Freezing Fruits and Vegetables at Home

Cooperative Extension Service
The University of Georgia
College of Family and Consumer Sciences

Advantages of Freezing

- Many foods can be frozen.
- Good natural color, flavor and nutritive value can be retained.
- Texture usually better than for other methods of food preservation.
  But this is personal preference.
- Foods can be frozen in less time than they can be dried or canned.

Advantages of Freezing

- Simple procedures.
- Adds convenience to food preparation.
- Proportions can be adapted to needs unlike other methods.
- Kitchen remains somewhat cool and comfortable.

Disadvantages of Freezing Foods

- Texture of some foods is undesirable because of changes due to the freezing process.
- Initial investment and cost of maintaining a freezer is high.
- Storage space is limited by how much the freezer will hold.
How Freezing Affects Food

Enzymes in Vegetables and Fruits

* To prevent color and flavor changes, as well as loss of some nutrients, enzymes should be controlled.
* Are slowed down but not destroyed during freezing.

(Enzymes are small proteins in foods that start or help with reactions, such as those that cause browning, off-flavors, mushiness, etc.)

How Freezing Affects Food

Enzymes in Vegetables

* Are destroyed by heat, called blanching, before packaging and freezing.

Enzymes in Fruits

* Usually controlled by ascorbic acid (also called vitamin C) or some other additives.
* Fruits are usually not blanched, but can be.
  * People like them raw and uncooked.

How Freezing Affects Food

Textural Changes

* The water in food freezes and expands.
* Ice crystals cause the cell walls of fruits and vegetables to rupture, making them softer when thawed.
* Some vegetables with very high water content do not freeze well: celery, lettuce, some tomatoes.

Best Advice for Freezing

* Freeze foods quickly.
  * Set freezer temperature at -10°F at least 24 hours ahead of freezing large quantities of fresh food.
  * Spread packages out around the freezer, until frozen, then stack.
  * Hold at 0°F for best quality.
Packing Foods to be Frozen

- Food must be cool before freezing.
- Ice water bath after blanching.
- Pack in serving size quantities.
  - Usually up to 1 quart.
  - Especially when whole package must be thawed to get out what is needed.

Packing Foods to be Frozen

- Press all air from bagged foods.
  - Except for headspace.
  - Seal non-zippered bags by twisting the loose top, and then folding the top of it down over itself (gooseneck). Secure with twist-tie, rubber band or string.
- Use tight lid on rigid containers.
  - Keep sealing edges clean and dry. Use freezer tape over seams of looser-fitting covers.
  - Trapped food or liquids in sealing area will freeze, expand, and loosen seal.

Packing Foods to be Frozen

- Pack foods tightly –
  - Avoid trapped air (oxygen).
  - Not to waste space.
- However, most foods need headspace or room for some expansion at the top, except
  - uneven vegetables like broccoli and asparagus,
  - bony pieces of meat,
  - tray-packed foods,
  - and breads.

Labels

- Name of product
- Added ingredients
- Form of food - halves, whole, ground, etc.
- Packaging date
- Number of servings or amount

9/15/02
Ground Beef
1 pound
Freezing Guidelines
1. Freeze foods at 0°F or lower.
   • 24 hours in advance of freezing large quantities of food, set freezer at -10°F or lower.
2. Freeze foods immediately after prep.
3. Do not overload freezer with unfrozen food.
   • Freeze amount that will freeze in 24 hours (2 to 3 pounds of food per cubic foot).
4. Pack already frozen foods together so they do not thaw.

Freezing Fruits
• Frozen in many forms –
  • Whole, sliced, crushed, juiced.
• Best quality –
  • Optimum maturity and freshness.
  • Immature or overripe both produce lower quality when frozen.
  • Wash and work with small amounts at a time to preserve best quality.

Freezing Guidelines, cont.
5. Place unfrozen foods in contact with surfaces and in coldest parts of freezer.
6. Leave space around packages so cold air can circulate.
7. When packages are frozen, organize freezer into types of food.
8. Arrange frozen foods so that the foods frozen longer can be used first.
9. Keep a frozen foods inventory up to date.
10. Check thermometer periodically.

Preventing Fruit Darkening During Preparation (Peeling, slicing, etc.)
• 1 tsp (3000 mg) ascorbic acid to one gallon of cool water
• Commercial ascorbic acid mixture
• Heating the fruit
• The following do not work as well:
  • Citric acid solution
  • Lemon juice
  • Sugar syrup
  • Salt/vinegar solution
Preventing Discoloration During Freezing

- **Ascorbic Acid**
  - Most economical
  - Powdered or tablet form
  - 1/2 t. powdered ascorbic acid = 1500 mg
  - For tablets, use number needed for desired milligrams
    - (for example, 3 x 500 mg tablets = 1500 mg)
  - Tablets must be crushed well

Preventing Discoloration During Freezing

- **Ascorbic Acid (con't)**
  - In sugar or dry packs, dissolve the powdered ascorbic acid in 3 T. in cold water and sprinkle over fruit.
    - In sugar packs, before adding sugar.
    - Usually ½ to ¾ tsp (750 to 1500 mg) per 3 T. water for each quart of fruit.
  - For crushed fruit, purees or juices, mix the powdered ascorbic acid with the prepared fruit.
    - Usually about ¼ tsp (750 mg) or less per qt. of fruit.

Preventing Discoloration During Freezing

- **Ascorbic Acid**
  - Use amount specified for each fruit.
  - In syrup or liquid packs - add powdered ascorbic acid to the covering liquid.
    - Usually ½ tsp (1500 mg) per quart of syrup.

Preventing Discoloration During Freezing

- **Ascorbic Acid Mixtures**
  - “Fruit Fresh” and others.
  - These have some other added ingredients.
  - Follow package directions to obtain correct strength of ascorbic acid.
Preventing Discoloration During Freezing

* Citric Acid or Lemon Juice
  * Not as effective as ascorbic acid.
  * May mask flavors of fruits.

* Steaming
  * Best for fruits that will be cooked before use.
  * Follow directions in freezing publications for times.

Sweetened Packs for Fruit

* Syrup Pack
  * Better texture.
  * Not needed for safety.
  * Fruits should be covered with syrup.
    * Place crumpled water-resistant paper in top of container.

Preparing Peaches in Syrup

* Sugar Pack
  * Sliced soft fruits (strawberries, peaches, etc.) make their own syrup when mixed with the right proportion of sugar.
  * Layer fruit and sugar in bowl or pan.
  * Allow mixture to stand 15 minutes to make juice or “syrup” before packaging.
Unsweetened Packs for Fruit

* Dry Pack
  * Good for small whole fruits such as berries that don’t need sugar.
  * Simply pack into containers and freeze.
  * Or may be frozen individually, in single layer, on a tray first.
  * “Tray pack” – next slide

Dry Tray Pack for Fruit

* Fruit pieces may be frozen individually, in single layer, on a tray first.
* Freeze until firm then package in rigid container or bag.
* Will pour out of container easily when frozen.

Dry “Tray” Pack for Fruit

* Can remove only the amount needed at one time.
* Fruit pieces retain shapes.
* Fruit pieces do not “clump” as when packed directly into containers or with sugar syrup.

Unsweetened Packs for Fruit

* Pectin Syrup
  * Good for strawberries and peaches.
  * Mix 1 package powdered pectin and 1 cup water. Bring to boil, boil 1 minute. Remove from heat, cool and add 1-3/4 cups more water.

* Water or Unsweetened Juice Packs
  * Texture will be mushier.
  * Color poorer.
  * Freezes harder, takes longer to thaw.
Packs for Purees or Juices

* Pack as is, with or without sugar.
* Add ascorbic acid if light-colored.

Sugar Substitutes

* May be used in the pectin syrup, juice or water packs.
* Or could be added just before serving.
* These do not help with color retention or texture, like sugar does.
* Use amounts on product labels or to taste.

Freezing Vegetables

* Select young, tender, high-quality vegetables.
* Sort for size and ripeness.
* Wash and drain before removing skins or shells.
* Wash small lots at a time, lifting out of water. DO NOT SOAK.
* Work in small quantities, preparing as directed.

Preventing Flavor and Color Changes in Vegetables

Blanching

* Primary method to destroy enzymes for vegetables.
* Will also soften hard veggies to make packaging easier.
* Will also remove some microorganisms.
* Under-blanching can be harmful; it will stimulate enzymes and not destroy them. Check required blanching times for each food.
How to Blanch Vegetables

Use specific directions. Work in small quantities.

In Boiling Water
- Use blancher with lid or a kettle with basket and lid.
- Have 1 gallon water per 1 lb. of vegetables.
- Place vegetables in blanching basket.
- Lower vegetable into vigorously boiling water. Put lid on. Water should hardly stop boiling or return to a boil within a minute.
- If water keeps boiling, begin timing immediately. Otherwise, wait for water to come back to a boil.

Steam Blanching
- Use kettle with tight lid and basket.
- 1” to 2” of boiling water in bottom of pan.
- Vegetable should be in a single layer in basket.
- Start timing when covered.
- Takes 1-1/2 times longer than water blanching. Check times, however, for each food.
Reliable Food Preservation Resources - 2019

Home food preservation is fun with tasty results. In order to ensure a safe product and to maximize flavor and texture of the food, always use a scientifically tested recipe. This is essential for canning in glass jars to prevent a life-threatening illness, botulism.

Scientific testing resulted in revision to several home canning processes in 1994. Recipes published prior to 1994, should be compared to a current, reliable resource for safety. Be aware that not all recipes found on the web or in publications are scientifically tested. Unsafe recipes or procedures may result in serious illness or death.

