NebGuide

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Research-Based Information That You Can Use

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Storing Fresh Fruits and Vegetables

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The following NebGuide outlines proper storage methods and conditions for fresh fruits and vegetables. It also provides methods for creating good storage conditions within the home.

Harvesting fruits and vegetables from your garden at the proper stage of maturity is only the first step to fresh table quality. Proper harvesting and post-harvest handling methods, as well as proper storage of fruits and vegetables not immediately eaten, will help maintain the flavor, texture and nutritive value of the produce.

Proper storage means controlling both the temperature and relative humidity of the storage area. All fruits and vegetables do not have the same requirements. This NebGuide will help you select the best storage conditions for homegrown and purchased produce.

Pre-Harvest Considerations

Food safety recommendations state raw manure applications must be made a minimum of 120 days prior to harvest for any produce where the edible portion is in direct contact with the soil and 90 days prior to harvest if the edible portion is not in direct contact with the soil. Guidelines differ for composted manure applications. Plant based compost is not considered raw manure.

Food safety is also a concern when flooding occurs in a vegetable garden. Remove and destroy produce if the edible portion is in contact with floodwaters.

Follow all label directions regarding post-harvest intervals when pesticide applications are made before harvesting produce. A post-harvest interval is the number of days produce must remain in the garden allowing breakdown of the pesticides to occur before produce is harvested.

Harvest Methods and Post-Harvest Care

Most fruits and vegetables are easily bruised if not handled carefully. When harvesting, treat produce as if it were fine china. Tossing fruits and vegetables into baskets or boxes may not leave visible bruises and damage, but decay will begin under the skin. Seemingly sturdy vegetables such as sweet potatoes are actually quite tender and will not store well if bruised.

Best practices for food safety encourages the use of washable containers when harvesting and during storage of produce.

Not all produce should be washed upon harvest but always use potable water if produce is washed. Berries, for example, are very delicate and fragile. Rinse them in cold water just before consuming, as prior washing will cause them to break down and turn mushy. Potatoes store better if they have a fine layer of soil left on the skin to reduce moisture loss and prevent the infestation of water-borne bacteria or fungi. Water can transport bacteria and fungi into the pores of fruits and vegetables as well, reducing viable storage time.

Some produce, however, is washed and dried before storing. Commercial packing houses use sanitizers in the packing line water to kill fungi, bacteria and yeast that might otherwise cause spoilage. Sodium hypochlorite (liquid bleach) is the most readily available of these sanitizers. Excessive use of hypochlorite can result in off-flavors, tis-

sue damage and may change the surface pH of the produce, encouraging microbial growth. Therefore, it is important to use only the recommended amount of bleach in the wash water when cleaning produce. Cool produce before washing and use wash water no more than 10 degrees cooler than the fruits. Do not allow produce to soak in wash water. This helps prevent the movement of bacteria and sanitizers into the fruits during washing. Crops that may benefit from rinsing with water and very diluted chlorine bleach are noted in Table 1.

