

Storing fruits and vegetables from the home garden

Teryl Roper, Karen Delahaut, Barb Ingham



It's possible to have crisp, home-grown apples well into November, and to use tender potatoes and crunchy carrots—dug from the garden in October—for a December holiday feast. When stored and handled properly, fresh fruits and vegetables from the garden can add special appeal to meals long after harvest.

Many Wisconsin residents enjoy growing fruits and vegetables at home. While our growing season is relatively short, many different kinds of produce can be stored at home, allowing us to enjoy good produce well after the harvest has finished. Sometimes produce can be purchased in bulk during the growing season at a reduced price, but this is only economical if the produce can be stored so that quality is maintained. This publication describes harvest and storage conditions and methods so that fresh produce can be successfully stored at home.

Produce can be preserved for longer storage by canning, freezing, pickling, or drying. The Extension publications listed on page 7 address these subjects and are available through your local county Extension office.

Where and how to store produce

Few homes have perfect storage conditions for fresh produce, but it is possible to create spaces that will help to extend the length of time produce can be stored. The optimum storage conditions for fruits and vegetables may be divided into three groups:

Cool and dry (50–60°F and 60% relative humidity). Basements are generally cool and dry—or places in basements can be made cool and dry. Cool and dry are the best storage conditions for winter squash and pumpkins.

Cold and dry (32–40°F and 65% relative humidity). Cold and dry describes most refrigerators or perhaps an insulated garage in the fall and spring. Onions and garlic prefer cold and dry conditions.

Cold and moist (32–40°F and 95% relative humidity). Cold and moist storage is the most challenging condition to create. Refrigerators provide the cold, but they also dry the air. Placing produce in perforated plastic bags in a refrigerator can create a cold and moist environment. All fruit that grows in Wisconsin and most tender vegetables require these storage conditions.

Maximizing storage life

Understanding storage needs can help you take steps to maximize storage life.

Store at ideal temperatures. Fresh fruits and vegetables are living organisms—even after harvest. They consume oxygen and release carbon dioxide. This process is called respiration. The rate of respiration depends on the storage temperature and type of produce: lowering the temperature slows respiration and extends storage life. Thus, produce should be cooled to the ideal temperature as quickly as possible after harvest. Some produce is sensitive to cold temperatures and should not be chilled (table 2, page 7).

Maintain moisture. All fresh fruits and vegetables contain water. It is water that makes fresh strawberries so juicy and potatoes flakey when they are baked. Fruits and vegetables release water into the air in a process called transpiration. After harvest, water released into the air is not replaced and the produce eventually shrivels. You can maintain moisture in most fresh fruits and vegetables by storing them in perforated plastic bags or by increasing the humidity in the air around the produce.

Avoid temperature extremes. When fresh fruits and vegetables are exposed to extreme temperatures (too high or too low), the tissue can be damaged. Fresh produce that has been frozen will begin to break down almost immediately upon thawing. Signs of cold damage include internal browning of plums or apricots, excessive softness in pears, and brown corky spots under the peel of apples. By contrast, overheating and exposure to sun may cause bleaching, scalding, uneven ripening, softening, or shriveling in fruits and vegetables.

Remove diseased produce. Most produce is quite resistant to disease as long as the skin remains intact. Skin punctures or cuts provide access to disease-causing fungi or bacteria. Before storing, inspect produce for wounds or for early signs of disease such as tissue discoloration, water soaking, or decay. Discard damaged produce or use immediately. Plan to routinely inspect stored produce, removing any fruits or vegetables with signs of decay.

If resources permit, a second refrigerator can be set up specifically for storing fresh produce. This second refrigerator can be maintained at the proper temperature for long-term high-quality storage of fresh produce. Also, a second refrigerator would be opened less, helping to maintain steady and uniform temperatures. Keeping a thermometer in the refrigerator will help you monitor the temperature.