The listed resources are from organizations that validate their information and recipes for safety and accuracy. Cooperative Extension and universities are good sources.

Websites: information, tested recipes, “how to” videos, printable factsheets and more

- USDA’s National Center for Home Food Preservation: http://www.uga.edu/nchfp
- Ball™ Home Canning: http://www.freshpreserving.com/home
- Rutgers, The State University, Cooperative Extension: https://njaes.rutgers.edu/food-safety/home-food-preservation/
- University of Nebraska—Lincoln, Cooperative Extension: https://food.unl.edu/canning-freezing-and-drying

Books:

- The All New Ball® Book of Canning and Preserving, 2016

More resources on back

Family and Community Health Sciences (FCHS)
Promoting Healthy Families, Schools & Communities

FCHS is a part of Rutgers Cooperative Extension, NJ Agricultural Experiment Station

http://njaes.rutgers.edu/fchs

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More Cooperative Extension Resources:


**Free App on the Google Play Store** - Download the “OSU Canning Timer & Checklist” app created by Oregon State University Extension Service.

Classes:

**FCHS home food preservation classes**: Contact your local Rutgers Cooperative Extension office to inquire about classes.

**FCHS Master Food Preservers**: These trained volunteers work with FCHS to educate the public about safe home food preservation. Contact your local FCHS professional to learn how to become a FMFP.

Updated by: Daryl Minch, FCHS Educator, Somerset County, 2/2019
Freezing is one of the easiest, most convenient and least time-consuming ways to prepare foods at home. Freezing does not sterilize food; the extreme cold simply retards growth of microorganisms and slows down changes that affect quality or cause spoilage in food. Properly frozen fruits will retain much of their fresh flavor and nutritive value. Their texture, however, may be somewhat softer than that of fresh fruit.

Selecting Freezer Containers
Before preparing fruit for freezing, assemble the containers you will use. The selection of containers depends on the fruit being frozen, personal preference and the types that are readily available. Containers should be moisture-vapor resistant, durable, easy to seal and should not become brittle at low temperatures.

Containers suitable for freezing fruits include plastic freezer containers, flexible freezer bags or glass canning and freezing jars. If jars are used, be sure to use wide-mouth jars for fruits packed in liquid. Regular (narrow mouth) jars break too easily at the neck.

Some household containers are not recommended for freezing. The cardboard cartons that milk, ice cream or cottage cheese come in are not moisture-vapor resistant enough. Regular (not canning) jars break too easily at freezer temperatures.

Preparing the Fruit
Sort, wash and drain fruits carefully, discarding parts that are green or of poor quality. Do not allow fruit to soak in wash water or it will lose nutrients and flavor. Prepare fruits as they will be used–stemmed, pitted, peeled or sliced. Prepare enough fruit for only a few containers at a time, especially those fruits that darken rapidly.

Do not use galvanized equipment in direct contact with fruit. The acid in the fruit dissolves zinc, which can be harmful in large amounts. Also, be wary of using iron utensils or chipped enamelware, as metallic off-flavors can result.

Types of Packs
There are several ways to pack fruits for freezing: syrup pack, sugar pack, dry pack or unsweetened pack.

Most fruits have a better texture and flavor if packed in sugar or syrup. However, the sugar is not necessary to safely preserve the fruit. For those watching their sugar intake, it can be left out or an artificial sweetener can be substituted.

The type of pack will depend on the intended use. Fruits packed in syrup are generally best for uncooked dessert use; those packed in dry sugar or unsweetened are best for most cooking purposes, because there is less liquid in the product.
**Syrup Pack** – The proportion of sugar to water depends upon the sweetness of the fruit to be frozen. A 40-per-cent syrup is recommended for most fruits. Lighter syrups are desirable for mild-flavored fruits to prevent masking of flavors. Heavier syrups may be needed for very sour fruits. A small piece of crumpled, water-resistant paper can be used to hold the fruit down in the syrup, if necessary.

**Sugar Pack** – Sprinkle sugar over the fruit and mix gently until the juice is drawn out and the sugar dissolved. Soft sliced fruits such as peaches, strawberries, figs, deseeded grapes, plums and cherries will yield sufficient syrup for covering if the fruit is layered with sugar and allowed to stand for 15 minutes. Some small whole fruits may be coated with sugar and frozen.

**Dry Pack** – The dry pack is good for small whole fruits such as berries, that give a good quality product without sugar. Simply pack the fruit into a container, seal and freeze.

A tray pack is an alternative that may make the fruit easier to remove from the container. Simply spread a single layer of prepared fruit on shallow trays and freeze. When frozen, promptly package and return to the freezer. The fruit pieces remain loose and can be poured from the container and the package re-closed. Be sure to package the fruit as soon as it is frozen, to prevent freezer burn.

**Other Unsweetened Packs** – In addition to a dry pack, unsweetened fruit can be packaged in water, un-sweetened juice or pectin syrup.

Unsweetened packs generally yield a product that does not have the plump texture and good color of those packed with sugar. The fruits freeze harder and take longer to thaw. However, some fruits such as raspberries, blueberries, steamed apples, gooseberries, currants, cranberries, rhubarb and figs give a good quality product without sugar.

The pectin syrup is often used for fruits, such as strawberries or peaches, that retain their texture better than if frozen in water or juice.

**Packs for Purées and Juices** – Purées and juices can be packed as is. Sugar may be added, if desired.

**Using Artificial Sweeteners**

Sugar substitutes may be used in any of the unsweetened packs. Both saccharin and aspartame work well in frozen products or they can be added to the fruit just before serving.

Artificial sweeteners give a sweet flavor but do not furnish the beneficial effects of sugar, such as color protection and thickness of syrup.

Labels on the products give the equivalents to a standard amount of sugar. Use directions on the container to determine the amount of sweetener needed.

**Preventing Discoloration**

Some fruits such as peaches, apples, pears and apricots darken quickly when exposed to air and during freezing. They may also lose flavor when thawed. There are several ways to prevent darkening of fruit and flavor loss.

**Ascorbic Acid (Vitamin C)** – Ascorbic acid or vitamin C is effective in preventing discoloration in most fruits. Not only does it preserve natural color and flavor of fruits, but it adds nutritive value as well.

Ascorbic acid in powdered form is available at some drugstores or where freezing supplies are sold. Ascorbic acid tablets may be more readily available and less expensive, but are more difficult to dissolve. They do need to be finely crushed before use. Fillers in the tablets may make the syrup cloudy, but they are not harmful. One-half teaspoon powdered ascorbic acid=1500mg.

Follow the directions below for using ascorbic acid in the various types of packs. Use the amount specified in the directions for freezing each specific fruit.

**In syrup or liquid packs** – Add powdered or crushed ascorbic acid to cold syrup shortly before using. Stir it in gently so you do not stir in air. Keep syrup refrigerated until use.

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**PECTIN SYRUP**

1 box powdered pectin
2 3/4 cups water

Combine pectin and 1 cup water in saucepan. Heat to boiling and boil 1 minute. Remove from heat and add remaining water. Cool. Makes about 3 cups of moderately thick syrup. Add more water if thinner syrup is desired.

For fruit packed in water, unsweetened juice, or pectin syrup, submerge fruit by using a small piece or crumpled water resistant material, as for syrup pack. Seal tightly.
In sugar or dry packs – Dissolve the ascorbic acid in two or three tablespoons of cold water and sprinkle dissolved ascorbic acid over fruit just before adding sugar.

In crushed fruits, fruit purées and fruit juices – Add ascorbic acid to prepared fruit and stir well.

Ascorbic Acid Mixtures – Ascorbic acid mixtures are special anti-darkening preparations, usually made of ascorbic acid mixed with sugar, or with sugar and citric acid. The important active ingredient in these mixtures is ascorbic acid. Follow the manufacturer’s directions for use. Do not confuse this with the ascorbic acid specified in the table, Directions for Freezing Fruits.

Citric Acid or Lemon Juice – Citric acid or lemon juice are sometimes used in place of ascorbic acid. Neither, however, is as effective as ascorbic acid. When used in large quantities, they often mask natural fruit flavors.

Steaming – Steaming works best for fruits that will be cooked before use. Steam the fruit just until hot according to the directions for each fruit.

Syrups for Freezing Fruits

<table>
<thead>
<tr>
<th>Type of Syrup</th>
<th>Percent Sugar*</th>
<th>Cups of Sugar**</th>
<th>Cups of Water</th>
<th>Yield of Syrup in (Cups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Light</td>
<td>10%</td>
<td>1/2</td>
<td>4</td>
<td>4 1/2 cups</td>
</tr>
<tr>
<td>Light</td>
<td>20%</td>
<td>1</td>
<td>4</td>
<td>4 3/4 cups</td>
</tr>
<tr>
<td>Medium</td>
<td>30%</td>
<td>1 3/4</td>
<td>4</td>
<td>5 cups</td>
</tr>
<tr>
<td>Heavy</td>
<td>40%</td>
<td>2 3/4</td>
<td>4</td>
<td>5 1/3 cups</td>
</tr>
<tr>
<td>Very Heavy</td>
<td>50%</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

* Approximate.
** In general, up to one-fourth of the sugar may be replaced by corn syrup or mild-flavored honey. A larger proportion of corn syrup may be used if a very bland, light colored type is selected.

To make the syrup, dissolve sugar in lukewarm water, mixing until solution is clear. Chill syrup before using. Use just enough cold syrup to cover the prepared fruit after it has been placed in the container (about 1/2 to 2/3 cup of syrup per pint). To keep the fruit under the syrup, place a small piece of crumpled parchment paper or other water-resistant wrapping material on top and press fruit down into the syrup before sealing the container.