Table 1. Storage Requirements for Fruits and Vegetables

Commodity	Storage Temperature* (°F)	Relative Humidity (%)	Average Storage Life	Storage Notes
Vegetables				
Artichoke, Jerusalem	31–32	90–95	2–5 months	
Asparagus	32–36	95–100	2–3 weeks	
Bean & pea, dry	32–40	65–70	1 year	
Bean, green or snap	40–45	90–95	7–10 days	
Bean, lima	37–41	90–95	5–7 days	
Beet (topped)	32	90–95	3–5 months	
Broccoli	32	90–95	10–14 days	
Brussels Sprout	32	90–95	3–5 weeks	
Cabbage, late	32	90–95	3–4 months	
Cabbage, Chinese	32	90–95	1–2 months	
Carrot	32	90–95	4–5 months	Trim tops to 1/2”
Cauliflower	32	90–95	2–4 weeks	
Celeriac	32	90–95	3–4 months	
Celery	32	90–95	2–3 months	
Chard	32	90–95	7–10 days	
Collard Greens	32	90–95	10–14 days	
Corn, sweet	32	90–95	4–8 days	
Cucumber	50–55	90–95	10–14 days	
Eggplant	45–55	90–95	1 week	
Endive, escarole	32	90–95	2–3 weeks	
Garlic	32	65–70	6–7 months	1, do not remove skins
Horseradish	30–32	90–95	10–12 months	
Kale	32	90–95	10–14 days	
Kohlrabi	32	90–95	2–4 weeks	
Leek	32	90–95	1–3 months	
Lettuce	32	95	2–3 weeks	
Melon, muskmelon (Cantaloupe)	32–40	85–90	5–14 days	
Melon, honeydew	45–50	85–90	3–4 weeks	
Melon, watermelon	40–50	80–85	2–3 weeks	
Mushroom	32	90	3–4 days	
Okra	45–50	90–95	7–10 days	
Onion, dry	32	65–70	1–8 months	1, do not remove skins

Commodity	Storage Temperature* (°F)	Relative Humidity (%)	Average Storage Life	Storage Notes
Onion, green	32	90–95	3–5 days	
Parsley	32	90–95	1–2 months	
Parsnip	32	90–95	2–6 months	
Pea, green	32	90–95	1–3 weeks	
Pepper, dry	32–50	60–70	6 months	4
Pepper, sweet	45–50	90–95	2–3 weeks	4
Potato, late	40–45	90	2–9 months	4
Pumpkin	50–55	70–75	2–3 months	2, 4
Radish	32	90–95	3–4 weeks	
Rhubarb	32	95	2–4 weeks	
Rutabaga	32	90–95	2–4 months	
Salsify	32	90–95	2–4 months	
Spinach	32	90–95	10–14 days	
Squash, summer	40–50	90	5–14 days	
Squash, winter	50–55	50–75	2–6 months	2
Sweet Potato	55	85–90	4–6 months	1, 4
Tomato, mature green	55–70	85–90	1–6 weeks	2, 4
Tomato, colored, firm	46–50	85–90	4–10 days	2, 4
Turnip	32	90–95		
Fruits				
Apple	30–40	90	3–8 months	4
Apricot	31–32	90	1–2 weeks	
Avocado	50–55	90–95	3–10 days	
Blackberry	31–32	90–95	2–3 days	3
Blueberry	31–32	90–95	2 weeks	3
Cherry, tart	32	90–95	3–7 days	3
Cherry, sweet	30–31	90–95	2–3 weeks	3
Grapefruit	40–50	85–90	4–6 weeks	
Grape	31–32	85	2–8 weeks	
Orange	32–40	85–90	3–10 weeks	
Peach	31–32	90	2–4 weeks	
Pear	29–31	90–95	2–4 months	4
Plum	31–32	90–95	2–4 weeks	
Raspberry	31–32	90–95	2–4 days	3
Strawberry	32	90–95	5–7 days	3

Storage Notes:
1. Do not wash, brush off excess soil
2. Wash with 1 teaspoons of 8.25 percent liquid chlorine bleach in one gallon of water, but do not allow produce to sit and soak in wash water
3. Do not wash before storing, rinse just before using
4. See detailed section on storing this product

*Fruits and vegetables of tropical and subtropical origin may be damaged by cool temperatures. Chilling injury, a result of prolonged exposure to low but not freezing temperatures may interrupt the ripening process. Symptoms of chilling injury include dark, circular pits on the surface, shriveling, internal darkening, loss of the ability to ripen and the development of off-flavor and poor texture. Careful attention to the storage conditions will help achieve maximum post-harvest life.