Storage compatibility

Even if fruits and vegetables require similar storage conditions, they can't always be successfully stored together. Produce may give off strong odors which can be absorbed by other items. Onions, for example, give off pungent gases and should not be stored near apples or potatoes or they will absorb the flavor. Apples, pears, tomatoes, and overripe cucumbers give off a gas known as ethylene. In sensitive crops, exposure to ethylene may cause yellowing, softening, and decay. Table 3 on page 8 gives a detailed list of susceptible crops and symptoms.

Storing fruit

Apples

Late-maturing apples are best suited for storage. Apples for storage should be harvested just ahead of optimal eating quality. Harvest fruit carefully to avoid bruising. Sort through apples to be stored to ensure that the fruit is sound and that the skin is unbroken. Apples that are picked too green are subject to physiological disorders such as scald; if picked too late they will soften quickly in storage. Store in baskets or boxes lined with perforated plastic to help retain moisture. Individual fruit can be wrapped in tissue paper or newspaper. Store apples between 32°F and 38°F with high humidity.

Refrigerators will tend to draw moisture from apples and they commonly shrivel in refrigerated storage unless they are in perforated plastic bags that will retain moisture.

Berries

Strawberries, raspberries, blackberries, gooseberries, currants, and blueberries are highly perishable and will only store for 7–10 days in the refrigerator. Sort through berries to remove debris and any damaged fruit. Store in perforated plastic bags in the refrigerator. Do not wash berries prior to storage. Wash them in a colander under running water just before use.

Grapes should be fully mature with firm berries and green stems. Remove any damaged or rotting berries. Store in perforated plastic bags at 36–40°F for 2–3 weeks.

Cranberries will store for 2–4 weeks in plastic bags in the refrigerator or they can be frozen for longer periods in the plastic bags.

Pears

Pears will not ripen on the tree. The fruit matures on the tree and then ripens after harvest. Pears undergo subtle changes that provide clues as to maturity. The bright grass-green skin color will soften into a lighter green. Lenticels (the spots on the skin) darken. The skin of the fruit may feel more waxy. Pears will still feel hard and the flesh will be firm and crisp at maturity. Pears need a period of ripening after harvest to achieve the best eating quality. Pears should be given a period of cold storage at 34 to 38°F for a couple of weeks or longer (up to 2–3 months, if desired) followed by storage at room temperature for 3–4 days to obtain optimum eating quality. When pears are ripe, the fruit is soft and buttery textured. Once pears are ripe, they should be eaten, or stored in the refrigerator for no

more than a few days. Pears lose moisture quickly. Wrapping individual fruit in paper will prolong storage in the refrigerator.

Stone fruit (apricots, cherries, peaches, plums)

Stone fruit (apricots, cherries, peaches, plums) are all highly perishable and won't keep longer than about 1–2 weeks in refrigerated storage. Store only sound fruit that is unblemished. Stone fruits will quickly lose moisture in storage and must be stored in perforated plastic bags.

Storing vegetables

Asparagus

Harvest asparagus when spears are 6–8 inches long and about the thickness of your index finger. Place upright in a jar containing about 1 inch of water, cover loosely with plastic, and cool immediately. Store at 36°F for up to 10 days. Asparagus is sensitive to chilling and after several days at 32°F it will lose its sheen and the tips will turn gray. Indications of severe chilling injury will appear as darkened spots near the tips. Conversely, storage at temperatures above 50°F for a prolonged time will quickly cause the spears to become tough.

Beans

Beans are warm-season crops and will be damaged when temperatures drop much below 40°F. The pods develop an opaque discoloration and rust-colored spots. Snap and pole beans should be harvested when pods are almost full-size but before the seeds begin to bulge from the shell. Beans are highly perishable and need to be stored in perforated plastic bags in the refrigerator.

Beets

Harvest beets when they are about 2 inches in diameter. Larger beets tend to be fibrous. Removing

tops before storage will greatly extend the storage life. Beets can be stored outside in insulated pits or trenches. When placing them in the pit, leave a small amount of space between each. Be sure to provide good air circulation to prevent post-harvest rots regardless of where beets are stored.