Packaging, Labeling and Storing

Most foods require headspace between the packed food and closure. This allows for expansion of the food as it freezes.

Before closing freezer containers, make sure sealing edges are free of moisture and food particles. Seal the container and label plainly. Include name of food, date and type of pack.

Freeze packaged fruits as quickly as possible at 0°F or below. For quickest freezing, place packages against the refrigerated surfaces of the freezer. Freeze no more food at one time than will freeze within 24 hours—usually two to three pounds of fruit per cubic foot of freezer space. After fruit is frozen, rearrange the packages and store close together.

Most fruits maintain high quality for eight to twelve months at 0°F or below; citrus fruits and citrus juices, for four to six months. Unsweetened fruits lose quality faster than those packed in sugar or syrup. Longer storage will not make the food unfit for use, but may impair its quality. It is a good idea to post a list of the frozen foods with freezing dates near the freezer and check the packages off the list as they are removed.

<table>
<thead>
<tr>
<th>Type of Pack</th>
<th>Container with wide top opening</th>
<th>Container with narrow top opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Pack*</td>
<td>PINT 1/2</td>
<td>QUART 1</td>
</tr>
<tr>
<td>Dry pack***</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

* Fruit packed in juice, sugar, syrup or water; crushed or purée; juice
** Fruit packed without added sugar or liquid.
*** Headspace for juice should be 1 1/2 inches.
Directions for Freezing Fruits

NOTE: The following fruits can all be packed using one of the unsweetened packs. However, the texture of some will be different than when sugar is used.

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Preparation</th>
<th>Type of Pack (Choose One)</th>
</tr>
</thead>
</table>
| Apples           | Wash, peel, core and slice crisp, firm fruit. Slice medium apples into twelfths, large ones into sixteenths. | • Syrup pack in a 40 percent syrup. If ascorbic acid is used, use 1/2 teaspoon per quart of syrup.  
• Sugar pack using 12 cup sugar per quart of fruit, after steaming or boiling for 1 1/2 to 2 minutes to prevent darkening. Cool fruit in cold water and drain before mixing fruit and sugar.  
• Dry pack using the instructions or sugar pack, but omitting the sugar. |
| Apricots         | Wash, halve and pit firm, ripe apricots. Peel and slice if desired. If apricots are not peeled, heat in boiling water for 1/2 minute to keep skins from toughening during freezing. Cool in cold water, drain. | • Syrup pack in 40 percent syrup. If ascorbic acid is used, use 3/4 teaspoon per quart of syrup.  
• Sugar pack using 1 cup sugar per quart of fruit. Mix until all sugar is dissolved. If ascorbic acid is used, use 1/4 teaspoon dissolved in 1/4 cup water. |
| Blackberries or Dewberries | Wash and sort fully ripe, firm berries. Discard any soft or defective berries. | • Syrup pack in 40 or 50 percent syrup.  
• Sugar pack using 3/4 cup sugar per quart of berries.  
• Use dry pack. |
| Blueberries or Huckleberries | Wash and sort fully ripe berries, removing leaves, stems and defective berries. | • Use dry pack. Do not wash the berries until just before serving.  
• Crush or purée the berries and then mix with 1 to 1 1/8 cups sugar per quart of crushed or puréed berries. |
| Cherries: sour   | Wash, stem and pit bright red, tree-ripened cherries.                        | • Syrup pack in 60 to 65 percent syrup.  
• Sugar pack using 3/4 cups sugar per quart of fruit. Mix until sugar is dissolved. |
| Cherries: sweet  | Wash, stem and pit bright, fully-ripe cherries of dark-colored varieties.   | • Syrup pack in 40 percent syrup. If ascorbic acid is used, use 1/2 teaspoon per quart of syrup. |
| Citrus Fruits    | Wash and peel firm tree-ripened fruit that is heavy for its size. Divide fruit into sections, removing membrane and seeds. | • Syrup pack in 40 percent syrup made from excess juice or water.  
• Juice-Squeeze juice from the fruit, being careful not to press any oil from the rind. Freeze as is or add 2 tablespoons sugar per quart of juice. |
| Cranberries      | Wash and drain firm, deep-red berries with glossy skins.                     | • Use dry pack.  
• Syrup pack in 50 percent syrup. |
| Figs             | Wash fully ripe fruit. Peel if desired.                                     | • Syrup pack in 35 percent syrup. If ascorbic acid is used, use 3/4 teaspoon per quart of syrup, or use 12 cup lemon juice per quart of syrup.  
• Use dry pack. If ascorbic acid is used, use 3/4 teaspoon per 3 tablespoons of water. |
<table>
<thead>
<tr>
<th>Fruit</th>
<th>Preparation</th>
<th>Type of Pack (Choose One)</th>
</tr>
</thead>
</table>
| Grapes                 | Sort, stem and wash fully ripe, firm, sweet grapes. Leave seedless grapes whole; cut table grapes with seeds in half and remove seeds. | • Syrup pack in 40 percent syrup.  
• Juice-Crush grapes. Add 1 cup water per gallon crushed grapes. Simmer 10 minutes. Strain juice through jelly bag. Let juice stand overnight in refrigerator or other cool place so tartrate crystals will settle. Pour off clear juice and freeze. (When freezing juice for jelly-making, be sure to use some slightly underripe fruit.) |
| Melons: Cantaloupe, Honeydew or Watermelon | Select firm-fleshed, well-colored, ripe melons. Remove seeds and peel. Cut into slices, cubes or balls. | • Syrup pack in 30 percent syrup. |
| Peaches or Nectarines  | Sort, wash and peel well-ripened fruit.                                        | • Syrup pack in 40 percent syrup. If ascorbic acid is used, use 1/2 teaspoon per quart of syrup.  
• Sugar pack using 2/3 cup sugar per quart of fruit. Mix until sugar dissolves. If ascorbic acid is used, dissolve 1/4 teaspoon in 1/4 cup water and sprinkle over the fruit.  
• Crush or purée peeled and pitted peaches and mix with 1 cup sugar per quart prepared fruit: (Heating the pitted peaches for 4 minutes in just enough water to prevent scorching makes them easier to purée.) If ascorbic acid is used, use 1/8 teaspoon per quart of prepared fruit. |
| Pears                  | Wash, peel, core and slice crisp, firm, well-flavored pears.                   | • Syrup Pack-Heat pears in boiling 40 percent syrup for 1 to 2 minutes. Drain and cool. Pack pears in cold 40 percent syrup. If ascorbic acid is used, use 3/4 teaspoon per quart of syrup. |
| Plums                  | Sort and wash ripe fruit that is soft enough to yield to gentle pressure. Leave whole or cut in halves or quarters and pit. | • Syrup pack in 40 to 50 percent syrup. If ascorbic acid is used, use 1/2 teaspoon per quart of syrup. |
| Raspberries            | Wash and drain fully-ripe, well-colored berries.                               | • Sugar pack using 3/4 cup sugar for each quart of berries. Mix carefully to avoid crushing.  
• Syrup pack in 40 percent syrup.  
• Use dry pack. |
| Strawberries           | Wash and remove caps from fully ripe, firm berries with a deep-red color.     | • Syrup pack whole berries using a 50 percent syrup.  
• Sugar pack whole, sliced or crushed berries using 3/4 cup sugar per quart of fruit. |
Edited by Judy A. Harrison, Ph.D., and Elizabeth L. Andress, Ph.D., Extension Foods Specialists.

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Gale A. Buchanan, Dean and Director

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Freezing is an excellent way to preserve fresh vegetables at home. Freezing does not sterilize food; the extreme cold simply retards growth of microorganisms and slows down changes that affect quality or cause spoilage in food.

The quality of frozen vegetables depends on the quality of the fresh products and how they are handled from the time they are picked until they are ready to eat. It is important, also, to start with high-quality vegetables because freezing will not improve the product’s quality.

**Selecting Freezer Containers**

Before preparing vegetables for freezing, assemble the containers you will use. The selection of containers depends on the vegetable being frozen, personal preference and the types that are readily available. Containers should be moisture-vapor resistant, durable, easy to seal and should not become brittle at low temperatures.

Containers suitable for freezing vegetables include plastic freezer containers, flexible freezer bags and their protective cardboard cartons, or glass canning jars. Foods packed in wide-mouth jars are easier to remove than those packed in narrow-mouth jars.

Some household containers are not recommended for freezing. The cardboard cartons that milk, ice cream or cottage cheese come in are not moisture-vapor resistant enough. Regular (not canning) jars break too easily at freezer temperatures.

**Preparing the Vegetables**

Use vegetables at peak flavor and texture for freezing. Whenever possible, harvest in the cool part of the morning and freeze within a few hours. Wash vegetables thoroughly in cold water, lifting them out of the water as grit settles to the bottom of the washing container. Sort according to size for blanching and packing.

**Blanching**

Blanching (scalding vegetables in boiling water or steam for a short period of time) is a must for almost all vegetables to be frozen. Blanching slows or stops the action of enzymes that can cause loss of flavor, color and texture. Blanching cleanses the surface of dirt and organisms, brightens the color and helps retard loss of vitamins. Blanching also wilts or softens vegetables and makes them easier to pack.

Blanching time is crucial and varies with the vegetable and its size. Underblanching stimulates the activity of enzymes and is worse than no blanching. Overblanching causes loss of flavor, color, vitamins and minerals. See the directions for freezing each vegetable for the correct blanching times.
**Water Blanching** – For home freezing, the most satisfactory way to heat all vegetables is in boiling water. Use a blancher with a blanching basket and cover, or fit a wire basket into a large kettle with a lid.

