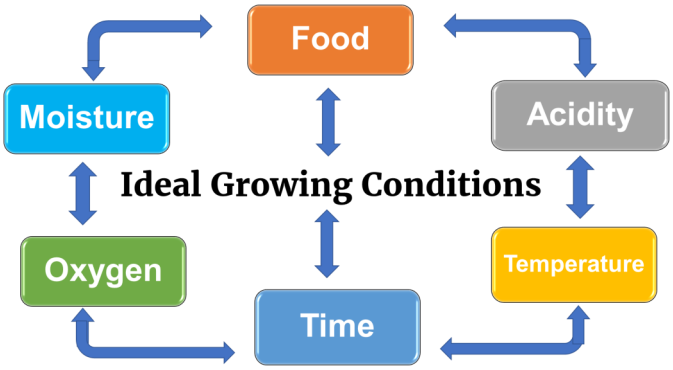
FILL YOUR PANTRY

Goal of Food Preservation: Increase Shelf-life of Food and Keep Food Safe



Factors Contributing to Bacterial Growth

Stop or Slow Down the Rate of Food Spoilage

Microorganisms causing food spoilage include molds, yeasts, and bacteria. These microorganisms can be found anywhere and can easily contaminate foods.

Under ideal conditions, bacteria can easily grow on food and multiply very quickly. This can increase the rate at which food spoils and can cause a foodborne illness.

Controlling the ideal growing conditions for these harmful microorganisms is the best way to prevent food spoilage and decrease the risk of foodborne illness.

Selecting Produce

Preserving Food Does Not Improve Its Quality

- Select good quality produce. Fruit and vegetables should be free of disease, mold, or insect damage, and not overripe
- Choose varieties best suited for freezing, as quality varies among varieties
- Freeze produce just after harvesting or shortly after purchase
- If unable to freeze fruit and vegetables within 6-12 hours of harvest store in a cool, dry location to minimize deterioration

Freezing Your Summer Harvest

Home Food Preservation Cannot Reproduce Commercial Outcomes

Freezing is an excellent way to preserve the summer harvest. It is easy, convenient and requires less time, compared to other food preservation methods, such as canning or dehydrating foods. And freezing has many benefits. It maintains the fresh flavor, natural color and nutritional value better than canning or dehydrating.

To successfully freeze your summer harvest, it is important to acknowledge a few basic principles.

Freezing will stop the growth of harmful microorganisms, however once thawed, microorganisms become active and begin multiplying rapidly.

Natural chemical changes occur during the freezing process, resulting in structural changes to fruits and vegetables. These changes will impact the taste, texture, and overall quality. Therefore, it is important to remember nothing will ever come out of the freezer in better condition than when it went in. Understanding these structural changes and why they occur is a key factor in successfully freezing your garden harvest.

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Home Food Preservation items are NOT the Same as those Manufactured by Industry

Freezing Science

Freezing

- Water contained in the food freezes and expands
- Cell walls rupture resulting in a softer texture
- More noticeable in higher water content
- Less noticeable in starchy vegetables

Although water will freeze at 32°F, not all foods will freeze at 32 °F. This is because most food contains a combination of many substances, such as air, fiber, sugar, and water.

How Freezing Affects Food

Understanding the Science Behind Freezing Fruits and Vegetables

Water makes up 70-90% of the weight of most fruits and vegetables. During the freezing process, water expands, and ice crystals are formed causing the cell walls to rupture.

Freezing produce as quickly as possible, will result in smaller ice crystal formation. Smaller ice crystals will cause less damage to cell walls, resulting in a crisper texture and less liquid being lost when thawed.

Rapid Freezing

Rapid freezing will result in a better-quality product. Rapid freezing produces small ice crystal formation and occurs at a temperature of -13°F degrees or less.

Slow Freezing

Slow freezing will result in a softer texture and more liquid loss when thawed. Slow freezing produces larger ice crystal formation and occurs at a temperature of -11°F degrees or above.

Freeze Thaw Cycle

The freeze thaw cycle occurs when there are fluctuating temperatures. Temperature fluctuations allow for the growth of ice crystals and further damage to cell walls impacting texture.