Table 2. Ideal Temperatures and Humidity Levels for Curing Vegetables

Commodity	Curing Temperature (°F)	Curing Relative Humidity (%)	Length of Curing Time	Storage Temperature after Curing (°F)
Irish Potato	60–70	80–90	10–14 days	35–45
Onion	60–80	40–50	7–14 days	32
Pumpkin	80–85	80–90	10 days	55–60
Sweet Potato	80–95	95	10 days	55
Winter Squash (except acorn)	80–85	80–90	7–14 days	55–60

Curing Vegetables to Improve Shelf-life

Several vegetables benefit from post-harvest curing. Curing heals or suberizes injuries from harvesting operations. It thickens the skin, reducing moisture loss and affording better protection against insect and microbial invasion. Curing is usually accomplished at an elevated storage temperature and high humidity.

In Home Storage

Produce can be cured in home storage areas. Temperature and humidity should be managed as accurately as possible, especially in outdoor locations. A space heater in an enclosed area can provide the needed heat for curing. Humidity can be increased by over-laying containers with sheets of plastic. Plastic bags, lined boxes, metal or plastic cans with lids or crocks also increase humidity around the stored produce. A humidifier will maintain humidity in an otherwise dry storage location. Or maintain moisture around produce by storing it in damp sand, sawdust, or peat moss. Use these materials for one storage season only, then use them as mulch or a soil amendment in the garden. They may accumulate mold or bacteria and reduce produce storage time if used more than one season.

Ensure that temperature is closely monitored, especially in outdoor locations. Place the produce in peat moss to help keep the humidity high. Do not store produce directly below raw meats to prevent contamination from food pathogens.

Check stored produce periodically throughout the winter for signs of decay or growth. Remove decaying produce from the storage area immediately to reduce the chance of decay in other products stored nearby.

Specifics for curing and storage of different types of vegetables are listed below.

In Garden Storage

Root crops such as beets, carrots, rutabagas, parsnips and turnips can be left in the garden into late fall and early winter. A heavy mulch of straw will help prevent the ground from freezing so the roots can be dug when needed. The mulch will also maintain the quality of the roots, as it will reduce repeated freezing and thawing of the vegetables. Many people prefer the taste of these root crops after they have been frosted because their flavors become sweeter and milder.

When temperatures drop low enough to freeze the ground under the mulch, finish harvesting the roots. Cut off all but one-half inch of the top and store at 32° to 40°F in high humidity to reduce shriveling.

Recommended Handling of Specific Vegetables and Fruits

Irish Potatoes

Late-crop potatoes are better for long-term storage than early potatoes since outdoor temperatures are usually lower when they are harvested. After harvest, cure late potatoes by holding them in moist air for 1 to 2 weeks at 60 to 75°F. Wounds will not heal at 50°F or below. After curing, lower the storage temperature to about 40–45°F. Potatoes will keep even longer at 35–40°F but at 35°F, potatoes tend to become sweet. This condition can be corrected by holding the potatoes at about 70°F for a week or two before you use them.

Potatoes will keep well for several months in a cool basement or cellar. They keep best in moderately moist air, which helps prevent shriveling. Do not wash potatoes before they are put into storage.

Store potatoes in the dark; exposure to light causes them to turn green. The green pigment contains the toxic alkaloid solanine. Green sections of potatoes should be removed before cooking.

Onions

Harvest onions when the tops have fallen over and begun to dry. Do not bend over the tops during the growing season to "force the energy into the bulb". This practice reduces the growth of the onions as they will not be able to translocate sugars to the bulb for storage.

Commercially, onions are dug, windrowed and allowed to cure in the field before they are picked up. Home gardeners should cure onions after harvest by spreading them in a single layer on screens in the shade or in a well-ventilated garage or shed for 1 to 2 weeks or until the tops are completely dry and shriveled. If the bulbs are exposed to full sun, prevent sunscald by covering with a light-weight cloth. When the tops are dry, they should be trimmed to 1 inch lengths, however if the onions are to be braided for storage the tops can be left attached. Leave the onion's dry outer skins on; they help reduce bruising, shrinking and act as an insect barrier.