Use one gallon of water per pound of prepared vegetables. Put the vegetables in a blanching basket and lower into vigorously boiling water. Place a lid on the blancher and start counting blanching time as soon as the water returns to a boil. Keep heat high for the time given in the directions for the vegetables you are freezing.

**Steam Blanching** – Heating in steam is recommended for a few vegetables. For broccoli, pumpkin, sweet potatoes and winter squash, both steaming and boiling are satisfactory methods. Steam blanching takes about 1 1/2 times longer than water blanching.

To steam, use a kettle with a tight lid and a basket that holds the food at least three inches above the bottom of the kettle. Put an inch or two of water in the kettle and bring the water to a boil.

Put the vegetables in the basket in a single layer so steam reaches all parts quickly. Cover the kettle and keep heat high. Start counting steaming time as soon as the lid is on. Steam blanch for the time recommended for each vegetable.

**Microwave Blanching** – Microwave blanching is not recommended. Research has shown that some enzymes may not be inactivated. Flavors could be off and texture and color lost. If you choose to risk low quality vegetables by microwave blanching, work in small quantities, using the directions for your specific microwave oven. Microwave blanching has not been shown to save time or energy.

**Cooling**

As soon as blanching is complete, cool vegetables quickly and thoroughly to stop the cooking process. To cool, plunge the basket of vegetables immediately into a large quantity of cold water, 60°F or below. Change water frequently or use cold running water or iced water. If ice is used, have about one pound of ice for each pound of vegetables. Cooling vegetables should take the same amount of time as blanching.

Drain vegetables thoroughly after cooling. Extra moisture can cause a loss of quality when vegetables are frozen.

**Types of Pack**

Two basic packing methods are recommended for frozen vegetables—dry pack and tray pack.

**Dry Pack** – Place the blanched and drained vegetables into meal-size freezer bags or containers. Pack tightly to cut down on the amount of air in the package. Leave 1/2-inch headspace at the top of rigid containers and close securely. For freezer bags, fill to within three inches of the top, twist and fold back top of bag; tie with a twist or rubber band about 1/2- to 3/4-inch from the food. This will allow space for the food to expand. Provision for headspace is not necessary for foods such as broccoli, asparagus and brussel sprouts that do not pack tightly in containers.

**Tray Pack** – Place chilled, well-drained vegetables in a single layer on shallow trays or pans. Place in freezer until firm, then remove and quickly fill bags or containers. Close and freeze immediately. Tray-packed foods do not freeze in a block, but remain loose, so the amount needed can be poured from the container and the package reclosed.

**Labeling and Storing**

Label packages with the name of the product and the freezing date. Freeze at once at 0°F or lower. Because speed in freezing is important for best quality, put no more unfrozen vegetables into the freezer at one time than will freeze in 24 hours—usually two to three pounds of vegetables per cubic foot of freezer space.

For quickest freezing, place packages against the refrigerated surface of the freezer. After vegetables are frozen, rearrange the packages and store close together. Most vegetables maintain high quality for 8 to 12 months at 0°F or lower. Longer storage will not make food unfit for use, but may impair quality.

It is a good idea to post a list of the frozen vegetables near the freezer and to check off packages as they are used. Remember, frozen vegetables should be cooked without thawing.
### Directions for Freezing Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Preparation</th>
<th>Blanching Time (in boiling water unless otherwise stated)</th>
</tr>
</thead>
</table>
| Asparagus               | Wash thoroughly, sort by size. Cut in 2-inch lengths or leave in spears. Blanch, cool and drain. Package, seal and freeze. | Small stalks - 2 minutes  
Medium stalks - 3 minutes  
Large stalks - 4 minutes |
| Beans: green or wax     | Select young tender beans. Wash and remove ends. Leave whole, slice or cut into 1-inch to 2-inch lengths. Blanch, cool and drain. Package, seal and freeze. | 3 minutes |
| Beans: lima, butter or pinto | Select beans ready for table use with slightly rounded, bright green pods. Wash, shell and sort according to size. Blanch, cool and drain. Package, seal and freeze. | Small beans - 2 minutes  
Medium beans - 3 minutes  
Large beans - 4 minutes |
| Beets                   | Wash and sort according to size. Leave tap root; trim tops leaving 1/2-inch of stem. Cook in boiling water until tender. Cool, peel (removing stem and tap root) and cut into slices or cubes. Package, seal and freeze. | Cook: Small beets - 25-30 minutes  
Medium beets - 45-50 minutes |
| Broccoli                | Wash and trim. If insects are present soak 1/2 hour in solution of 4 teaspoons salt to 1 gallon of cold water. Split lengthwise into pieces no more than 1/2 inches across. Blanch, cool and drain. Package, seal and freeze. | In water - 3 minutes  
In steam - 5 minutes |
| Brussels Sprouts        | Select green, firm, compact heads. Make sure no insects are present. Trim, removing coarse outer leaves. Wash and sort. Blanch, cool and drain. Package, seal and freeze. | Small - 3 minutes  
Medium - 4 minutes  
Large - 5 minutes |
| Cabbage (for cooked dishes) | Select fresh, compact heads. Remove coarse outer leaves. Cut into medium to coarse shreds, or thin wedges, or separate head into leaves. Blanch, cool and drain. Package, seal and freeze. | 1 1/2 minutes |
| Carrots                 | Select tender, mild-flavored carrots. Remove tops. Wash and peel. Leave small carrots whole. Cut others in 1/4-inch cubes, thin slices or lengthwise strips. Blanch, cool and drain. Package, seal and freeze. | Small, whole - 5 minutes  
Diced, sliced or strips - 2 minutes |
| Cauliflower             | Choose tender, firm, snow-white heads. Break into pieces about 1 inch across. Wash. If insects are present, soak 1/2 hour in solution of 4 teaspoons salt to 1 gallon of cold water. Drain. Blanch, cool and drain. Package, seal and freeze. | 3 minutes |
## Directions for Freezing Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Preparation</th>
<th>Blanching Time (in boiling water unless otherwise stated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corn: sweet</strong></td>
<td>Select ears with plump kernels and thin sweet milk. Husk ears, remove silk and wash.</td>
<td>4 minutes</td>
</tr>
<tr>
<td><strong>whole kernel and creamed</strong></td>
<td>Blanch, cool and drain. For whole kernel corn, cut corn off cob about 2/3 the depth of kernels. For cream style corn, cut at 1/2 the depth of kernels and scrape cob with back of knife to remove juice. Package, seal and freeze.</td>
<td></td>
</tr>
</tbody>
</table>
| **on the cob**             | Sort ears according to size. Small ears–1 1/4 inches or less in diameter. Medium ears–1 1/4 to 1 1/2 inches in diameter. Large ears–over 1 1/2 inches in diameter. Blanch, cool completely and drain. Package, seal and freeze. | Small ears - 7 minutes  
Medium ears - 9 minutes  
Large ears - 11 minutes |
| **Eggplant**               | Wash, peel and slice 1/3 inch thick. Blanch in 1 gallon of water containing 4 1/2 teaspoons citric acid or 1/2 cup lemon juice. Cool and drain. Package, seal and freeze.  
For Frying–Package the drained slices with freezer wrap between slices. Seal and freeze. | 4 minutes                                                |
| **Greens: beet greens, collards, chard, kale, mustard greens, spinach or turnip greens** | Select tender leaves. Wash and remove stems. Blanch, cool and drain. Package, seal and freeze.                                               | Collards - 3 minutes  
Other greens - 2 minutes                                    |
| **Mushrooms**              | Choose mushrooms free of spots. Sort by size; wash and trim ends. For better color, soak 5 minutes in a solution of 1 pint water and 1 teaspoon lemon or 1 1/2 teaspoons citric acid. Blanch, cool and drain. Optional Method–Sauté in butter or margarine until tender. Package, seal and freeze. | In steam - 5 minutes  
Buttons or quarters - 3 1/2 minutes  
Slices - 3 minutes                                             |
| **Okra**                   | Wash pods and separate into small pods (4 inches or less) and large pods. Remove the stems at the end of the seed cells, being careful not to expose the seed cells. Blanch, cool, drain. Leave whole or slice crosswise. Package, seal and freeze.  
For Frying–Slice blanched pods crosswise and dredge with flour or meal. Spread in a single layer on a shallow pan. Freeze just until firm. Package, seal and freeze. | Small pods - 3 minutes  
Large pods - 4 minutes                                        |
| **Peas: edible pod (snow, sugar, sugar snap or Chinese)** | Choose table-ready, tender pods. Wash, remove blossom ends and strings. Leave whole. Blanch, cool and drain. Package, seal and freeze. | Small pods - 1 1/2 minutes  
Medium pods - 2 minutes                                         |
## Directions for Freezing Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Preparation</th>
<th>Blanching Time (in boiling water unless otherwise stated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peas: field</strong></td>
<td>Wash pods, shell, blanch, cool and drain. Package, seal and freeze.</td>
<td>2 minutes</td>
</tr>
<tr>
<td><strong>Peas: green</strong></td>
<td>Pick sweet and tender table-ready peas. Shell, blanch, cool and drain.</td>
<td>1 1/2 minutes</td>
</tr>
<tr>
<td><strong>Peppers: hot</strong></td>
<td>Wash and remove stems. Package, cool and drain. Package, seal and freeze.</td>
<td>— —</td>
</tr>
<tr>
<td><strong>Peppers: sweet</strong></td>
<td>Wash, cut in half, remove stems and seeds. If desired, cut into 1/2-inch strips or rings. Package, seal and freeze. For Use in Cooked Dishes—Blanch, cool and drain. Package, seal and freeze. For Use in Uncooked or Cooked Foods—Do not blanch. Package, seal and freeze.</td>
<td>Halves - 3 minutes Strips or rings - 2 minutes</td>
</tr>
<tr>
<td><strong>Peppers: pimiento</strong></td>
<td>Peel by roasting in oven at 400° to 450° F for 6 to 8 minutes or until skins can be rubbed off. Wash off charred skins, remove stems and seeds. Package, seal and freeze.</td>
<td>— —</td>
</tr>
<tr>
<td><strong>Potatoes: Irish</strong></td>
<td>Select new potatoes directly from the garden. Peel or scrape and wash. Blanch and cool. Package, seal and freeze. For French Fries—Wash and peel mature potatoes. Cut into 1/3-inch by 3/8-inch strips. Rinse in cold water. Dry thoroughly. Deep fry in hot fat (360° F) for about 5 minutes until tender but not brown. Drain and cool. Package, seal and freeze. To serve, heat in a 475° F oven until golden brown.</td>
<td>3 to 5 minutes</td>
</tr>
<tr>
<td><strong>Pumpkin and Winter Squash (including spaghetti squash)</strong></td>
<td>Select mature squash or pumpkin. Wash, cut into small pieces and remove seeds. Cook until soft in boiling water, in steam, or in 350° F oven. Remove pulp from rind. Mash, cool, package and freeze.</td>
<td>Cook until tender.</td>
</tr>
<tr>
<td><strong>Summer Squash (including Zucchini)</strong></td>
<td>Select young tender squash. Wash and cut into 1/2-inch slices. Blanch, cool and drain. Package, seal and freeze. Grated Zucchini for Baking—Steam in small quantities until translucent. Pack in amounts used in recipes, allowing headspace. Put containers in cold water to cool. Seal and freeze. Drain before using in baking.</td>
<td>3 minutes In steam - 1-2 minutes</td>
</tr>
</tbody>
</table>
### Directions for Freezing Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Preparation</th>
<th>Blanching Time (in boiling water unless otherwise stated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweet Potatoes</strong></td>
<td>Wash and sort sweet potatoes according to size. Cook until tender in water, steam or in the oven. Cool, peel and cut in halves, slice or mash. To prevent whole or sliced sweet potatoes from darkening, dip for 5 seconds in a solution of 1 tablespoon citric acid or 1/2 cup lemon juice per quart of water. To prevent mashed sweet potatoes from darkening, mix 2 tablespoons orange or lemon juice with each quart of mashed sweet potatoes. Package, seal and freeze.</td>
<td>Cook until tender.</td>
</tr>
<tr>
<td><strong>Tomatoes</strong></td>
<td>Wash, dip in boiling water for 30 seconds to loosen skins. Peel, core, leave whole or cut in pieces. Package, seal and freeze.</td>
<td>— —</td>
</tr>
<tr>
<td><strong>juice</strong></td>
<td>Wash and trim tomatoes. Cut into quarters or eighths. Simmer 5 to 10 minutes. Press through a sieve. Cool, package, seal and freeze.</td>
<td>— —</td>
</tr>
<tr>
<td><strong>stewed</strong></td>
<td>Remove stems, peel, and quarter ripe tomatoes. Cover and cook until tender (10 to 20 minutes). Cool, package, seal and freeze.</td>
<td>— —</td>
</tr>
<tr>
<td><strong>Turnips</strong></td>
<td>Select small to medium, firm, mild-flavored turnips. Wash, peel and cut into 12-inch cubes. Blanch, cool and drain. Package, seal and freeze.</td>
<td>2 minutes</td>
</tr>
</tbody>
</table>
Herbs and spices play an important role in the cuisine of many cultures and consumer demand in the U.S. for spicy and flavorful foods continues to increase. The leaves and seeds of herbaceous plants used to season foods have become known as herbs while spices are berries, seeds, flower buds, roots, or bark of tropical plants. These savory ingredients can be used as healthier alternatives to replace or reduce the amount of salt and sugar in foods. Herbs are often grown in home gardens or purchased fresh and used to enhance food dishes and flavor beverages, vinegars, and oils. Fresh herbs can also be dried or frozen for later use. Their flavor comes from specialized aromatic oils in the cells of the plants. Chopping or grinding breaks the cell walls and releases the flavor; heat increases the rate at which some herbs release their flavors.

