling or clean cloths.

Vegetables

Vegetables, with few exceptions, should be treated before drying to stop the enzymatic action that allows these foods to undergo undesirable changes. (The exceptions include mature peas and beans; and some types of corn.)

 Blanching is the treatment used for vegetables. The steam-blanching method is preferred over the boiling water method.

 Blanching before drying helps save some of the vitamin content, sets the color, hastens drying by relaxing the tissues, helps prevent undesirable changes in flavor during storage, and helps insure satisfactory restoration during cooking.

Steam-Blanching

- Use a kettle which has a close fitting lid and a wire basket, colander, or sieve placed so the steam will circulate freely around the vegetable. In order not to lose water-soluble vitamins and minerals, make sure water does not come in contact with the vegetable.
- Add several inches of water and bring it to a brisk boil before putting the prepared vegetable in the kettle.
- Layer the vegetables in the basket no more than 2½ inches deep.
- Steam the vegetable until each piece is heated through and is thoroughly wilted.
- Test by removing a piece from the center of the vegetable layer and pressing it. It should feel tender but not completely cooked.

Fruits

Fruits generally make a better product if they are treated by one or more methods before being dried. The following methods, with different degrees of effectiveness, may be used.

Sulfuring

Many fruits, especially apples, apricots, peaches, nectarines and pears, tend to darken during drying and storage. Sulfuring preserves color as well as flavor. It decreases loss of vitamins A and C (though thiamine loss is increased). Sulfuring also minimizes microbial spoilage and insect infestation. For these reasons it usually is recommended for cut fruits that are to be sun-dried.

Sulfur is readily available as flowers of sulfur or sublimed sulfur at most pharmacies. This form normally has a high degree of purity. Garden dusting sulfur is not suitable.

- Always sulfur outdoors in the open air. Sulfur fumes can be irritating to the eyes and nose.
- Use wooden trays with ventilated bottoms. Do not use aluminum or galvanized screening materials. Sulfur fumes discolor and corrode most metals.
- Spread fruit of the same type and size in a single layer. (Weigh fruit first.) Place the skin side down to help prevent loss of juices.
- Stack the trays at least 1½ inches apart so the sulfur fumes can circulate. Put the bottom tray on wooden blocks or bricks to raise it at least 4 inches above the ground. Separate the trays with small wooden blocks, or strips of wood.
- Place sulfur (about ¼ inch deep) in a clean metal container that is shallow but deep enough to prevent overflow. For each pound of prepared fruit, use 1 to 2 teaspoons of sulfur if sulfuring time is less than 3 hours; 3 teaspoons of sulfur if the sulfuring time is 3 hours or longer. (See charts on pages 10 to 15 for specific times.)
- Set the container of sulfur beside the stacked trays. Ignite the sulfur. Do not leave burned matches in the container; they may keep the sulfur from burning completely. Because of the flame and the heat from the burning sulfur, allow sufficient spaces between the containers and the trays and the side of the cover. The
burning time of sulfur will vary with the ventilation, shape of container, weather conditions, and amount of food to be sulfured.

- Cover the stacked trays with a heavy cardboard carton or a wooden box that has no cracks or openings. The box should be several inches higher than the stacked trays and at least 1 to 1½ inches wider around all sides of the trays, including the sulfur container placed beside them.

- To provide air for burning sulfur, leave the bottom of the box slightly propped up, or cut an opening about 1 by 6 inches at the bottom. The opening should be on the side by the sulphur. A slash or small opening may be needed at the upper edge of the opposite side. Drop the box or close the openings after the sulfur has completely burned.

- Count sulfuring time after the sulfur has finished burning. After sulfuring the recommended length of time, remove the trays and begin drying the fruit. (Various factors affect sulfuring time: texture of the fruit, size of pieces, peeling, and whether fruit is to be sun-dried under controlled conditions.)

Blanching

Fruits may be steam-blanch ed if they are to be dried under controlled conditions (oven or dryer) or if it is not possible to sulfur them. Blanching only, and not sulfuring, gives a darker colored product. Blanching may give a slightly cooked flavor to some fruits, such as apricots, peaches and pears. Blanch ed fruits may be soft and somewhat difficult to handle.

Cracking Skins of Fruit

Sometimes it is necessary to crack the skins of fruit before drying. Boiling water should do a satisfactory job for most fruits. Lye no longer is recommended because of the danger in handling it.

Fruits such as grapes, prunes and small dark plums, cherries, figs, and some firm berries like blueberries have relatively tough skins with a wax-like coating. To remove this waxy substance and to permit inside moisture to come to the surface and be evaporated, the skins are cracked or "checked" in many places.

