

Storage Guidelines For Fruits & Vegetables

From Cornell Cooperative Extension, Chemung County

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Cold storage of fruits and vegetables was used extensively by our ancestors to keep food after the harvest season. In modern times, the year round availability of fresh produce in the supermarket has reduced the use of home storage. However, even today there are benefits of home storage, which make it a good alternative to buying produce from the store. Most importantly, home gardeners often have excess fruits and vegetables that cannot be consumed immediately but would store well. Even those without gardens can buy food 'in season' when it is fresh and inexpensive and then store it at home until a later date. Both these options are cheaper than buying food in the winter when it is often quite expensive. In addition, stored food harvested at peak maturity from the garden usually has better flavor and a higher nutritional value.

When harvesting your own produce for storage, or buying it locally in season, there are certain guidelines to follow which assure maximum quality and minimum spoilage of your stored food.

1. Harvest fruits and vegetables at peak maturity or as near as possible.
2. Only use produce that is free from all visible evidence of disease.
3. Do not pick any fruit or vegetable that has severe insect damage.
4. Handle food carefully after harvest so that it is not cut or bruised.
5. Leave an inch or more of stem on most vegetables to reduce water loss and prevent infection.
6. Use late-maturing varieties better suited to storage.

In general, use only the best food for storage. Damaged food is more likely to suffer

mold and bacterial decay during storage and thus should be used fresh, processed, or discarded.

Once harvested, fruits and vegetables must be stored under proper conditions, the most important of which are temperature and humidity. Each fruit or vegetable has its own ideal set of conditions at which it will store most successfully for the maximum length of time. These conditions can be classified into four groups:

1. Vegetables which require cold & moist conditions
2. Vegetables which require cool & moist conditions
3. Vegetables which require cold & dry conditions
4. Vegetables which require warm & dry conditions

The tables on the following page list temperature and humidity requirements for most vegetables. In addition to proper temperature and humidity, all fruits and vegetables must be kept in a dark, aerated environment. While most vegetables like moist conditions, standing water must be avoided, as it will quickly lead to rot. Produce must not be allowed to freeze and should be protected from animal pests such as mice. It is important to remember that crops held in storage are still living plants, capable of respiration and affected by their environment. The goal of storage is to keep them in a dormant state. *One other note, fruits and vegetables should always be stored separately. Fruits release ethylene, which speeds the ripening process of vegetables. Fruits are also very susceptible to picking up the taste of nearby vegetables

Helping You Put Knowledge to Work

Table 1. Fruits & Vegetables that require cold, moist conditions

Vegetable	Temperature (°F)	Relative Humidity (%)	Length of Storage
Asparagus	32-36	95	2-3 weeks
Apples	32	90	2-6 months
Beets	32	95	3-5 months
Broccoli	32	95	10-14 days
Brussels Sprouts	32	95	3-5 weeks
Cabbage, Early	32	95	3-6 weeks
Cabbage, Late	32	95	3-4 months
Cabbage, Chinese	32	95	1-2 months
Carrots, mature	32	95	4-5 months
Carrots, immature	32	95	4-6 weeks
Cauliflower	32	95	2-4 weeks
Celeriac	32	95	3-4 months
Celery	32	95	2-3 months
Collards	32	95	10-14 days
Corn, sweet	32	95	4-8 days
Endive, Escarole	32	95	2-3 weeks
Grapes	32	90	4-6 weeks
Kale	32	95	10-14 days
Leeks, green	32	95	1-3 months
Lettuce	32	95	2-3 weeks
Parsley	32	95	1-2 months
Parsnips	32	95	2-6 months
Pears	32	95	2-7 months
Peas, green	32	95	1-3 weeks
Potatoes, early	50	90	1-3 weeks
Potatoes, late	39	90	4-9 months
Radishes, spring	32	95	3-4 weeks
Radishes, winter	32	95	2-4 months
Rhubarb	32	95	2-4 weeks
Rutabagas	32	95	2-4 months
Spinach	32	95	10-14 days

Table 2. Vegetables that require cool, moist conditions

Vegetable	Temperature (°F)	Relative Humidity (%)	Length of Storage
Beans, snap	40-50	95	7-10 days
Cucumbers	45-50	95	10-14 days
Eggplant	45-50	90	1 week
Cantaloupe	40	90	15 days
Watermelon	40-50	80-85	2-3 weeks
Peppers, sweet	45-50	95	2-3 weeks
Potatoes, early	50	90	1-3 weeks
Potatoes, late	40	90	4-9 months
Tomatoes, green	50-70	90	1-3 weeks
Tomatoes, ripe	45-50	90	4-7 days

Table 3. Vegetables that require cool dry conditions.

Vegetable	Temperature (°F)	Relative Humidity (%)	Length of Storage
Garlic	32	65-70	6-7 months
Onions	32	65-70	6-7 months

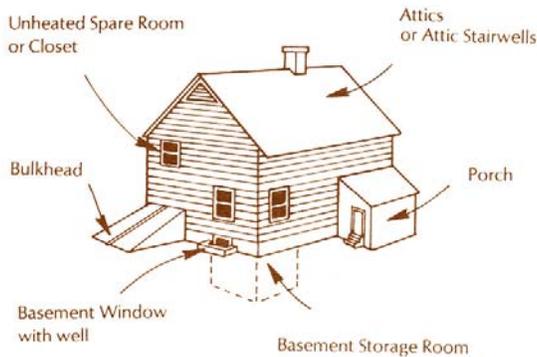
Table 4. Vegetables that require warm dry conditions.