Using Herbs

Fresh basil, cilantro, parsley, chives, rosemary, and many herb seedlings are often available at Colorado markets. Whether fresh herbs are grown in the garden or purchased, damaged leaves should be removed and the herbs should be thoroughly washed before using. Sturdy herbs, such as rosemary and thyme, can be rinsed well under cool running water but delicate or fine-leaved herbs, such as basil, dill, or tarragon, should be submerged in a bowl of cool water and swished back and forth. Shake gently or use a salad spinner to remove excess water and dry with paper towels.

Herbs are used to complement, not disguise, the flavor of food. Generally, when preparing soup, sauce or meat dishes, 1/4 teaspoon of dried herbs per four servings is adequate. The flavor of dried herbs is about three to four times stronger than fresh herbs. To substitute dried herbs for fresh in a recipe, use 1/4 to 1/3 as much. These amounts can be used as guidelines:

- 1/4 teaspoon dried powdered herbs = 1 tsp. dried whole/crumbled = 1 tablespoon fresh chopped herbs

Chopping leaves finely will create more cut surface and allow additional flavor components to be released.

Herbal infusions, which involve steeping fresh herbs with desired flavors or characteristics in water or oil, are used to flavor drinks, such as teas and cocktails, and foods, such as salad dressing, butter, yogurt, vinegar, and oil. To become familiar with the flavor of an herb, mix it with butter or cream cheese, let stand for half an hour, then taste this mixture on a cracker.

The way herbs are prepared and used can vary widely and this influences their culinary use.

- For best flavor results, add dried herbs near the beginning of the cooking process to provide sufficient time for the herbs to rehydrate.
- Fresh herbs are usually added during the last part of cooking.

Quick Facts

- Herbs are used to add flavor, aroma, and color to foods and beverages.
- Herbs and spices can sometimes replace or reduce salt and sugar in foods.
- A food dehydrator, oven, microwave oven, or air drying can be used for drying herbs.
- Dried herbs store well for up to one year.

See Table 1 on Page 4 for Seasoning Suggestions

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• Wrapping whole herbs in a cheesecloth bag before adding them to cooked dishes makes removal easy before serving.
• Herbs in uncooked foods, such as salad dressings, dips and fruit mixes, need time to blend flavors, so add them as far in advance of serving as possible.
• Basil, cilantro, dill, mint, oregano, parsley, rosemary, sage, savory, tarragon, and thyme add interest to salads; rosemary, thyme or basil may be added as a secondary flavor to sorbet or summer beverages. Some herbs are best used fresh—such as burnet, chervil, and parsley—because they have little flavor once dried or frozen.

_Herb Flavored Vinegars and Oils._ Herbs may be added to vinegar or oil and used in the seasoning of salads and sauces. It is important to store homemade herb infused oils in the refrigerator and use within four days because they have the potential to support the growth of _Clostridium botulinum_ bacteria. Commercially made herb/oil mixtures are often stored at room temperature but this is because of special processing or acidification steps. Always check the label before storing.

_Herbal Teas and Beverages._ Traditionally, a true tea is made from the leaves of the tea plant, _Camellia sinensis_. Beverages made from the leaves, flowers, bark or roots of other plants have become widely known as herbal teas. Herbal teas do not go through the same curing process as black or green tea so it is important to brew herbal teas using water that has been heated to a temperature high enough to destroy harmful microorganisms. It is recommended to brew herbal teas at 180-200°F for 5-15 minutes. Brewed herbal tea can be chilled for use as iced tea. Herbs or herbal teas should not be used in making tea which is not brewed, such as sun tea; however, after cooling, brewed herbal tea can be added to sun tea that has been made with black tea labeled for cold brewing use.

_Drying and Storing Herbs._ Drying is the traditional method for preserving herbs. To minimize wilting and maximize flavor, gather herbs in the morning of a dry day, just after dew has evaporated. Rinse thoroughly and dry with paper towels. Because many herbs look alike when dry, label them before you dry them. Herbs are dry when they are crispy, crumble easily, and stems break. When collecting the seeds of herbs, try drying inside a paper bag with holes cut in the side of the bag. Sun drying is not recommended because of the potential for insect infestation and loss of flavor and color.

_Food Dehydrator._ Drying herbs with a commercial food dehydrator typically allows for better control of temperature within the recommended temperature range. Arrange herbs on drying trays in single layers; good air circulation between trays is important. The National Center for Home Food Preservation recommends pre-heating the dehydrator with the thermostat set to 95 °F to 115 °F. In areas with higher humidity, temperatures of 125 °F may be required. Check your dehydrator instruction booklet for specific details.

_Can homemade pesto be canned?_ Pesto, a spicy green paste well known for flavoring pasta dishes, is an uncooked seasoning mixture of herbs, often including fresh basil, garlic, olive oil, pine nuts and cheese. There are no home canning recommendations but it may be stored frozen. Prepared pesto may be frozen in small freezer containers or in ice cube trays (2 tablespoons per cube). Another option is to freeze in a square pan, covered with plastic wrap. When completely frozen, cut into cubes and transfer to a resealable plastic freezer bag. Frozen pesto will store for up to 6 months. Thaw pesto cubes for 15 minutes at room temperature or at 30-second intervals in a microwave oven until soft. Mash with a fork before using in recipes.