Bok choy and Chinese cabbage

Bok choy is a type of non-heading Chinese cabbage. Chinese cabbage is susceptible to fungal and bacterial diseases while in the garden and both will cause the rapid decline of affected heads in storage. Store in the refrigerator in a perforated plastic bag.

Broccoli

Harvest broccoli when the heads are firm and before the florets have begun to open. Store unwashed heads in the refrigerator in perforated plastic bags. Washing before storage encourages bacterial head rot.

Brussels sprouts

Harvest Brussels sprouts when they are 1–1³/₄ inches in diameter and solid. Brussels sprouts become sweeter and more flavorful if harvested after frost. Refrigerate up to 3–5 weeks in perforated plastic bags.

Cabbage

Harvest cabbage heads when they are firm and before they split. Leave two to four wrapper leaves around the head to help prevent drying. Do not wash before storage. It is not necessary to store cabbage in a plastic bag. Cabbage will remain in good condition for 3–4 months under cold, moist conditions.

Carrots

Carrots improve in quality with cold storage and become sweeter as time goes on. Leave carrots in the soil as late as possible to get maximum growth. Wash roots and remove the tops before storage. Refrigerated carrots should be stored in perforated plastic bags. If refrigerator space is

limited, carrots may be stored in a cool location in 5-gallon buckets filled with damp sand.

Cauliflower

Harvest cauliflower when heads are 6–8 inches in diameter but still compact and smooth. Keep enough wrapper leaves to hold the head together. Do not wash cauliflower before refrigerating. Wrap in a damp cloth or paper towel to maintain high humidity. Cauliflower stored at low humidity levels will turn brown.

Celeriac

Harvest before frost. Store celeriac at 32°–38°F in a perforated plastic bag.

Cucumbers

Harvest cucumbers when bright green and firm (overripe fruit will be dull, less crisp, and seedy). Wipe clean with a damp cloth and store in the vegetable crisper in the refrigerator. Cucumbers will turn yellow and decay rapidly if stored at temperatures below 40°F or above 59°F.

Eggplants

Harvest eggplant when mature, firm, bright in color, and heavy for their size. Overripe eggplants are dull in color, soft, seedy, and bitter. If exposed to temperatures below 41°F, eggplants will develop surface pits and brown spots. Store at 50°–54°F for up to 2 weeks.

Garlic

Wait until two-thirds of the leaves have dried before harvesting—typically 9 months after planting. Clean soil from the garlic immediately after harvest and before curing the bulbs. To cure, place the bulbs in a warm, dry, dark, place for 30 days. After this period, cut the tops to 1½–2 inches and remove the roots and the outer two scale layers. Store hardneck garlic uncovered in the refrigerator for 3–6 months and softneck garlic for 6–9 months. Discard garlic that develops mold during storage.

Leeks

Harvest leeks when they are 1¼–3 inches in diameter near the base. Trim the green leaves and roots and wash before storing in a plastic bag in the refrigerator. Store for 2–3 months.

Melons

Watermelon should be harvested when the ground spot—the light-colored spot on the portion that touches the ground—turns a creamy yellow. The tendril on the stem next to the fruit will also begin to wilt when the melon is fully ripe. Wipe watermelons clean with a damp cloth before storing. Harvest musk- and honeydew melons when they reach the “full-slip” stage when the fruit readily separates (slips) from the stem, leaving a clean stem cavity or scar. All melons are susceptible to chilling injury at temperatures below 50°F. Symptoms include surface pitting, water loss, yellowing, browning of watermelon rinds, decreased sweetness of melons, and rapid deterioration.

Onions

Harvest fresh onions when close to one-fourth of the tops have fallen over; storage onions should be harvested when half to three-quarters of the tops have fallen over. Onions for storage should be dug slightly to break off the roots so the tops can dry down completely and the neck seals. After the neck has sealed, cut the tops from the bulb. Onions grown from seed will store better than onions grown from sets. After harvest, storage onions should be cured at temperatures of 85–90°F for 1 week. Drying is complete when the neck is tight and the outer scales are dry. Store in a cool, dry location. Onions exposed to freezing temperatures will have water-soaked scales.