This checking process is done by dipping the fruit into briskly boiling water, then into very cold water, followed by thorough draining on absorbent toweling. The length of the boiling water dip varies from 30 to 60 or more seconds, depending upon the toughness of the fruit skin, the maturity of the fruit, and the altitude.

Syrup-Blanching

Syrup-blanching fruit before drying gives a sweetened, "candied" type product. It also helps to keep the color in apples, apricots, figs, nectarines, peaches, pears and plums if they are not sulfured.

Make a syrup using 1 cup corn syrup and 1 cup sugar to 3 cups water. Or, use 1 part corn syrup to 1 part water. Heat the syrup to boiling. Add the prepared fruit and simmer 10 to 15 minutes. Remove the pan from the heat and let the fruit stand in the syrup for 10 minutes longer. Lift out, drain, and cool.

Fruit treated in this way will take longer to dry. Also, because it will attract insects, it should be well protected if dried outdoors.

Treating with Ascorbic Acid

Pure ascorbic acid (vitamin C) is an antioxidant that helps to keep fruit from darkening as it is being prepared for drying. Make a solution as recommended for specific fruits on the chart, Steps in Drying Fruit, page 10. One cup of the solution should treat about 5 quarts of cut fruit. Sprinkle the solution over the fruit pieces, turning them over gently until all are coated. Pure ascorbic acid usually can be obtained from pharmacies.
Drying Trays

Shallow wooden trays with slatted, perforated or woven bottoms are ideal for drying foods. They can be used outdoors in sun or shade, or indoors in a dryer or an oven. Open bottoms allow the passage of air. Air needs to reach all sides of the food for rapid drying.

A uniform size is important for easy and quick stacking. It also means less space will be required for out-of-season storage. And, it makes for convenience if drying is to be done both indoors and outdoors.

Trays for sun drying can be any size but should be no larger than can be handled easily when loaded. Each one square foot of tray space will dry from 1½ to 2½ pounds of prepared food.

A suggested tray size is 14" x 24" x 1" or 1½". If trays are to be used in an oven or dryer, make them at least 1½" smaller in length and width than the oven or dryer to allow for circulation of air.

Wooden blocks or spools an inch or more in height can be used in stacking. For oven use, trays can be measured for a staggered arrangement to allow the drying air to zigzag its way up and over each tray.

Trays with sides are better than those without sides because they keep foods from sliding off when the trays are moved, make stacking easier, keep trays from resting on food when they are stacked, and provide an edge to which a protective covering may be fastened.

Wooden trays are preferred because they can be used both for sulfuring and drying. Metals can discolor and corrode. Galvanized screen should not be used because it has been treated with zinc and cadmium. These metals can cause dangerous reactions when they come in contact with acid foods. Thin wood slats or dowels, placed ¼" or ½" apart, make good tray bottoms.

A thickness of cheesecloth laid over the tray bottom will keep sugar-rich foods from sticking and pieces of food from falling through. A fresh, low-flavored vegetable oil or mineral oil probably will help protect the wood bottoms and make for easier cleaning.

To insure cleanliness, wash trays in hot soapy water with a stiff brush, rinse in clear water, and air dry thoroughly after each use. When not in use, store in such a way as to keep them clean and ventilated.

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Drying Methods

Successful drying depends upon:
- heat — enough to draw out moisture, but not enough to cook the food material
- dry air — to absorb the released moisture
- air circulation — to carry the moisture off

Spread or arrange the prepared vegetable or fruit on the drying trays in a thin layer, usually not over ½ inch deep. Use clean cheesecloth on the trays if needed to prevent the food pieces from sticking or falling through.

Before testing foods for desired dryness, remove a handful to cool for a few moments. Foods that are warm or hot from the sun or oven seem softer, more moist and more pliable than they actually are.

Check the chart, Steps in Drying Fruits and Vegetables, for the drying test for specific fruits and vegetables.

Sun-Drying

Place trays of pretreated fruits or vegetables in the direct sun, either flat or tilted, in an arrangement that allows air to circulate underneath them. Select a drying area that offers some protection from dust and dirt, as well as from animals. To protect against insects, place cheesecloth or screening over the food, but not in contact with it.

Turn the food occasionally to help it dry evenly.

An electric fan directed onto the food will hasten the drying and help keep insects away. For safety, be sure the fan has a grill covering the blades.

When the food seems about two-thirds dry, move the trays into the shade and continue drying until "done." Do not allow the sun to scorch or sunburn the food.

If there is a chance for moisture during the night, bring the trays indoors or stack them, covered, in a sheltered area. Let the food cool somewhat before covering it.

Oven-Drying

Products dried in controlled heat generally will be superior to sun-dried ones in color, flavor, cooking quality, and nutritive value. Also, the food more likely will be free from insects and insect eggs which often result from outdoor exposure.