Good-quality freezer packaging is essential when freezing fruits and vegetables. Freezer bags and containers are specially designed for freezer use. These materials have a different composition and/or thickness compared to regular plastic storage bags and containers, allowing them to provide the best moisture-vapor barrier.

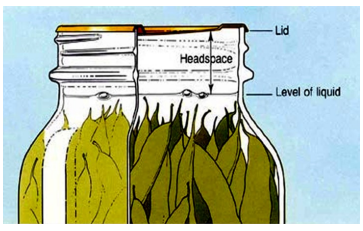
Packaging Matters

Quality Packaging

- Moisture resistant
- Leak proof/easy to seal
- Provide odor protection
- Durable

Freezer containers should keep moisture in and air out, while protecting food from absorption of off-flavors or odors, and freezer burn. When using rigid packaging, select containers specifically designed to withstand cold temperature and will not become brittle and break. Select contains with screw-on lids, that will not pop-off in the freezer and spill. If using glass jars, use caution as glass breaks easily at freezing temperatures.

Headspace



The unfilled space above the food in a sealed container and below the lid is head-space. This space is needed to allow for the expansion of food while processing.

- Amount of headspace depends on the type of food being frozen
- Liquids will expand

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Blanching

Enzyme Activity and Vegetables

Enzymes are large protein molecules found in fruits and vegetables, which promote chemical reactions before and after harvest, such as ripening.

Enzyme activity: Helps to speed up deterioration or breakdown of foods, leading to the deterioration of food quality.

The activity of enzymes is specific for the actual type of enzyme and is dependent on both pH and temperature.

Enzyme activity effects the quality of your product, leading to changes in color, texture, and flavor. As well as loss of nutrients, such as Vitamin C in fruits.

Freezing does not stop enzyme activity, only blanching will inactivate enzymes in vegetables.

Blanching Vegetables

Blanching is the process of quickly exposing vegetables to either boiling water or steam for a specified amount of time and then rapidly cooling. Blanching is needed to inactive enzymes which can lead to loss of flavor, color, and texture.

Blanching is not required from a food safety standpoint; however, it will affect the quality of frozen vegetables.

In addition to inactivating enzymes, blanching destroys microorganisms on the surface of vegetables, brightens the color, slows the loss of vitamins, and softens the vegetable.

Blanching Vegetables in Boiling Water

Vegetable	Time*	Vegetable	Time*
Artichoke – Globe (Hearts)	7	**Carrots**	
Artichoke – Jerusalem	3-5	Small	5
Asparagus		Diced, sliced or lengthwise strips	5
Small Stalk	2	**Celery**	3
Medium Stalk	3	**Collard Greens**	3
Large Stalk	4	**Greens All other**	2
Beans (Snap, Green or Waxed)	3	**Corn-on-the-cob**	
Beans (Lima, Butter or Pinto)		Small ears	7
Small	2	Medium ears	9
Medium	3	Large ears	11
Large	4	Whole kernel or cream style corn**	4
Broccoli		**Peas**	
Flowerets 1.5 inches across	3	Edible pod	2-3
Steamed	5	Field (black-eyed)	2
Cauliflower Flowerets 1 inch across	3	Green	1.5-2.5
Steamed	5	*So Easy to Preserve, 6th Edition*	

Blanching Vegetables

Use one gallon water per pound of prepared vegetables.

Place vegetable in a blanching basket and lower into vigorously boiling water. Place a lid on the kettle.

The water should return to boiling within 1 minute. If water does not return to boil within 1 minute, too many vegetables are being used for the amount of boiling water.

Begin counting blanching time as soon as the water returns to a boil. Keep heat high for the time given in the directions for the vegetable you are freezing.

**Blanching time in minutes* ***Ears blanched before cutting corn from cob*

For a more complete listing of vegetables and blanching times, please see: So Easy to Preserve, 6th Edition or National Center for Home Food Preservation website

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Freezing Fruit

Enzyme Activity and Fruit

Enzyme activity in fruit may lead to browning and loss of Vitamin C. Ascorbic acid (Vitamin C) is the most common chemical compound used to control enzyme activity in fruit.

Ascorbic Acid

Ascorbic acid is effective at preventing discoloration in most fruits. When using ascorbic acid, it must be in powder form. Ascorbic acid can be purchased where freezing supplies are sold.