Green onions and scallions can be harvested any time the tops are at least 6 inches tall and stems are ½–1 inch in diameter. Store in a perforated plastic bag in the vegetable crisper of the refrigerator.

Parsnips

Harvest parsnips after the first light frost to sweeten the roots, but don't expose them to temperatures below 30°F. Remove the tops and wash before storing. Like carrots, parsnips become sweeter with cold storage as more starch is converted to sugar. Harvest roots carefully; bruising during harvest will cause surface browning which will worsen during storage. Parsnips can be stored 4–6 months. Periodically sort through stored parsnips to remove any damaged roots.

Peas

Peas are cool-season crops and can be stored at 32–35°F. Shelling or garden peas are harvested when the pods are fully developed but still bright green; edible pod peas should be harvested before the seeds within enlarge. Peas are highly perishable and need to be stored in plastic bags in the refrigerator.

Peppers

Harvest peppers when fruit is firm. Peppers may be harvested immature (green, yellow, orange, purple, brown) or fully mature (red) depending on your preference. Hot peppers should be harvested when fully mature. Peppers with blossom end rot or sunscald should be used as soon as possible and should not be stored because they will decay more quickly. Peppers are very chilling sensitive and should not be stored at temperatures below 41°F or they will develop surface pits, water-soaked areas, and will decay more quickly.

Potatoes

Harvest “new” potatoes when vines are still green and the tubers are small. Because these immature potatoes have thin skins, they should be refrigerated for best storage.

Dig fall or late-season potatoes after the tops have died and the tubers are fully mature. Gently brush potatoes free of soil. Cure by storing at 45–60°F and 85–95% humidity for 2 weeks to heal cuts and thicken the skin. Store cured potatoes at 40°F and 90–95% humidity for 5–10 months.

Radishes

Remove the tops from radishes before storing. Radishes are not sensitive to chilling and should be stored under cold conditions. Avoid freezing as radishes will shrivel and lose color.

Rutabagas

Rutabagas become sweeter if harvested after frost. Store in a cool, dark place with good air circulation. Remove the tops and store at temperatures as close to 32°F as possible. Rutabagas can be stored for 4–6 months.

Salad greens

Salad greens include leafy crops like lettuce, spinach, and Swiss chard. All are highly perishable and wilt easily. Refrigerate immediately after harvest to reduce transpiration. Do not wash before storage. Store leafy greens loosely packed in a perforated plastic bag. When too much moisture is present during storage, leafy greens turn slimy and brown as the tissue breaks down.

Summer squash

Harvest zucchini, crookneck, and yellow summer squash when they are 6–8 inches long. Scalloped varieties should be harvested when they are 3–6 inches in diameter. Handle summer squash gently to prevent wounds to the skin. Gently wipe the fruit clean with a damp cloth and

Prolong storage life using perforated plastic bags

For storing produce, perforated plastic bags are preferable to solid ones. The holes allow some air movement in and out of the bags while retaining most of the moisture inside the bag. This prevents condensation and reduces shriveling. When produce is stored in sealed bags with no holes, water will condense on the inside of the bag leading to storage rots. You can purchase perforated bags or make your own.

Make your own: There are a variety of ways to perforate bags.

You can make holes using a standard paper punch or a sharp object such as a pen, pencil, or knife. Punch holes approximately every 6 inches through both sides of the bag. If using a knife to create the openings, make two cuts—in an “X” shape—for each hole to ensure good air circulation.

store in the vegetable crisper of the refrigerator. Summer squash is susceptible to chilling injury at temperatures below 50°F; symptoms include surface pitting, water loss, and yellowing.

Sweet corn

Harvest sweet corn when the kernels are full and filled with a milky juice. The silks will be brown and dry at the tip of the ear. Overripe sweet corn will rapidly turn starchy. Sweet corn should be chilled to just above 32°F as quickly as possible after harvest and kept in the refrigerator. The husks can remain on the ear or be removed. Refrigerate in a perforated plastic bag to minimize moisture loss.