_Gas or Electric Oven._ The oven light of an electric range or the pilot light of a gas range may furnish enough heat for overnight drying of herbs. Place single layer of herbs on oven-safe trays.

_Microwave Oven._ Drying in a microwave oven can be a good option for small amounts of herbs and appears to be the best drying method for reducing microbial contamination of herb leaves. Check the microwave oven owner’s manual for specific herb drying directions. Make sure herbs are thoroughly dry before placing in the microwave oven so that residual water does not cause the herbs to cook instead of dry. To dry, place a single layer of herbs between two paper towels on a microwave-safe plate. Avoid using paper towels made from recycled materials as they may contain metal particles which could cause sparking in the microwave oven. Place a 1/2 cup of water in 1 cup measure next to plate of herbs.

Some herbs, such as basil, should be dried on the microwave ovens ‘low’ setting. It is important to stop every
15 seconds to check the herbs and periodically turn them over. Although some microwave drying instructions suggest a longer time, in Colorado’s dry climate it is necessary to check every 15 seconds to reduce the risk of fire and/or charring of the herbs.

**Air Drying.** Air drying is the least expensive method but offers the least amount of consistency in drying and the greatest opportunity for contamination with bacteria or dust. Tie two to three sprigs of fresh herbs at the base of stems with twine and hang away from direct sunlight at room temperature or lay on cheesecloth stretched on frames or netting screens. This method may be used for sturdier herbs. More tender leaf herbs—such as basil, tarragon, lemon balm, and mint—are higher in moisture and should be dried quickly, using one of the previous methods, to prevent mold growth.

**Storing Dried Herbs.** Dried herbs should be stored in a cool, dry place and most will keep well for up to a year. Their strength can be judged by their aroma. Dried herbs can be stored whole or crushed, but whole herbs retain their flavor longer. To ensure optimum quality, store in rigid, opaque containers with airtight seals. Choose ceramic jars or darkened glass containers to help protect the herbs against light deterioration. Make sure herb leaves are completely dry to prevent mold growth during storage. Label all storage containers with the herb’s name and date.

**Freezing Herbs**

Quick-frozen herbs will keep up to one year in the freezer if well packaged. To tray-freeze herbs, wash them, then drain and pat dry. Strip leaves off stems, spread leaves in a single layer on a cookie sheet; place in freezer for at least 30 minutes. Place the frozen leaves in a freezer bag. Label with the herb’s name, date, and return to freezer for use as needed. Cut leaves like basil can also be frozen in ice cube trays half filled with water. Add 1 tablespoon chopped leaves to each section of the ice cube tray. Press herbs under water as much as possible. Freeze overnight. The next day, top off the ice cube trays so the herbs are completely submerged in water and re-freeze. When frozen, pop out the cubes and stored in a labeled and dated freezer bag. Frozen herbs are best used in cooked dishes as they will become limp when thawed.

Table 3 summarizes the flavor profile, harvesting, preservation methods and culinary uses for several herbs that can be grown or purchased fresh in Colorado. Many popular herb members of the mint (Lamiaceae) and carrot (Apiaceae) families.

### General Guide for Microwave Drying

<table>
<thead>
<tr>
<th>Microwave Oven Wattage</th>
<th>500-600 watts</th>
<th>650-700 watts</th>
<th>750-1200 watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Drying Time</td>
<td>3-6 minutes</td>
<td>2-4 minutes</td>
<td>1-2 minutes</td>
</tr>
</tbody>
</table>

### References


Figure 1. Herbs: parsley, rosemary, mint, and sage, Gardens on Spring Creek, Fort Collins,

Table 1. Seasoning suggestions. These herbs, spices and other seasoning may serve as alternatives to salt (modified from NHLBI, 2011). Suggested seasonings are not intended to all be used together; experiment with mixing different herbs to suit your preferences.

<table>
<thead>
<tr>
<th>Food</th>
<th>Herbs and other seasonings to enhance flavor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td></td>
</tr>
<tr>
<td>Beef</td>
<td>Bay leaf, marjoram, nutmeg, onion, pepper, sage, thyme</td>
</tr>
<tr>
<td>Lamb</td>
<td>Basil, curry powder, garlic, mint, rosemary</td>
</tr>
<tr>
<td>Pork</td>
<td>Garlic, onion, oregano, pepper, sage</td>
</tr>
<tr>
<td>Chicken</td>
<td>Marjoram, oregano, parsley, rosemary, saffron, sage, tarragon, thyme</td>
</tr>
<tr>
<td>Fish</td>
<td>Basil, chervil, chives, dill, marjoram, dry mustard, paprika, pepper</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>Cinnamon, cloves, marjoram, nutmeg, rosemary, sage</td>
</tr>
<tr>
<td>Corn</td>
<td>Cilantro, cumin, curry powder, paprika, parsley, onion</td>
</tr>
<tr>
<td>Green Beans</td>
<td>Curry powder, dill, lemon juice, marjoram, oregano, tarragon, thyme</td>
</tr>
<tr>
<td>Greens</td>
<td>Onion, red pepper</td>
</tr>
<tr>
<td>Peas</td>
<td>Ginger, marjoram, mint, onion, parsley, sage, ginger</td>
</tr>
<tr>
<td>Potatoes</td>
<td>Bay leaves, chives, dill, paprika, parsley, sage, garlic, onion</td>
</tr>
<tr>
<td>Summer Squash</td>
<td>Marjoram, rosemary, sage, cloves, curry powder, nutmeg</td>
</tr>
<tr>
<td>Winter Squash</td>
<td>Cinnamon, ginger, nutmeg, onion</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Basil, bay leaf, chives, dill, marjoram, oregano, parsley, pepper</td>
</tr>
<tr>
<td>Eggs</td>
<td>Basil, chives, chervil, dill, marjoram, parsley, paprika (hard cooked eggs) tarragon</td>
</tr>
<tr>
<td>Yogurt</td>
<td>Basil, chives, lemon thyme, marjoram, mint, sage</td>
</tr>
<tr>
<td>Butter</td>
<td>Chives, dill, garlic, mint, parsley</td>
</tr>
</tbody>
</table>

Table 2. Flavor characteristics of common culinary herbs (Modified from Snider, 2007).