Controlled-heat drying has the advantage over
sun-drying of reducing drying time since it goes on continuously even after sundown, and during rainy as well as sunny weather. However, the cost is more for equipment and operating expenses.

When using a home oven for drying, limit the oven load to no more than 4 to 6 pounds of fresh prepared fruit at one time.

Use trays that are at least 1 1/4 inches smaller than the width and depth of the oven. Separate trays by about 2 1/2 inches. Allow at least a 3-inch clearance from each the top and the bottom. A larger space between the bottom tray and the oven floor may be needed if the temperature cannot be set as low as 140°F.

Disengage, remove, or do not light the top heating element of an oven. Try to maintain a temperature of 140°F if the oven cannot be adjusted for the lower temperatures listed in the drying chart. Preheat the oven at its lowest setting. Allow it to cool down if necessary, by turning the heat off and/or opening the door slightly, before the food is put in. Be careful with a gas oven which does not have an automatic shut-off. Do not let the flame go out unnoticed during drying.

Prop open the oven door to maintain an even low temperature and to let the moist air out. The opening will vary among ovens, from a 1/4-inch crack up to 8 inches.

Use a thermometer (oven, roasting, candy or dairy) to keep track of the temperature in various parts of the oven. If using other than an oven thermometer, make sure the bulb does not touch any surface.

Turn the food occasionally on the trays. Trays next to the top and bottom dry the fastest. Shift them around every half hour or so. Also turn trays front to back. It might help to number the trays so that a record can be kept of the shifts.

If some pieces around the tray edges get dry first, remove them first — it is easy to scorch food if it overheats near the end of the drying time. In order to avoid this, turn off the heat when drying is almost completed and open the oven door wide.

Most vegetables take 4 to 12 hours to dry: fruits, 6 to 20 hours. Time varies according to the kind of fruit or vegetable being dried, the size of pieces, and the load on the tray.

Other Methods

Sun (solar) heaters and dehydrators or dryers sometimes are used to dry foods. They can be made fairly easily at various costs. Sun heaters are effective when drying foods requiring humidity or when drying small lots of food. Dehydrators are best used when drying large amounts of food.
Conditioning and Pasteurizing
Most fruits should be allowed to "sweat" or condition for a week after drying. This equalizes the moisture. Apricots, particularly, develop a candy-like consistency during conditioning. To condition, place fruit in a sturdy nonporous, non-aluminum container. Place the container in a warm, dry, well ventilated and protected area. Stir the food gently each day.
Foods dried in the sun may harbor spoilers like insects or insect eggs. Generally, though, this is not a problem with fruits that have been sulfured.
Dairy products that come from the oven or dehydrator usually are free from infestation. However, certain foods need to be pasteurized to destroy spoilage organisms. These include sun-dried foods; vegetables cut in small pieces so that in the drying process the heat is not high enough or long enough to kill spoilers; and foods that are allowed to stand exposed to air, such as during conditioning. To pasteurize, use whichever of the following methods is suitable:
1. Heat fruits and vegetables on trays in a 150°F oven for 30 minutes.
2. Heat the food on trays in a 175°F oven; fruits for 15 minutes and vegetables for 10 minutes.

Packaging and Storing
Dried foods should be thoroughly cooled before packaging.
Pack the food as tightly as possible without crushing into clean, dry, insect-proof containers. Metal cans or boxes with fitted lids, glass jars, or moisture-vapor proof freezer cartons or bags (heavy gauge, plastic type) make good containers for storing dried food.
Fruit that has been sulfured should be separated from a metal can or lid by putting the fruit into a plastic bag or by inserting a cellophane or polyethylene sheet under the lid. Color changes take place when sulfur fumes react with metal.
To insure protection from insects and to prevent any reabsorption of moisture, seal lids to the containers. Do this by wrapping the joining area with a plasticized pressure-sensitive tape, or with a clean 1-inch strip of cloth that is still warm after having been dipped in paraffin.
Herbs dried on the stem may be stored on the stem in plastic or paper sacks (to protect them from the dust), if ample storage space is available. Otherwise, store the dried leaves, whole or crushed, in an appropriate container.
It is well to package in small amounts, because dried foods are best if used within a short time after the container has been opened.
Most dried foods should be stored, tightly sealed, in a cool, dry, dark place. Recommended storage times for dried fruits and vegetables range from six months to one year. Because food quality is affected by heat, the storage temperature helps determine the length of storage: the higher the temperature, the shorter the storage time. Labeling the packaged foods with the date of packaging and the name of the product also is helpful.
Foods that are packaged seemingly "bone dry" can spoil as a result of reabsorbing moisture in storage. Check from time to time during storage to see that they remain dry. Glass containers are good for storage because any moisture that collects on the inside can be seen easily. Food affected by moisture, but not spoiled, should be used immediately or reheated and repackaged.
Preparation for Table Use

Properly dried foods refresh well. They return practically to their original size, form, and appearance. If carefully handled, they retain much of their aroma and flavor, as well as the minerals and appreciable amounts of vitamins.