Ascorbic Acid Mixtures

These are special anti-darkening preparations, consisting of a mixture of ascorbic acid, with sugar and citric acid.

Citric Acid and Lemon Juice

Although both citric acid and lemon juice can be used, these are not as effective as ascorbic acid and may mask the natural fruit flavor.

Methods for Freezing Fruit

When freezing fruit, always know what the intended use for the fruit will be. Most fruit will have a better texture and flavor if packed in sugar or syrup. Sugar is not necessary to safely preserve fruit.

The type of pack will depend on the intended use of the fruit.

Fruit packed in dry sugar or unsweetened are best for cooking purposes because there is less liquid.

Fruits packed in syrup are generally best for uncooked desserts.

Syrup Pack

A 40 percent syrup pack is recommended for most fruits, however the proportion of sugar to water will depend upon the sweetness of the fruit being frozen.

Lighter syrups are recommended for mild-flavored fruits to prevent masking of natural fruit flavor. Heavier syrups are recommended for very sour fruits.

Sugar Pack

Sprinkle sugar over fruit and gently mix until the juice is drawn out of fruit and sugar is dissolved.

For soft sliced fruits, layer slices with sugar and allow to stand for 15 minutes. Ideal for peaches, strawberries, figs, deseeded grapes, plums, and cherries. Small whole fruit may be coated with sugar and frozen.

Syrups for Use in Freezing Fruit

Type of Syrup	Percent of Syrup*	Cups of Sugar**	Cups of Water	Yield of Syrup in Cups
Very Light	10%	½	4	4 ½
Light	20%	1	4	4 ¾
Medium	30%	1 ¾	4	5
Heavy	40%	2 ¾	4	5 ⅓
Very Heavy	50%	4	4	6

So Easy to Preserve, 6th Edition

**Approximate*

*** Up to ¼ of the sugar may be replaced by mild-flavored honey or corn syrup. However, this may affect the color and flavor of fruit.*

Making Syrup Pack

- Dissolve sugar in lukewarm water, mixing until the solution is clear.
- Chill solution before covering fruit.
- Cover fruit with just enough syrup.
- Approximately ½ to ⅔ cup solution per pint.

When using a rigid container, place crumpled parchment paper or other water-resistant wrapping material on top of fruit solution before sealing in container to prevent fruit from floating to the top.

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Freezing Unsweetened Fruit

Unsweetened Pack

Unsweetened packs may result in products having a softer texture and dull color compared to sweetened packs. Fruits will freeze harder and take longer to thaw.

This method is ideal for fruits such as blueberries, cranberries, gooseberries, raspberries, steamed apples, currents, rhubarb, and figs.

Dry Pack

Pack fruit into container, seal, and freeze. To prevent clumping, place fruit in a single layer onto shallow tray and freeze. Once frozen, remove from tray, pack in freezer safe packaging, and return to freezer.

This method is ideal for small whole berries that will result in a good quality product without sugar.

Pectin Syrup

This unsweetened pack method is ideal fruit that retain their texture better than if frozen in just water or unsweetened juice. Fruits such as strawberries and peaches work well.

Making Pectin Syrup

- Combine in a saucepan, pectin and 1 cup of water.
- Bring solution to a boil and boil for 1 minute.
- Remove from heat and add 1 ¾ cup water. Cool.
- Yields 3 cups of moderately thick syrup.

References

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Andress, Elizabeth. Preserving Food – Freezing Prepared Food: updated June 2014 - Nation Center for Home Food Preservation – University of Georgia publication http://nchfp.uga.edu/publications/uga/FreezingPreparedFoods.pdf

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Zepp, M. (2018, May 3). Understanding the Process of Freezing. Retrieved June 1, 2020, from https://extension.psu.edu/understanding-the-process-of-freezing

Resources

Additional Resources

- So Easy to Preserve, 6th Edition
- Complete Book of Home Preserving
- The Ball Blue Book
- National Center for Home Food Preservation
- YouTube: What's Cooking with Mary Liz Wright
- From Garden Gates to Dinner Plates: https://web.extension.illinois.edu/cottage/taskforce.cfm
- University of Illinois Extension Food Preservation Resources: https://web.extension.illinois.edu/foodpreservation/

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June 2020