Tomatoes

Harvest tomatoes that are firm, shiny, and fully colored for maximum sugar content. Partially ripe tomatoes may be ripened by storing them in a paper bag at room temperature out of direct sunlight. Mature green tomatoes can be harvested in the fall before frost and wrapped individually in newspaper and stored at room temperature until they ripen. Red-ripe tomatoes should not be refrigerated or they will lose their flavor and become overly soft. Periodically check stored tomatoes to remove ripened fruit and fruit beginning to decay.

Turnips

Turnips can be harvested when young but they will be much sweeter if harvested 60–70 days after planting. Remove the tops and wash turnip roots before storing. Mature topped turnips will keep for 4–5 months.

Winter squash & pumpkins

Winter squash and pumpkins should be harvested in the fall before a hard frost. The fruit should be full-size with a firm and glossy rind. Gently test the rind for firmness by pressing a fingernail to it. If mature, the rind will resist fingernail pressure. Wipe the rind clean with a damp cloth. Pumpkins and winter squash require curing before long-term storage. This can be done by exposing the fruit to 80°F temperatures for 7–10 days. After curing, store in cool, dry conditions. For optimum quality, store acorn squash for 5–6 weeks, butternut and pumpkins store for 2–3 months, turban and buttercup for 3 months, and Hubbard squash for 6 months.



Table 1. Storage conditions for commonly grown fruits and vegetables

Commodity	Temp (°F)	Plastic bag*	Duration
FRUITS			
Apples	32–38	Yes	1–8 months
Apricots	32	Yes	1–2 weeks
Blackberries	32	Yes	7–10 days
Blueberries	32	Yes	7–10 days
Cherries, sweet	32	Yes	2–3 weeks
Cherries, tart	32	Yes	2 weeks
Cranberries	32	Yes	2–4 weeks
Currants	32	Yes	7–10 days
Gooseberries	32	Yes	7–10 days
Grapes, American	32	Yes	2–4 weeks
Nectarines	32	Yes	2–3 weeks
Peaches	32	Yes	2–3 weeks
Pears	32	Yes	2–5 months
Plums	32	Yes	2–4 weeks
Raspberries	32	Yes	7–10 days
Strawberries	32	Yes	7–10 days
VEGETABLES			
Asparagus	36	Yes	7–10 days
Beans, snap	41–46	Yes	8–12 days
Beet	32–36	No	1–3 months
Bok choy	32–41	Yes	2–3 weeks
Broccoli	32	Yes	2–3 weeks
Brussels sprouts	32	Yes	3–5 weeks
Cabbage	32	Optional	3–4 months
Carrot	32–38	Optional	7–9 months
Cauliflower	32	Optional	2–4 weeks
Celeriac	32–36	Yes	6–8 months
Chicory	32	Yes	2–4 weeks
Chinese cabbage	32	Yes	3–6 months
Cucumber	50–54	No	2 weeks
Eggplant	50–54	No	1–2 weeks
Endive/escarole	32	Yes	2–3 weeks
Garlic	68–86 (short-term) 30–32 (long-term)	No No	1–2 months 3–9 months
Kohlrabi	32	Optional	2–4 weeks (with leaves) 2–3 months (without leaves)
Leeks	32	Yes	2–3 months
Lettuce	32	Yes	10–14 days

* Plastic storage bags should be perforated. For details on making your own, see instructions in box on page 5.

