

Harvesting and storing apples

Storing apples at home is convenient and, if done properly, can be economical. Home-grown fruit that otherwise may go to waste can be stored for several months. However, most homes are not equipped for proper apple storage. Unless you grow your own or have adequate storage facilities available, it is often a better buy to purchase fruit in small quantities that can be stored easily in the refrigerator.

Harvesting

Important keys to a long storage life for home-grown apples are picking at the proper time and storing correctly.

The best time to pick an apple cultivar may vary a week or more from year to year, depending on the time the tree is in bloom and the climatic conditions during the growing season. Cloudy, cool conditions or drought conditions tend to delay fruit maturity. The harvest time also depends on the apple cultivar. See PM 453, *Fruit Cultivars for Iowa*, for approximate harvest times for several apple cultivars.

Home-grown apples that will be stored should be harvested when they have reached minimum maturity but are not yet ripe. Mature apples are full-size and have a light straw or greenish-yellow undercolor. The undercolor is the “base” color beneath the red blush. The intensity of the red color is not an indicator of maturity. At minimum maturity, apples will be hard and crisp. They will have developed their characteristic flavor but will be somewhat starchy.

Fruit does not die when harvested. It remains a living organism that continues to take in oxygen and give off carbon dioxide. After harvest, an apple no longer receives nutrients from the tree and, since it is still respiring, it must use the food it has stored over the growing season. As this food is gradually used up during storage, the sugar, starch, and acid content of the apple change. Eventually the tissue breaks down; the apple becomes mealy, and develops an “off” flavor. Loss of water can cause the fruit to become rubbery. Proper apple storage preserves the quality of the fruit by slowing ripening and reducing water loss.

Storing

The length of time apples remain good in storage depends on the apple cultivars, stage of maturity at picking, handling before storage, how soon they are cooled down, and the temperature and humidity of the storage area.

If large quantities are to be stored for an extended period of time, selecting the proper cultivar is important. Some

cultivars will keep quite well if stored under the proper conditions, while others will not. Most early ripening cultivars, such as Lodi, are good for immediate use but have a very short storage life. Red Delicious, and Golden Delicious are considered good storage apples (see table).

Storage life of several apple cultivars at 30-32°F. and 90-95 percent relative humidity

Cultivar	Storage life
Lodi	1-2 weeks
Wealthy	3-10 weeks
Cortland	3-4 months
McIntosh	3-4 months
Golden Delicious	3-5 months
Jonathan	3-5 months
Red Delicious	3-5 months
Chieftain	3-6 months

Sort the apples that are to be stored. Remove any that are bruised, cut, or show signs of decay. Plan to consume the larger fruit of any cultivar first, saving the smaller ones for later in the season. The larger apples are usually the first to lose their quality and show signs of internal breakdown.

Low temperature slows the respiration rate and preserves good quality. Apples last several times longer at 32°F than they do at 70°F. Most apple cultivars should be stored at 30 to 32°F for optimum storage. However, McIntosh apples should be kept around 36°F. If possible, the storage temperature should remain constant. The freezing temperature of apples is 27.8 to 29.4°F, so it is best not to store apples in unheated locations where the temperature may get too low. Once thawed, frozen apples deteriorate quickly, resulting in softening of flesh and loss of texture.

Relative humidity must be kept high, between 90 and 95 percent, in a fruit storage area. If the humidity is not maintained, apples dehydrate and shrivel, particularly Golden Delicious.

Apples can be kept well in humid cellars that maintain a cool temperature below 40°F. They also can be stored in unheated outbuildings or garages, in Styrofoam chests, or with hay or other insulating materials piled around them to prevent them from freezing.

Apples should be kept in containers lined and covered with polyethylene to help retain the humidity.

Storing small quantities

Unfortunately, most homes are not equipped for proper apple storage. It may not be economically wise to buy large quantities of apples unless proper storage is available or the fruit will be used in a short period of time.

Small quantities of apples are usually sold in perforated plastic bags. Storing the fruit in these or similar bags in a cool refrigerator will greatly reduce the respiration rate and the fruit should remain firm and crisp until used. The atmosphere inside the plastic bags is usually quite humid, whereas the atmosphere of the refrigerator has a lower humidity that tends to pull moisture out of the fruit, causing it to shrivel. The holes in the bags eliminate the buildup of carbon dioxide and excess moisture inside the plastic bags. Apples also can be stored in unperforated polyethylene bags. However, the bags should not be tied shut. After the fruit has cooled down, the open ends should be folded over.

If an old, operating refrigerator is available, it can be used to store larger quantities of apples. However, the fruit should be kept in plastic bags to prevent drying out. Check the refrigerator's temperature setting before using it for fruit storage. Many refrigerators are designed to compensate for being opened several times a day, and if the door is opened only a few times a week, the temperature may go below freezing.

Storage disorders of apples

Apples may develop physiological disorders in storage. Several of the problems can be controlled by altering the harvest period or modifying the storage environment.

Scald

Scald is a serious storage disorder of apples, occurring most often on apples that are picked at their minimum maturity. Scald is caused by the buildup of volatile gases just under the skin.

Soft scald affects all apple cultivars. It appears as blister-like or burnt areas over the skin. These are often brown and slightly sunken. The flesh beneath these areas is usually soft and slightly discolored.

Harvest fruit at minimum maturity if scald has been a problem. If scald persists on a cultivar, the fruit can be individually wrapped in newspaper that has been lightly misted with mineral oil.

Water core

Water core is a disorder that can develop in the field, in storage, or it can develop in the field and disappear in storage. Its occurrence is influenced by environmental conditions. Apples that are exposed to the sun and develop a high internal temperature during the day are more susceptible. Water core develops in the area around the vascular bundles of the core line. The cells in this area will have a glossy appearance. A water core apple tastes sweeter than one not showing the symptoms, and with some cultivars the fruit will develop a slight "off" flavor.

Water core is a sign of overmaturity and is prevalent in Red Delicious apples when they are left on the tree to develop a deeper red color. To prevent water core, harvest the fruit early, at minimum stages of maturity.

Jonathan spot

This disorder is most prevalent on Jonathan apples but will occur on other cultivars as well. It is a skin disorder associated with the lenticels (tiny dots on the skin of apples). The skin around the lenticels develops dark colored, sunken spots. This occurs on fruits when stored for an extended period, or earlier on fruits that were harvested late. The dark colored side of fruit is more susceptible to Jonathan spot than the shaded side.

Harvest fruit as soon as it reaches minimum maturity and place it in cold storage immediately. Maintain the storage temperature at the optimum.

Internal browning

Internal browning shows up as brown streaks in the flesh, radiating out from the core. It is a symptom of low temperature injury. It is prevalent in McIntosh when stored at or near 32°F. It can be controlled by storing these cultivars at 38°F.

Internal breakdown

This browning or discoloration of the flesh indicates the end of the normal storage life of the fruit. Usually the first symptoms show in larger fruit. Internal breakdown can be caused by overmature fruit at harvest, a delay in getting the fruit cooled down, a high storage temperature, or too long in storage.

Alternatives to fresh storage

Often it is impossible to consume or store all the apples produced in the backyard orchard. Drying, freezing, and canning are alternative storage methods. How-to information is available in these publications:

PM 1045, Freezing Fruits and Vegetables
PM 1043, Canning Fruits and Tomatoes

Additional information and publications are available at these Web sites.

www.extension.iastate.edu/store

www.extension.iastate.edu/healthynutrition/food/preservation

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