Roughly, 1 to 2 cups of dried foods will serve 6 persons.

Fruits

One to eight hours are required for refreshing most fruits. The time varies with the kind of fruit, the size of the pieces, and whether the refreshing process is done with hot or cold water. Hot water takes less time.

Add water just to cover — more can be added if needed. Do not oversoak. Oversoaking produces loss of flavor, and sometimes a mushy waterlogged product. Fermentation spoilage will occur if soaking is continued too long, as drying does not render the food free from bacteria, yeasts and molds.

To cook, cover and simmer in the soak water to retain the nutritive quality.

Sometimes less sugar is needed in cooking dried fruit than in cooking fresh fruit. In the drying process, some of the starch in fruit may change to sugar. When sugar is used, it should be added at the end of the cooking process so it will not interfere with the fruit’s absorption of water.

Adding a few grains of salt helps bring out the natural sweetness of most fruits. Lemon, orange, or grapefruit juice added to the fruit just before serving will help give a fresh fruit flavor and add vitamin C to the food.

Vegetables

To replace the moisture removed from most vegetables, soak them in cold water just to cover for 20 minutes to 2 hours. Cover greens with boiling water. Bring vegetables to a boil and simmer until done. Allow excess water to evaporate during cooking.

The amount of water used for soaking and cooking should be as nearly the same as the amount the food will take up. It is better to add water during the cooking process than to start with more than is needed.

Like fresh foods, dried ones will lose both texture and flavor if overcooked. Dried vegetables already have been partially precooked and therefore can be prepared for the table in a short time.

Use powdered products and herbs without soaking.
Steps in Drying Fruits
(Refer to text for details)

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Pretreatment</th>
<th>Drying Procedure*</th>
</tr>
</thead>
</table>
| Apples (Use varieties of good dessert or cooking quality. Mature but not soft.) | Choose one:  
  • Blanch in steam 10 minutes.  
  • Sulfur 30 to 60 minutes depending on size of pieces. | Arrange slices on trays not more than two layers deep.  
  Under controlled conditions (oven) start at 130°F; gradually increase to 165°F; finish at 145°F.  
  Drying time approximately 6 hours in controlled heat.  
  Dry until leathery, suede-like, and there is no moisture when cut and squeezed. |
| Wash, peel, and core. Cut into slices or rings 1/8” to 1/4” thick, or into quarters or eighths.  
To prevent browning during preparation, treat cut portions with an ascorbic acid solution (2 1/2 tsps. of pure crystalline ascorbic acid in each cup of cold water). | | |
| Apricots (Use any variety. Fully ripened but not so soft they are easily mashed or lose shape during drying.) | Choose one:  
  • Sulfur 1 to 2 hours depending on size of pieces and ripeness of fruit. The riper the fruit the more slowly it absorbs sulfur dioxide.  
  • Steam-blanch halves 5 to 10 minutes.  
  • Blanch in a hot syrup made of equal parts corn syrup and water or sugar and water. | Arrange in single layer on drying trays, pit side up.  
  Under controlled conditions (oven) start at 130°F; gradually increase to 150°F. Reduce to 140°F when nearly dry.  
  Average drying time for halves up to 14 hours in controlled heat; 1 to 2 days in the sun.  
  Dry until leathery and pliable; handful of pieces falls apart after squeezing; no moisture in center when cut.  
  May be dried in sun heater. |
| Wash, cut in half and pit. Do not peel.  
Coat with ascorbic acid solution (1 tsp. pure crystalline ascorbic acid in each cup of water) to prevent darkening. | | |