Store onions in shallow boxes, mesh bags or hang them in old nylons in a cold, dry, well-ventilated room. Or braid the leaves of onions for hanging and storage. Temperatures close to 32°F will give the longest storage. Products prone to absorb odors or flavors should not be stored close to onions.

Sweet and Hot Peppers

Mature, green bell peppers can be kept for 2 or 3 weeks if handled properly. Firm, dark-green peppers free of blemishes and injury are best for storage.

To prevent chilling injury, pick peppers just before frost or before frost threatens if daytime temperatures are consistently below 45°F. Wash them with water containing 1 1/2 tsp. of chlorine bleach per gallon of water. Dry and sort according to maturity and firmness. Store peppers in boxes lined with plastic or in plastic bags, which have several 1/4" holes punched in them to maintain high humidity. The temperature should be between 45 and 50°F. Fully mature green peppers may turn red during storage, which does not affect the flavor of the peppers.

Hot chile peppers are easiest to store after they are dry. One exception is habanero or Scotch bonnet type peppers. These do not dry well except in a dehydrator. Peppers can be dried by either pulling the plants and hanging them upside down or by picking the peppers from the plants and stringing together. Ripe chili peppers can be dried in a forced air dehydrator, but it is usually not necessary to do so.

Tomatoes

With care, mature green tomatoes will keep and ripen for about 4 to 6 weeks in the fall. Some cultivars have been developed for even longer storage. Tomatoes from nearly spent vines are more subject to decay and are usually not as good as those from vigorous vines. A late planting of tomatoes will provide vigorous vines from which fruit can be harvested for storage.

Harvest tomatoes just before the first killing frost. If an unexpected frost occurs, undamaged fruits can be salvaged and ripened. Prevent chilling injury to the fruit by harvesting everything when temperatures drop regularly to 32° to 50°F.

To store, pick the tomatoes and remove the stems. Reduce rots by disinfecting fruits by washing in water with 1 1/2 teaspoons of chlorine bleach per gallon of water. Dry thoroughly with a soft cloth.

Pack tomatoes 1 or 2 layers deep in shallow boxes. Reduce bruising by separating those showing red; they will ripen sooner and can be used first.

Pumpkins and Winter Squash

Harvest mature fruit with hard rinds before frost. Leave the stem on when cutting from the plants to prevent decay organisms from entering. Pumpkins and winter squash will keep best if they are cured for 10 days at 80–85°F. Acorn squash, however, should not be cured but stored at 45°F to prevent stringiness.

Apples

Many cultivars of apples store moderately well under home storage conditions for up to six months. Late maturing varieties are best suited to storage. These apples can be stored in baskets or boxes lined with plastic to help retain moisture. Always sort apples carefully and avoid bruising them. The saying "one bad apple spoils the barrel" is true because apples give off ethylene gas which speeds ripening. When damaged, ethylene is given off more rapidly and will hasten the ripening of other apples in the container. Because of their sugar content, apples can be stored at 30–32°F without freezing the tissue. In general, apples ripen about four times as fast at 50°F as at 32°F, so they should be kept as close to 32°F as possible for long-term storage.

Apples often pass their odor or flavor to more delicately flavored produce and the ethylene given off by apples can accelerate ripening in other crops. When possible, store apples separately.

Pears

For good flavor and texture, pears, except for 'Seckel' must be ripened after harvest. Pick pears when they are fully mature. Fruit is ready to harvest while it is quite firm but the color has lightened to a pale green. It should part easily from the branch when you lift up on the fruit and twist. Pears left to ripen on the tree tend to become grainy or stringy. The center also may turn brown before the exterior shows deterioration.

Pears ripen quickly after harvest when held at 60 to 65°F. Ripening will take 1 to 3 weeks, depending on the type of pear. After ripening, pears should be canned or preserved. To keep pears longer in storage, sort for defects after picking and place sound fruit into cold storage at 29–31°F and 90% humidity. Ripen small amounts as needed, by moving them to a warmer location, 60–65°F. Too high of temperatures (75°F and higher) will cause the fruit to break down without ripening.

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