Vegetable	Temperature (°F)	Relative Humidity (%)	Length of Storage
Peppers, hot	50	60-65	6 months
Pumpkins	50-55	70-75	2-3 months
Squash, winter	50-55	50-60	2-6 months
Sweet Potato	55-60	80-85	4-6 months

Indoor Storage

There are many areas in dwellings that naturally provide, or can be adapted to provide, a variety of temperature and moisture conditions for storage. Assess your specific situation; if possible, use a thermometer to monitor temperatures in various areas of your building during the fall and winter to find locations that are convenient and most readily adaptable for food storage.

Any spot that is sufficiently and evenly cool



(32-60 °F) can be adapted for some type of food storage. The relative humidity of these locations will also affect what can be stored there. Basements are generally the most logical place to adapt. Older homes are often less well-insulated, and have pantries, back halls, enclosed porches, sheds and bulkheads which are adaptable to storage. Homes heated with wood stoves often have a central area of radiant warmth and peripheral areas that are considerably cooler.

Outdoor Storage

In areas with cold winters, vegetables requiring cool to cold, moist conditions can be stored in any of several types of outdoor storage areas. Earthen storages, from simple mounds to more elaborate root cellars, naturally provide cool, moist, dark and even conditions for a fairly long time. All outdoor storages have the disadvantage of sometimes being inaccessible, as well as being subject to damage by rodents and other vermin. To be successful, any outdoor storage must have thorough drainage.

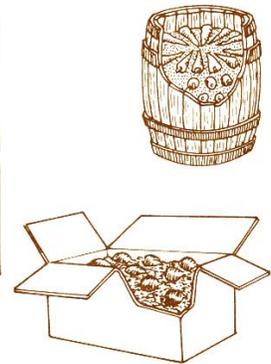
A storage into which water settles will not keep produce and may result in total loss.

Packing Materials

Packing materials used in storage perform several functions- insulation against fluctuating temperatures, moisture retention, and reduction of disease transmission. In outdoor storages, clean straw, dry leaves, corn stalks, hay, or sawdust are commonly used for insulation. These materials may be readily available or can be purchased relatively cheaply from local farms or garden centers. A slightly more expensive alternative is peat moss. Use these materials for a single storage season only, as they can become contaminated with molds and bacteria. They often can be recycled as mulch in the garden. Moisture retention of produce is usually achieved with moistened sand, sawdust or peat moss. Plastic bags, lined boxes, crocks, metal cans with liners, or plastic garbage cans are all items that retain moisture. Perforate plastic bags or liners at regular intervals to allow air circulation and prevent condensation. Vegetables requiring moist storage should never be left directly exposed to air. Alternating layers of produce with packing materials reduces disease transmission. Wrapping individual items of produce with newspaper aids moisture retention and reduces the possibility of cross-transfer of odors and disease.

Packing Materials

Clean Straw
Sawdust
Sphagnum Moss
Peat Moss
Dry Leaves
Sand



Timing of Storage

Placing fruits and vegetables in storage, either in pits or in basement rooms, *before* cold weather starts in the fall is a frequent cause of early spoilage. One of the most difficult steps in successful storage is to keep the produce in prime condition from the time of optimum maturity until the night temperature is low enough to cool the storage area. The length of storage and retention of nutrients will be maximized if the produce can be stored under the proper conditions immediately after harvest.

The following page contains a few examples of storage areas for fruits and vegetables.

Refrigerator Storage

One of the best ways to store small quantities of vegetables requiring cold or cool moist conditions is to use an old or extra refrigerator. The amount of current required to run a storage refrigerator is usually low because they are opened infrequently and can be located in an out of the way, cool location. For best storage, produce should be washed free of soil and placed into plastic bags with 2 to 4 ¼" holes for ventilation. The 5 or 10 pound bag size is usually most convenient for the average family. Vegetables in plastic bags do not wilt nearly so rapidly as those stored openly in the refrigerator.

Outdoor Sheds

Sheds, breezeways, enclosed porches, and garages can be used to store insulated containers. An insulated container stored in an unheated area should have 6-8" of insulation on the bottom, sides, and top, with 2-3" between layers of produce. Additional blankets or other coverings may be necessary depending on how cold the outside temperature reaches. Remember that produce must not be allowed to freeze!

Basement Storage Room

Modern basements with furnaces are generally at least 50-60°F and dry. While this is appropriate for some types of food storage, in

order to achieve the cool, moist conditions necessary for most fruit and vegetables it may be necessary to construct a separate room. This separate storage area should be located in the coldest part of the basement, away from the furnace. The north and the east sides of the house are preferred. Avoid heat ducts and hot water pipes that generate heat. The room should have an outside window for ventilation.

While the exterior walls do not need to be insulated, the inside partitions should have 3½" thick fiberglass insulation. Faced insulation should have the vapor barrier closest to the warm side of the storage. If unfaced insulation is used, a vapor barrier such as 6-mil thick polyethylene can be used. The ceiling also requires insulation and a vapor barrier. Temperature can be controlled in this storage room by opening and closing the outside window. Humidity can be kept high by pouring water on the floor or by keeping wet burlap sacks or some similar material in the room.

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References

Isenberg, F. M. R. *Storage of Home Grown Vegetables*. Cornell University Department of Vegetable Crops, Master Gardener Reference.

MacKay, Susan. *Home Storage of Fruits and Vegetables*. Northeast Regional Agricultural Engineering Service Bulletin 7. 1984.