*If suggested temperature ranges are not possible to control, maintain the drying temperature at 140°F.
<table>
<thead>
<tr>
<th>Preparation</th>
<th>Pretreatment</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Berries (Firm type)</strong></td>
<td>Choose one:</td>
<td></td>
</tr>
<tr>
<td>Sort, wash and leave whole.</td>
<td>• No treatment necessary.</td>
<td>Spread in layer not more than 2 berries deep. Cloth on tray may help keep berries from sticking.</td>
</tr>
<tr>
<td></td>
<td>• Steam 1/2 to 1 minute.</td>
<td>Under controlled conditions start at 120°F, increase to 130°F after one hour then to 140°F.</td>
</tr>
<tr>
<td></td>
<td>• Crack tougher skins by dipping 15 to 30 seconds in boiling water, then in cold water. Remove excess moisture.</td>
<td>Drying time up to 4 hours. Dry until berries are hard, rattle when shaken on the tray, and do not show moisture when crushed between the fingers.</td>
</tr>
</tbody>
</table>

| Cherries                     | Choose one:                                                                   |                   |
| Sort, wash, leave whole or stem and remove pit. | • No further treatment necessary.                                             | Dry in single layers on trays. Under controlled conditions start at 120°F; increase gradually to about 145°F. Reduce temperature near end if chance of scorching. |
|                              | • Check skins of whole cherries in boiling water 15 to 30 seconds, cool immediately, and remove moisture. | Drying time up to 6 hours. Dry until leathery and slightly sticky. |
|                              | • Syrup-blanch.                                                              |                   |

| Dates (Dates with low moisture content are desirable. Best to pick translucent fruit.) | No treatment necessary.                                                      |                   |
| Wipe clean with damp terry towel; do not wash. Discard any fruit showing fungus, skin damage, or souring. Dry only the same type of date in any one batch. | Spread fruit one layer deep on racks or trays. Dry in oven. Preheat oven to 225°F for 5 minutes. Turn heat off; place dates in oven and leave them until the oven has cooled. Repeat the process the next day. Or Dry in a sun heater from 2 to 8 days, depending upon fruit and temperature conditions. Dry until leathery, pliable and slightly sticky. |                   |

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</tr>
</thead>
<tbody>
<tr>
<td>Dates (continued)</td>
<td></td>
<td>Pasteurize sun heater dried fruit at 150° F for 30 minutes. Fruit temperatures above 155° F cause a caramelization of the sugars with a resulting scorched flavor, and produce a syrupy, sticky date.</td>
</tr>
</tbody>
</table>

**Figs**
Select fully ripe fruit. When not fully ripe, the sugar content is too low to produce a good dried product, and fruit may sour.
Wash, or clean whole fruit with damp Terry cloth.
If small or partly dried on tree, leave whole. Otherwise, cut in half lengthwise.
Choose one:
- Check skins of whole figs by dipping in boiling water for 30 to 45 seconds. Cool quickly, and remove excess moisture.
- Sulfur light colored varieties (like Kadotas) for 1 hour or more. Sulfuring is optional with others. (Black figs will turn a mottled color when sulfured.)
- If cut, steam-blanch 20 minutes.
- Syrup blanch.
Spread in single layers on trays.
Under controlled conditions start at 115° F, increase to 145° F after first hour. Reduce to about 130° F when nearly dry.
Stir or turn figs to keep from sticking.
Drying time averages up to 5 hours for halves in controlled heat; about 3 days in the sun.
Dry until leathery, with flesh pliable yet slightly sticky.

**Grapes (Any seedless varieties.)**
Wash, and remove all defective fruit.
Leave whole on stem; cut closely packed stems into small bunches; or, remove from stems.
- No treatment necessary.
- Or, dip in boiling water 15 to 30 seconds to crack skins; then in cold water to cool immediately. Drain.
Under controlled conditions start at 120° F, increase gradually up to 150° F. Reduce temperature near end of drying, if necessary.
Drying time averages up to 8 hours.
Dry until pliable and leathery.

**Nectarines**
Peel if desired.
Halve and stone.
Cut into quarters or slices.
To prevent browning during preparation, treat with ascorbic acid solution as for apricots.
Choose one:
- Steam-blanch halves 15 to 18 minutes, slices 5 minutes.
- Sulfur slices 1 hour, halves or quarters 2 hours. If blanched, sulfur 30 and 90 minutes, respectively.
Dry like peaches.