<table>
<thead>
<tr>
<th>Flavor</th>
<th>Herbs</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delicate</td>
<td>Burnet, chervil, chives, parsley</td>
<td>May be used in fairly large quantities; combines well with most other herbs</td>
</tr>
<tr>
<td>Medium</td>
<td>Basil, celery leaves, tarragon, marjoram, mint, oregano, savory, thyme</td>
<td>Use in moderate amounts (1-2 teaspoons dried herbs for 6 servings)</td>
</tr>
<tr>
<td>Strong</td>
<td>Bay leaf, rosemary, sage</td>
<td>Will impart a dominant flavor</td>
</tr>
<tr>
<td>Sweet</td>
<td>Mint</td>
<td>Gives a cool burst of flavor to meat, seafood, and sweet dishes</td>
</tr>
<tr>
<td>Savory</td>
<td>Oregano, tarragon, chives, dill</td>
<td>Often used to flavor meat, egg and cheese dishes</td>
</tr>
<tr>
<td>Characteristics/Culinary Uses</td>
<td>Preserving</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Anise (seeds), Pimpinella anisum; Carrot Family</strong></td>
<td>Used to flavor cookies, candies, pickles, beverages, breads, and fig dishes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cut stems of seed heads after seeds have developed but while they are still green. Tie the stalks in small bunches and suspend inside a paper bag with holes punched in the sides. Suspend the bag in a dark area with good air circulation. When dry, shake the bag well and collect the seeds. Store in light-proof airtight containers.</td>
<td></td>
</tr>
<tr>
<td><strong>Basil, sweet (leaves), Ocimum species; Mint Family</strong></td>
<td>Tender green leaves have sweet flavor with wild pungency. Used in pesto and Italian and Thai dishes. Excellent with tomatoes, cheese, green salads, eggs, yogurt, soups, stews, lamb, and fish.</td>
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<td>When the plant starts to flower, cut stems 6 to 8 inches above ground, about ¾ inch above a stem node. Wash leaves well before drying or freezing. Basil dries well in microwave oven at a low setting. When dry, leaves will crumble easily. Store whole or crushed in airtight containers. To freeze, pack washed leaves in ice cube trays half-filled with water, pressing leaves under water as much as possible. Freeze overnight. Top off the trays so the leaves are completely submerged in water and re-freeze. When frozen, remove cubes and store in labeled and dated plastic bags. Defrost in a strainer and use as fresh.</td>
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<tr>
<td><strong>Bay (leaves), Laurus nobilis; Laurel Family</strong></td>
<td>Leaves are aromatic with a sweetish odor and pungent flavor. A classic ingredient in French bouquet. Used in sauces, pickling, stews, and with meats and potatoes. Bay leaves are tough and should be removed before serving. Complements tomatoes, beans, potatoes and beef.</td>
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<td>Pick individual leaves to use fresh or preserve. When dry, pack in airtight containers. Freeze as for basil.</td>
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<tr>
<td><strong>Burnet, Sanguisorba minor; Rose Family</strong></td>
<td>Perennial herb with a light cucumber flavor; used in flavored butter, cottage cheese, cream cheese, potato salads and salad dressings.</td>
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<td>Select young leaves, older leaves may be bitter. May be used in place of mint leaves but does not keep flavor well when dried or frozen.</td>
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<tr>
<td><strong>Caraway (seeds), Carum carvi; Carrot Family</strong></td>
<td>Mostly used whole in rye breads, sauerkraut, cheeses, potato salads, meats and stews.</td>
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<td>Cut plants to ground level when flowers and stalks turn grayish-brown, about a month after flowering. For air drying, see anise seeds shake out easily when fully ripe. Store in airtight containers.</td>
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<tr>
<td><strong>Chervil (leaves), Anthriscus cerefolium; Carrot Family</strong></td>
<td>Has a light, licorice flavor with a wild taste of pepper. Gives pleasant flavor to salads and salad dressings, meats, fish, soups, omelets and stews.</td>
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<td>Pick only young, tender leaves just before the buds break, fresh chervil has a short storage life. Dry or freeze as for basil.</td>
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<tr>
<td><strong>Chives (leaves), Allium schoenoprasum; Onion Family</strong></td>
<td>Flavor is similar to green onion, but milder and finer leaves. Used for light, oniony flavor in salads, dips, sauces, vegetables, soups, fish, etc.</td>
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<td>Use leaves fresh by snipping off the tops with scissors. Chives lose their color and flavor when dried. To freeze, wash and chop finely, then continue as for basil.</td>
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<tr>
<td><strong>Cilantro, Coriandrum sativum; Carrot Family</strong></td>
<td>Used in Asian and Latin American dishes. Goes well with corn, cucumbers, avocado, rice, fish, and chili peppers.</td>
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<td>High heat reduces flavor. Freezes well in ice cube trays. Dry or freeze as for basil.</td>
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<td>Note: Cilantro leaves contain chemicals called aldehydes which impart a flavor characteristic which is disagreeable to some people.</td>
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<tr>
<td><strong>Coriander (seeds), Coriandrum sativum; Carrot Family</strong></td>
<td>Small, orange-flavored seeds used in cold cuts, curry powder, cakes, cookies, poultry dressings, French dressing and Scandinavian cooking. Same plant is source of cilantro.</td>
<td>For air drying, see anise. When seeds are dry, shake out of heads and store in airtight containers. Flavor improves if stored a month before using.</td>
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<tr>
<td><strong>Dill (seeds, leaves), Anethum graveolens; Carrot Family</strong></td>
<td>Seeds have slightly bitter taste. Used in soups, pickles, cheese dishes, breads, sauces, meats and fish. Dill weed has delicate bouquet. Used to flavor fish sauces, salads, dips, potatoes and meats.</td>
<td>Pick young leaves just as flowers open. Cut leaves and spread in a thin layer to dry until brittle. Crumble leaves and store in an airtight container. To collect seeds, cut flower umbels stalks or pull entire plant from ground. See instructions for anise seeds; store in airtight containers.</td>
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<tr>
<td><strong>Fennel (stems, leaves, seeds), Foeniculum vulgare; Carrot Family</strong></td>
<td>Yellowish-brown seeds with sharp, sweet, licorice-like flavor; used to flavor sausages, breads, salads, salad dressings, pickles, cheese spreads, soups and sauces. Leaves garnish or flavor sauces and salads.</td>
<td>Young stems can be used like celery. Pick young leaves to dry, as for basil. Cut off flower stems before seeds fall. Store in airtight containers.</td>
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<tr>
<td><strong>Horseradish (root, leaves), Armoracia rusticana; Mustard Family</strong></td>
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<td>Home prepared horseradish is about twice as strong as store-bought and lasts 3 to 4 weeks in the refrigerator. Excellent with roasted and smoked meats. Young leaves may be added to salads. Rinse the horseradish roots well. Horseradish has potent volatile compounds so work in a well-ventilated room, or outdoors, and protect your eyes. Peeling under water will help contain the volatile oils. Chop in a food processor with a small amount of water. A basic horseradish recipe is: 1 root + 4 Tbsp water; add 2 Tbsp vinegar; ¼ tsp salt. Transfer to a jar and refrigerate. Excess shredded root may be sealed in freezer bags and frozen up to 6 months.</td>
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<tr>
<th><strong>Marjoram, sweet (leaves), Origanum majorana; Mint Family</strong></th>
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<tr>
<td>Gray-green leaves with slightly bitter undertone. May be used fresh or dried to season vegetables, lamb, sausage, eggs, poultry, cheese dishes, potato salad, stuffings and soups. Cut stems just before buds begin to flower, leaving a few leaves to send up another crop. Dry as for basil. When dry, crumble and store in airtight containers. To freeze, follow tray freezing directions above or pack small bunches in plastic bags and place in freezer. Blanch before freezing if storing more than 2-3 months.</td>
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<tr>
<th><strong>Mint, spearmint, peppermint, apple mint, orange mint (leaves); Mint Family</strong></th>
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<tr>
<td>Refreshing odor and flavor. Often used as garnish. Flavor combines well with lamb, peas, fish, sauces, yogurt, candies, chocolate and vegetables. Crush leaves just before adding to a dish. Pick young, fresh leaves to dry. Dry or freeze as for basil.</td>
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<th><strong>Oregano (leaves), Origanum species; Mint Family</strong></th>
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<td>Flavor similar to sweet marjoram, but stronger and more sage-like. Liberally used in Spanish and Italian dishes, pizza; component of chili powder. See sweet marjoram for preserving instructions.</td>
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<th><strong>Parsley (leaves), Petroselinum crispum; Carrot Family</strong></th>
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<tr>
<td>Finely curled, aromatic leaves are rich in vitamins A and C. Used as flavoring or garnish for soups, salads, eggs, meat and poultry dishes, creamed vegetables and hot breads. Parsley can be dried or frozen as for basil, but the flavor is better if frozen.</td>
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<th><strong>Rosemary (leaves), Rosmarinus officinalis; Mint Family</strong></th>
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<td>Leaves have a spicy odor and warm, pinye taste. Used as a garnish and to flavor vegetable and meat dishes, cream soups, sauces and jellies. Makes a good tea. Air or microwave drying works well for rosemary and other sturdy herbs; when dry, rub leaves from stem and store in airtight containers.</td>
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<th><strong>Saffron, Crocus sativus; Iris Family</strong></th>
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<td>Yellow stigmas are pleasantly bitter, give a yellow hue to foods. Used sparingly in sauces, cookies, cakes, chicken, gravies and Spanish rice. Remove stigma in late fall and dry on a cloth in a warm room. Store stigma in airtight containers.</td>
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<th><strong>Sage (leaves), Salvia officinalis; Mint Family</strong></th>
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<tr>
<td>Strong bitter flavor. Used sparingly in stuffings, soups, stews, sausage and herb breads. Pick leaves in spring before flower buds form, or flavor becomes musty. Dry or freeze as for basil. To store more than three months, blanch before freezing.</td>
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<th><strong>Summer savory (leaves), Satureja hortensis; Mint Family</strong></th>
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<td>Used in poultry, soups, gravies, stuffings, salads, bean dishes; sauces for fish or veal. Cut leafy tops and use only young, tender leaves. Remove woody stems. Dry as for basil.</td>
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<th><strong>Tarragon (leaves), Artemisia dracunculus; Sunflower Family</strong></th>
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<td>Considered essential in many French dishes; goes well with eggs, poultry, fish, shellfish and many vegetables. Used as flavoring in pickles and vinegar. Use fresh young leaves and stem tips. Dry or freeze as for basil.</td>
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<th><strong>Thyme (leaves), Thymus vulgaris; Mint Family</strong></th>
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<td>The leaves have unexcelled aroma and flavor. Good with roast meats, fish chowders, sauces, soups, gumbos, stews, stuffings and salads. Makes a flavorful tea. Cut sprigs before the plant flowers. After drying, rub leaves from stems and store in airtight containers. Freeze as for sage.</td>
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Flavored Vinegars and Oils

Fact Sheet No. 9.340 Food and Nutrition Series | Preparation

by P. Kendall and J. Rausch

Flavored vinegars and oils add excitement to salads, marinades and sauces. They also make special gifts, provided a few simple precautions are followed. Of the two, flavored vinegars are easiest and safest to make. Because vinegar is high in acid, it does not support the growth of Clostridium botulinum bacteria. However, some vinegars may support the growth of Escherichia coli bacteria. Infused oils have the potential to support the growth of C. botulinum bacteria. These products may cause great harm if not made and stored properly. By following the procedures below, both types of products can be safely prepared and used.

Flavored Vinegars
Preparation

Containers. Select and prepare containers first. Use only glass jars or bottles that are free of cracks or nicks and can be sealed with a screw-band lid, cap or cork. Wash hands well before starting any food preparation work. Wash containers thoroughly, then sterilize by immersing the jars in a pan of hot water and simmering for 10 minutes. Once the jars are sterilized, remove from the simmering water and invert on a paper towel to dry. Fill while the jars are still warm.

Lids and caps. If using screw caps, wash in hot soapy water, rinse and scald in boiling water. (To scald, follow manufacturer’s directions, or place caps in a saucepan of warm water, heat to just below boiling and then remove from the heat source. Leave caps in the hot water until ready to use.) Use non-corrodible metal or plastic screw caps. If using corks, select new, pre-sterilized corks. Use tongs to dip corks in and out of boiling water 3-4 times. Prepare two-piece metal home canning jar lids according to manufacturer’s directions for canning. If using these lids, allow enough headspace between the lid and the vinegar so that there is no contact between them. Plastic storage screw caps that are made for canning jars are also now available and would work well for flavored vinegars.