Table 1. Storage conditions for commonly grown fruits and vegetables (continued)

Commodity	Temp (°F)	Plastic bag*	Duration
Melon, musk and honeydew	50	No	7–10 days
Onions, green	32	Yes	3–4 weeks
Onions, storage	32	No	6–9 months
Onions, sweet	32	No	1–3 months
Parsnip	32–34	Optional	4–6 months
Peas	32	Yes	1–2 weeks
Pepper	45	No	2–3 weeks
Potato, early	40	No	4–5 months
Potato, late	40	No	5–10 months
Pumpkin	50–55	No	2–3 months
Radish, spring or summer	32	No	3–4 weeks (without tops)
Radish, winter	32	No	2–4 months
Rutabaga	32	No	4–6 months
Salad greens	32–36	Yes	2–3 weeks
Squash, summer	41–50	No	1–2 weeks
Squash, winter	50–55	No	2–6 months
Sweet corn	32	Yes	1 week
Swiss chard	32	Yes	10–14 days
Tomato	65–70	No	4–7 days
Turnips	32	No	4–5 months
Watermelon	50–59	No	2–3 weeks

* Plastic storage bags should be perforated. For details on making your own, see instructions in box on page 5.

Table 2. Chilling injury symptoms. To avoid chilling injury, store susceptible produce above 50°F and limit exposure to colder temperatures. Injured produce can be eaten but won't be as good.

Commodity	Chilling injury symptoms
Asparagus	Gray tips and loss of sheen
Beans	Opaque discoloration and rusty spots
Cucumber	Pitting, water loss, yellowing, decay
Eggplant	Pitting and brown spotting
Melon	Pitting, water loss, browning of watermelon rinds, decreased sweetness, decay
Onions	Water-soaked scales
Pepper	Pitting, water-soaked areas, and decay
Summer squash	Pitting, water loss, and decay
Tomato	Pitting and decay
Winter squash, pumpkins	Pitting, water loss, and decay

For more information:

The following publications are available from your Wisconsin county Extension office or from Extension Publications (<http://cecommerce.uwex.edu>, 877-WIS-PUBS).

- Canning Fruits Safely* (B0430)
- Canning Vegetables Safely* (B1159)
- Freezing Fruits and Vegetables* (B3278)
- Homemade Pickles and Relishes* (B2267)
- Safe Canning Methods* (B2718)
- Tomatoes Tart and Tasty* (B2605)
- Making Jams, Jellies and Fruit Preserves* (B2909)
- Canning Salsa Safely* (B3570)
- Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stock* (USDA Handbook 66, available on the web at www.ba.ars.usda.gov/hb66/)

Table 3. Ethylene production rate and exposure symptoms.

Produce with symptoms of ethylene exposure are not unsafe to eat, but may be of lower quality.

Commodity	Ethylene	
	Production rate	Exposure symptoms
Apples	High	Softening
Apricots	Low	Softening
Berries	Low	Softening, browning
Broccoli	Low	Floret yellowing
Brussels sprouts	Low	Leaf yellowing
Cabbage	Low	Yellowing and wilting
Carrot	Low	Bitterness
Cauliflower	Low	Discoloration, hollow stem
Celeriac	Low	Slightly sensitive – toughened root
Cherries	Low	Softening
Chicory	Low	Brown spots on midrib
Chinese cabbage	Low	Leaves separate from head
Cucumber	High in overripe fruit	Yellowing
Eggplant	Low	Browning and decay
Endive/escarole	Low	Leaf yellowing
Leeks	Low	Softening and decay
Lettuce	Low	Brown spots on midrib, leaf yellowing
Parsnips	Low	Bitterness
Pears	High	Softening, internal browning
Peas	Low	Yellowing and decay
Peppers	Low	Immature peppers ripen
Salad greens	Low	Leaf yellowing
Squash, hubbard or green-skinned types	Low	Skin yellowing
Swiss chard	Low	Leaf yellowing
Tomato	Moderate	Immature tomatoes ripen
Watermelon	Low	Thinning and softening of rind



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Authors: Teryl Roper is professor of horticulture; Karen Delahaut is fresh market vegetable specialist; and Barbara Ingham is associate professor of food science. All hold joint appointments with the College of Agricultural and Life Sciences, University of Wisconsin-Madison and University of Wisconsin-Extension, Cooperative Extension. Produced by Cooperative Extension Publications, University of Wisconsin-Extension.

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