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<table>
<thead>
<tr>
<th>Preparation</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Peaches (Any good table variety; freestones preferred. Ripe enough for eating but not dead ripe.)</strong></td>
<td><strong>Pretreatment</strong></td>
<td><strong>Drying Procedure</strong>*</td>
</tr>
<tr>
<td>Peel.</td>
<td>Choose one:</td>
<td>Arrange in single layers on trays, pit side up to retain juices.</td>
</tr>
<tr>
<td>Cut in half and pit.</td>
<td>- Steam-blanch halves 15 to 20 minutes, slices 5 to 7 minutes.</td>
<td>Turn over halves when visible juice disappears.</td>
</tr>
<tr>
<td>Leave in halves or cut in quarters or slices.</td>
<td>- Sulfur 1 to 2 hours, depending upon size of pieces. If steam-blanch before sulfuring, cut sulfuring time about half.</td>
<td>For controlled heat drying, start at 125°F, increase gradually to 155°F. Reduce heat when nearly dry to prevent scorching.</td>
</tr>
<tr>
<td>To prevent browning during preparation, treat with ascorbic acid solution as for apricots.</td>
<td></td>
<td>Drying time under controlled conditions averages up to 15 hours for halves and about 6 hours for slices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry until leathery and somewhat pliable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May be dried in sun heater.</td>
</tr>
<tr>
<td><strong>Pears (Bartlett is best for drying.)</strong></td>
<td><strong>Pretreatment</strong></td>
<td><strong>Drying Procedure</strong>*</td>
</tr>
<tr>
<td>Pare.</td>
<td>Choose one:</td>
<td>Spread in single layers on trays.</td>
</tr>
<tr>
<td>Cut in half lengthwise and core.</td>
<td>- Steam-blanch 5 to 20 minutes, depending upon size of pieces.</td>
<td>Under controlled conditions start at 130°F, increase gradually to 150°F after first hour. Reduce to 140°F for last hour or when almost dry.</td>
</tr>
<tr>
<td>Cut in quarters or eighths or slices 1/8&quot; to 1/4&quot; thick.</td>
<td>- Sulfur as for peaches.</td>
<td>Drying time under controlled conditions averages up to 15 hours for halves or 6 hours for slices.</td>
</tr>
<tr>
<td>To prevent browning during preparation, treat with ascorbic acid as for apricots.</td>
<td>- Syrup-blanch.</td>
<td>Dry until springy and suede-like; no moisture when cut and squeezed.</td>
</tr>
<tr>
<td><strong>Prunes-Plums</strong></td>
<td><strong>Pretreatment</strong></td>
<td><strong>Drying Procedure</strong></td>
</tr>
<tr>
<td>Dry whole if small. Otherwise, cut into halves (pit removed) or slices.</td>
<td>Choose one:</td>
<td>Dry like pears.</td>
</tr>
<tr>
<td></td>
<td>- Dip whole fruit in boiling water 30 or more seconds to check skins. Cool and drain.</td>
<td>Drying time under controlled conditions averages 6 to 8 hours for slices and halves; up to 14 hours for whole fruit.</td>
</tr>
<tr>
<td></td>
<td>- Steam-blanch halves 15 minutes, slices 5 minutes.</td>
<td>Dry until pliable and leathery; handful of pieces will spring apart from squeezing.</td>
</tr>
<tr>
<td></td>
<td>- Sulfur whole fruit 2 hours, halves and slices 1 hour.</td>
<td></td>
</tr>
</tbody>
</table>

*If suggested temperature ranges are not possible to control, maintain the drying temperature at 140°F.
### Steps in Drying Vegetables**

(Refer to text for details)

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Pretreatment</th>
<th>Drying Procedure*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beans — Lima</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Shell. Choose one:  
• Steam 10 to 15 minutes.  
• Place in boiling water 5 minutes. Drain. | Spread on tray about 1/2" deep.  
Under controlled conditions start at 115° F, increase to 140° F.  
Stir frequently at beginning.  
Will dry in 6 to 10 hours in controlled heat.  
Dry until hard and brittle.  
Beans will break clean when broken. |
| **Chili Peppers (Green)** | 
To loosen skin, rotate pepper over flame or scald in boiling water.  
Peel, split pods, and remove seeds and stem. Choose one:  
• No treatment necessary.  
• Steam-blanch 10 minutes. | Under controlled conditions start at 120° F, increase to 150° F. Reduce heat toward end.  
Dry until crisp and brittle. |
| **Chili Peppers (Red)** | 
Select mature pods.  
Wipe clean with damp cloth.  
String whole pods together with needle and cord, or suspend plants in bunches, root side up, where air can get to them. No treatment necessary. | Drying time in controlled heat, 6 to 10 hours at 150° F; in room temperature, several weeks.  
Dry until pods are shrunken dark red, flexible. |
| **Corn (Any good table variety.** | 
Select tender, sweet corn.  
Husk.  
Sort ears on basis of maturity because young corn requires longer blanching time.  
Cut from cob after blanching and cooling enough to handle.  
Steam on the cob 10 to 15 minutes, or until milk is set. | Spread kernels 1/2" to 3/4" deep on trays.  
Under controlled conditions start at 130° F, increase to 165° F. Reduce to 140° F when nearly dry.  
Stir frequently to prevent kernels from lumping together.  
Dry until hard and brittle — from 6 to 10 hours. |
<table>
<thead>
<tr>
<th>Preparation</th>
<th>Pretreatment</th>
<th>Drying Procedure*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onions (<em>Select pungent varieties.</em>)</td>
<td>Peel. Remove outer discolored layers. Cut uniform slices 1/8&quot; to 1/4&quot; thick.</td>
<td>No treatment necessary.</td>
</tr>
<tr>
<td>Peas</td>
<td>Select young, tender peas of a sweet variety. Shell.</td>
<td>Choose one: * Steam-blanch 8 to 10 minutes. * Dip in boiling water 3 to 4 minutes.</td>
</tr>
<tr>
<td>Pumpkin (deep orange); Squash (Hubbard)</td>
<td>Cut into strips about 1&quot; wide. Peel off rind. Scrape off fiber and seeds. Cut peeled strips crosswise into pieces about 1/8&quot; thick.</td>
<td>Steam-blanch until tender (about 6 minutes).</td>
</tr>
<tr>
<td>Herbs for Seasoning</td>
<td>Gather when leaves are mature but before flowers develop. Wash thoroughly, remove excess water.</td>
<td>No treatment necessary.</td>
</tr>
</tbody>
</table>