Herbs and spices. Commercial companies that make herbal vinegars dip the herbs in antibacterial agents not readily available to consumers. As an alternative, briefly dip the fresh herbs in a sanitizing bleach solution of 1 teaspoon household bleach per 6 cups (1 1/2 quarts) of water, rinse thoroughly under cold water, and pat dry. For best results, use only the best leaves and flowers. Discard any brown, discolored, trampled or nibbled parts of the herbs. Fresh herbs are best picked just after the morning dew has dried. Allow three to four sprigs of fresh herbs or 3 tablespoons dried herbs per pint of vinegar. Spices such as peppercorns and mustard seed are also popular in flavored vinegars.

Fruits and vegetables. Fruits often used to flavor vinegars include strawberries, raspberries, pears, peaches and the peel of oranges or lemons. Allow the peel of one orange or lemon or 1 to 2 cups of fruit per pint of vinegar flavored. For variation, try fruits in combination with herbs or spices. Vegetables, such as fresh garlic cloves and jalapeno peppers, can also be used to add zest to vinegars. Thread these on thin bamboo skewers for easy insertion and removal. Thoroughly wash all fruits and vegetables with clean water and peel, if necessary, before use.

Quick Facts

- Flavored vinegars can be safely prepared. They are best stored in the refrigerator.
- Garlic, vegetable or herb in oil mixtures may support the growth of C. botulinum bacteria. For safety reasons, they should be made fresh. Leftovers should be refrigerated for use within three days, frozen, or discarded.
Small fruits and vegetables may be halved or left whole; large ones may need to be sliced or cubed.

**Vinegar selection.** The type of vinegar to use as the base depends on what is being added. Fruits blend well with apple cider vinegar. Distilled white vinegar is clear in color and best with delicate herbs. Red and white wine vinegars work well with garlic and tarragon. Do be aware, however, that wine and rice vinegars contain protein that provides an excellent medium for bacterial growth, if not stored properly.

**Preparation**

To make flavored vinegars, place the prepared herbs, fruits or spices in the sterilized jars, being careful to avoid overpacking the bottles. Use three to four sprigs of fresh herbs, 3 tablespoons of dried herbs or 1 to 2 cups of fruit or vegetables per pint of vinegar to be flavored. Heat vinegar to just below boiling (190°F), then pour over the herbs and cap tightly. Allow to stand for three to four weeks in a cool, dark place for the flavor to develop fully. Then, strain the vinegar through a damp cheesecloth or coffee filter one or more times until the vinegar is no longer cloudy. Discard the fruit, vegetables or herbs. Pour the strained vinegar into a clean sterilized jar. Add a sprig or two of fresh herbs or berries that have been sanitized as described above. Seal tightly. Store in the refrigerator for best flavor retention.

The flavoring process can be shortened by a week or so by bruising or coarsely chopping the herbs and fruits before placing in the bottles and adding the hot vinegar. To test for flavor development, place a few drops of the flavored vinegar on some white bread and taste. When the flavor is appropriate, strain the ingredients one or more times through a damp cheesecloth or coffee filter. Pour the strained vinegar into a clean sterilized jar. Add a sprig or two of fresh herbs that have been sanitized as described above. Seal tightly. Store in the refrigerator for best flavor retention.

**Fresh Dill Vinegar**

8 sprigs fresh dill
4 cups (1 quart) white vinegar
Wash dill and dip in solution of 1 teaspoon household bleach in 6 cups water. Rinse thoroughly under cool running water. Place dill in sterilized quart jar. Heat vinegar to just below boiling point (190°F); pour over dill. Cap tightly and allow to stand in cool, dark place for three to four weeks. Strain vinegar, discarding dill. Pour vinegar into clean sterilized bottles with tight fitting covers. Add a fresh sprig of cleaned and sanitized dill, if desired. Store in the refrigerator. Makes 1 quart.

**Herbal Vinegar**

4 cups red wine vinegar
8 sprigs fresh parsley
2 teaspoons thyme leaves
1 teaspoon rosemary leaves
1 teaspoon sage leaves
Thoroughly wash herbs and dip in solution of 1 teaspoon household bleach in 6 cups water. Rinse thoroughly under cool running water and pat dry. Place herbs in sterilized quart jar. Heat vinegar to just below boiling point (190°F); pour over herbs. Cap tightly and allow to stand in cool, dark place for three to four weeks, shaking occasionally. Strain out herbs. Pour vinegar into clean sterilized bottles with tight fitting covers. Add a fresh sprig of cleaned and sanitized parsley, if desired. Store in the refrigerator. Makes 1 quart.

**Strawberry Vinegar**

2 cups fresh strawberries
3 cups cider vinegar
1/4 cup sugar
Clean strawberries, remove stems and halve; set 1/4 cup aside. Place remaining strawberries in a large bowl. Pour vinegar over strawberries; cover and set aside for 1 hour. Transfer vinegar and strawberries to a large sauce pot. Add sugar, bring to a boil. Reduce heat and simmer, covered, for 10 minutes. Strain mixture through a fine meshed sieve lined with cheesecloth into quart measure, pressing firmly on the solids to extract as much liquid as possible. Discard solids. Pour vinegar into a clean sterilized pint jar. Seal tightly and store in the refrigerator. Makes 1 pint.

**Storage and Use**

For the best retention of flavors, store flavored vinegars in the refrigerator or a cool dark place. If properly prepared, flavored vinegars should retain good quality for two to three months in cool room storage and for six to eight months in refrigerated storage. If you notice any signs of mold or fermentation (such as bubbling, cloudiness or sliminess) in your flavored vinegar, throw it away without tasting or using for any purpose.

Some people enjoy displaying pretty bottles of herb and fruit vinegars on a kitchen window sill. If left out for more than a few weeks, these bottles should be considered as decoration and not used in food preparation.

Flavored vinegars can be used in any recipe that calls for plain vinegar. They add zest to marinades for meats and fish and interesting flavors to dressings for salads, pastas and vegetables.
Flavored Oils

Safety Concerns

Herbs- and garlic- in oil mixtures are considered potentially hazardous food items by the U.S. Food and Drug Administration (FDA) because of the large number of cases of botulism that have been traced to improperly stored commercial and home-prepared mixtures of garlic and oil. Short refrigerated or frozen storage is necessary because all other conditions that favor growth of C. botulinum are met: low-acid environment with pH higher than 4.6, anaerobic conditions (oil), food and moisture source (garlic), not boiled before eating.

Garlic in oil. For added safety, the FDA now requires that all commercial garlic in oil products contain specific levels of microbial inhibitors or acidifying agents such as phosphoric or citric acid. Although most garlic products do contain these additives, some boutique or specialty mixes may not. Always check the label to be sure.

As for home-prepared mixtures of garlic in oil, the FDA recommends that these “be made fresh for use and not left at room temperatures.” Any leftovers should be refrigerated for use within three days, frozen for longer storage, or discarded.

The reason for the concern is that unrefrigerated garlic in oil mixtures lacking antimicrobial agents have been shown to permit the growth of C. botulinum bacteria and its toxins, without affecting the taste or smell of the products. Toxin production has been known to occur even when a small number of C. botulinum spores were present in the garlic. When the spore-containing garlic is bottled and covered with oil, an oxygen-free environment is created that promotes the germination of spores and the growth of microorganisms at temperatures as low as 50°F.

Botulism is a potentially fatal food poisoning characterized by blurred or double vision, speech and breathing difficulty, and progressive paralysis. Without prompt and correct treatment, one-third of those diagnosed with botulism may die. C. botulinum spores are widespread in the environment but cause no harm as long as oxygen is present. Also, the toxin produced by C. botulinum bacteria is readily destroyed by heat. Boiling a potentially suspect mixture for 10 minutes, plus one minute for each 1,000 feet above sea level, will destroy any botulism toxin that may be present.

Vegetables and herbs in oil. Several cases of botulism have been associated with home-prepared vegetables and herbs stored in oil. These products also should be made fresh, with leftovers refrigerated for use within 3 days, or frozen for longer storage. Vegetables have a high water activity level which further encourages the growth of C. botulinum bacteria in an anaerobic environment. Even when dried, there is still the potential for risk, unless the vegetable has been acidified to a pH of 4.6 or lower.

Dried tomatoes in oil are less of a safety concern than other mixtures in oil because the pH of tomatoes is generally 4.6 or lower. In addition, by sufficiently drying the tomatoes, conditions become less favorable to growth of C. botulinum due to a decrease in water activity. Dried herbs in oil also are less of a safety concern because of their low water activity. However, to ensure safety, it is recommended that all tomato in oil and herb in oil products be stored at refrigerator temperatures and used within three days. If longer storage is desired, these products should be frozen in meal sized portions.

Avoid Rancidity

In addition to reducing the potential for growth of C. botulinum bacteria, storing flavored oils in the refrigerator or freezer helps keep the oils from becoming rancid. A putrid “off” odor indicates the development of rancidity. All fats and oils will become rancid given enough exposure to air, sunlight and heat. Polyunsaturated fats, like vegetable oils, are especially prone to such deterioration. Eating rancid food won’t make you sick, but it may be unhealthy in the long run. Rancid fat contains chemicals called peroxides and aldehydes that can damage cells and may even encourage cholesterol to clog arteries.

It is important to note that rancidity and the presence of botulism toxins are not necessarily related. Toxins may be present without any hint of an off-odor. Likewise, an off-odor does not necessarily indicate the presence of botulism toxin. It does, however, indicate the product may have been left for long periods at room temperature, which would promote the growth of C. botulinum. Therefore, it’s best to discard any oil-based mixtures that have become rancid so they’re out of the reach of humans or animals.

References