*If suggested temperature ranges are not possible to control, maintain the drying temperature at 140° F.<br>**Other vegetables can be dried successfully. These were selected as representative within the state.<br>***Blanching time will be slightly longer if altitude is high or quantity of vegetable is large.
VEGETABLE MOBILE

Instructions
Use to study the parts of the plants we harvest and eat.

Beets - root and leaves
Radish - roots
Cucumber - fruit
Asparagus - shoots
Broccoli - flower and stems
Lettuce - leaves
Tomato - fruit

- Print on heavy cardstock paper.
- Color the plant parts.
- Cut on dotted lines.
- Punch holes and tie string.
- Attach to coat hanger.
Plants We Eat

Above, Below, Watch the Veggies Grow

OBJECTIVE: To identify vegetables that grow above and below the ground.

TIME: 20 to 25 minutes

MATERIALS NEEDED: below ground vegetables – carrots, potatoes, onions and radishes; above ground vegetables – tomatoes, broccoli, squash and lettuce; vegetable tags for children

INSTRUCTIONS

The teacher/leader should begin by showing the children the below ground and above ground vegetables. The leader should talk about the characteristics of each. This might include the color, smell and how the vegetable is prepared in food. The children should be allowed to touch and smell all of the vegetables displayed. The leader/teacher should emphasize that some of these vegetables grow above the ground and some grow below the ground.

The teacher/leader should then divide the children into groups of about six, grouping their desks or chairs together. The teacher/leader should give each child a vegetable tag to pin on his or her shirt. Randomly give these to the children in each group. After the children have identified what vegetables they are wearing, gather the teams and have them race to get all the vegetables in the proper place. For example, the children with above ground vegetables will stand on top of their chair. The children with below ground vegetables will get under their desk. The group that correctly gets their vegetables in the proper place first wins the game. Recognize all the groups that successfully get their vegetables in the proper place.
Plants We Eat

The Choo-Choo Song

OBJECTIVE: To associate a variety of plants and their food by-products through learning a song.

TIME: 15 minutes

MATERIALS NEEDED: song sheets with verses for children who can read

INSTRUCTIONS

The teacher/leader should sing the song for the children first so that they can learn the melody of the song. The teacher then can add as many verses as he or she desires. A fun addition to this activity would be to have the children develop their own verses to the song as well.

Song

Tomato sat on the railroad track,
Thought he was the boss,
Along came the Choo-Choo train, (clap)
Tomato sauce.

Avocado sat on the railroad track,
All green and roly,
Along came the Choo-Choo train, (clap)
Guacamole.

Cucumber sat on the railroad track,
For this there is no excuse,
Along came the Choo-Choo train, (clap)
Pickle Juice.

Other verses

Blueberry, Huffin and a puffin, (clap) Blueberry muffin.
Apple, Playing with a spider, (clap) Apple cider
Lemon, Where he often stayed, (clap) Lemonade
Strawberry, Being such a ham, (clap) Strawberry jam
Orange, Silly as a goose, (clap) Orange juice
Grape, Sunning his fat belly, (clap) Grape jelly
Onion, Doing his own thing, (clap) Onion ring
Potato, Wishing he could fly, (clap) French fry
Plants We Eat

Vegetable Song

OBJECTIVE: To list a variety of vegetables and their unique qualities through the Vegetable Song.

TIME: 5 to 10 minutes

MATERIALS NEEDED: lyrics

INSTRUCTIONS

The teacher/leader will tell the children that the "Vegetable Song" is sung to the familiar song of "Mary Had A Little Lamb." The teacher/leader will then need to sing the first verse for the children so that they may hear how the song is to be sung. After this have the children join in and add additional verses as needed.

The Vegetable Song
Sung to: "Mary Had a Little Lamb"

We are pumpkins, big and round
Big and round, big and round.
We are pumpkins, big and round,
Seated on the ground.

Verses

We are string beans green and fine...growing on a vine.
We are onions round and white...we make soup taste right.
We are carrots, orange and long...help us sing the song.
We are cabbage green or red...see our funny head.
We are cornstalks tall and straight...don't we just taste great.

by Lynn Beaird (Lompac, CA)
Taken from Piggyback Songs
SESSION 12
Putting the Garden to Bed

Class Preparation: Think about a plant life cycle and what must be done when the growing season is over.

Materials:

1. Have children make sequence cards showing the steps of a garden: bed preparation, planting, watering, pollination, fruited, harvesting, etc. Could be a headband, mobile comic book, pinwheel or flowchart. Explain how the growing season is over and time for the garden to go to bed and get some rest until the spring season.

2. Note plant growth and how plants have matured and possibly died.

3. Visit garden and pull up remaining plants. Add remains to compost pile and review the decomposition of organic materials.

Terms: sequence, bed preparation, pollination, fruited, harvesting.

Process Skills:
- manipulating, observing, classifying, communicating, drawing inferences, applying defined terms, investigating.

Activities:
- Sequence card pinwheel
Plants Are Beautiful

Pinwheel Plants

OBJECTIVE: To recognize the stages of plant growth by making a plant pinwheel.

TIME: 30 to 45 minutes

MATERIALS NEEDED: 4 white index cards for each child, crayons, pencils and glue, tape or other adhesive

INSTRUCTIONS

To begin this activity the teacher/leader might want to draw some example cards for the children to follow as a guideline. Draw on the first card a picture of a young plant. Draw the sequence of growth on the other cards, keeping the drawing to the center. Fold the cards back to back. Glue or tape the cards together leaving a narrow space so a pencil can fit through the center. Twirl the pencil and watch the action of the plant developing. Other motions could also be used such as planting, watering or cutting a flower.
PROCESS SKILLS AND ESSENTIAL ELEMENTS
<table>
<thead>
<tr>
<th>Activity</th>
<th>Grade Level</th>
<th>Process Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant People</td>
<td>PK-5</td>
<td>X X X X X X X X</td>
</tr>
<tr>
<td>Leaf Pictures</td>
<td>4-6</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Dried Celery</td>
<td>PK-5</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Picture Yourself as a Plant</td>
<td>PK-5</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Learning to the Light</td>
<td>PK-5</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Catch and Keep Raindrops</td>
<td>3-5</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Sunshine Fun</td>
<td>PK-5</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Plant Word Puzzle</td>
<td>4-5</td>
<td>X X</td>
</tr>
<tr>
<td>Mystery Match</td>
<td>PK-2</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Gas Gobblers</td>
<td>PK-2</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Just Diggin Around</td>
<td>PK-3</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>What Plants Need?</td>
<td>PK-4</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Seed Growth Viewing</td>
<td>PK-2</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Plant Journal &amp; Chart</td>
<td>PK-5 draw write graph</td>
<td>X X X X X X</td>
</tr>
</tbody>
</table>

Learning to Grow
<table>
<thead>
<tr>
<th>Activity</th>
<th>Grade Level</th>
<th>Process Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinwheel Plants</td>
<td>PK-5</td>
<td>X X X</td>
</tr>
<tr>
<td>What part of a plant?</td>
<td>PK-1</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Plant Parts Charade</td>
<td>PK-3</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>What do leaves, roots, fruit, stems, shoots, &amp; photosyn. do?</td>
<td>4-5</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Caring is for everyone</td>
<td>PK-5</td>
<td>X X X</td>
</tr>
<tr>
<td>Who am I?</td>
<td>PK-3</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Above, below, watch veggies grow</td>
<td>PK-5</td>
<td>X X X</td>
</tr>
<tr>
<td>Vegetable Song</td>
<td>PK-2</td>
<td>X X X X</td>
</tr>
<tr>
<td>Choo-Choo Song</td>
<td>PK-2</td>
<td>X X X</td>
</tr>
<tr>
<td>Compost Column</td>
<td>PK-5</td>
<td>X X X</td>
</tr>
<tr>
<td>Trash to Treasure</td>
<td>PK-5</td>
<td>X X X</td>
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1. manipulating  
2. observing  
3. classifying  
4. communicating  
5. measuring  
6. drawing inferences  
7. relating  
8. applying  
9. investigating

*Learning to Grow*
# Plant Projects

## Essential Elements

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### Plants We Use

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# Plants We Eat

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# Plants Are Beautiful

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## Plants and Nature's Helpers

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Plants We See

Essential Elements

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## Plants In Your World

### Essential Elements

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