



Pears



Pear Handling Manual

www.usapears.org/trade

INTRODUCTION

According to the USDA, pears are among the top twenty most popular fruits purchased by Americans. They make a healthy go-to snack or recipe ingredient, offering families an excellent source of fiber and a good source of vitamin C, with no fat, sodium, or cholesterol.

The United States ranks among the top three pear-producing countries in the world, with 84% of the fresh pears in the U.S. hailing from the Pacific Northwest states of Washington and Oregon. The more than 1,500 pear growers who maintain the bountiful orchards of this lush region are renowned for their collective commitment to quality.

From tree to table, Washington and Oregon's pear growers and shippers demonstrate their dedication to producing the finest quality fruit. They cultivate, harvest, store, and pack pears using state-of-the-art pre- and post-harvest techniques and equipment, all to ensure the pear is at its peak flavor once it reaches the consumer.

Each link in the supply chain plays an important part in maintaining the pear's quality. This manual was developed by Pear Bureau Northwest to support and educate organizations involved in storing, conditioning, displaying, or merchandising pears from Washington and Oregon. Working together, we will provide families with the healthy, ripe, sweet, and juicy pears they crave, and will keep them coming back for more.

The handling of pears, like any other produce item, is shaped by each season's characteristics. The guidelines set forth in this manual should be implemented in conjunction with the unique circumstances of a given pear season. Some of these circumstances include harvest maturity, time since harvest, quality, and condition.

The Pear Bureau offers comprehensive support for pear conditioning, merchandising, and promotion. To learn more, visit www.usapears.org/trade, or contact your Pear Bureau Regional Marketing Manager, or call us at 503-652-9720.



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NORTHWEST PEAR GROWING REGIONS

Within the vast and diverse geography of the United States, the Pacific Northwestern states of Washington and Oregon produce the majority of North America's fresh pears. In these states, the following four regions have the ideal combination of climate, fertile volcanic soil and available water, producing some of the world's finest pears.



Wenatchee - The city of Wenatchee, located in the North Central Washington growing region, is named for Chief Wenatchee, once head of the powerful Yakima tribe. The name Wenatchee is a Native American word believed to mean "boiling waters," a fitting description of the turbulent rapids of the Wenatchee River that tumbles through the surrounding canyons.



Yakima - According to Native American legend, the word Yakima means "black bear." Each year, the fertile soil of the beautiful Yakima Valley brings thousands of acres of pear trees into bloom.



Mid-Columbia - The Columbia River flows through the Columbia Gorge as it passes through the heart of the Mid-Columbia region. This abundant pear-growing region begins just north of White Salmon, Washington and stretches south through Hood River, Oregon to the slopes of Mt. Hood.



Medford - Southern Oregon's Rogue Valley is as rich in lush pear orchards as the surrounding area is rich in history. The area around Medford and the neighboring town of Jacksonville, a designated National Historic Landmark, serves as a time capsule dating from Oregon's early pioneering days.

PEARS: AN EARLY HISTORY

The first mention of pears was as a medical ingredient found on a clay tablet in Sumer in ancient Mesopotamia, around 2,750 B.C. The history of domesticated pears is probably even older. In 10 B.C., Homer referred to pears as a “gift of the gods,” and one of the fruits present in the Garden of Alcinous.



For centuries, historical records have made note of pears gracing the tables of monarchies throughout Persia, China, and Rome. As civilization spread, thousands of varieties came to be cultivated throughout Europe.

IN NORTH AMERICA

Pears arrived in the New World with the British and Europeans during the colonial period. Modern pears grow throughout the world, but no other area matches the ideal growing conditions of the Pacific Northwest of the United States. Here, in the shadows of volcanic mountain peaks, a perfect combination of soil, climate, and available water produce beautiful, sweet, and juicy pears enjoyed around the world.

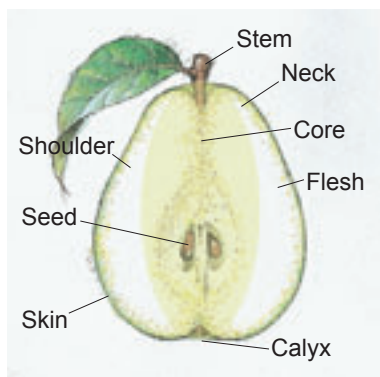
MODERN VARIETIES OF PEARS

The common pear (*Pyrus communis*), native to regions in southeastern Europe and western Asia, is an ancestor of today's popular varieties. Anjou, Bosc, and Comice were first cultivated in France and Belgium for their delicate flavor and texture and their long storage life.

It was this cultivation that developed the prized "melt in your mouth" texture that earned them the nickname "butter fruit."



Of the many varieties of pears in the world today, Washington and Oregon produce ten major varieties and a range of small-production varieties. Early harvested varieties, mainly Bartlett, Red Bartlett, and Starkrimson, are referred to as summer pears, while later-harvested varieties such as Anjou, Bosc, and Comice are known as winter pears, which are available throughout the winter months and beyond. Most varieties are grown both conventionally and organically.



The anatomy of a pear: industry standard terms for parts of a pear



GREEN AND RED BARTLETT

***Signature sweet pear flavor and
aroma with abundant juice***

Bartlett pears (also known as Williams pears outside of the US) are a classic bell-shaped variety that change color as they ripen. The Bartlett changes from green to yellow, while the Red Bartlett brightens to a vibrant red as it ripens. Its sweet and aromatic flavor is ideal for fresh eating, desserts, canning, and salads.

Availability:

Green Bartlett: August - February

Red Bartlett: August - February



STARKRIMSON

***Aromatic, refreshing, and
delicately sweet***

Named for its brilliant crimson color, the Starkrimson is a beautiful red pear with a shape similar to a Bartlett. The Starkrimson brightens as it ripens and is wonderful for eating fresh out of hand, in salads, or in fresh applications that show off its vivid skin color.

Availability: August – January



GREEN AND RED ANJOU

Refreshingly sweet and juicy with a slightly tangy flavor and hint of citrus

The Green Anjou is egg-shaped in appearance and its skin shows little or no change in color as it ripens. Anjous are very juicy and have a sweet, mellow flavor. They are a favorite all-purpose pear that is excellent for eating out of hand, in salads and in all types of cooking applications.

Availability:

Green Anjou: September - July

Red Anjou: September - June



BOSC

Crisp, spicy, and woodsy with a honey sweetness

Bosc pears are identified by their long, tapering neck, long stem, and cinnamon-brown russet color. Bosc pears show little color change as they ripen. When ripe, the flesh is crunchy, yet tender and sweet. The Bosc's firmer flesh makes it ideal for baking, broiling, poaching, and is also wonderful when simply eaten fresh out of hand.

Availability: September - May





COMICE

Succulent, buttery, and exceptionally sweet

Comice pears have a full, rounded shape with a short neck and stem. This juicy and sweet pear is greenish-yellow in color, sometimes with a red blush. A natural, spotty russet is also common. Comice are usually at their best during the winter holiday season, when they're often found in gift boxes and fruit baskets.

Availability: September - March



CONCORDE

Crisp and sweet with a distinct note of vanilla

The Concorde is a unique pear variety that combines the best features of the Comice and Conference varieties. The Conference, a popular European-grown pear variety, is similar to the Bosc pear in flavor, shape, and texture. Known for its elongated neck and firm, dense flesh, the Concorde has a vanilla-sweet flavor. The Concorde's green skin, often with golden brown russeting, shows little color change as it ripens. It is ideal for any cooking or baking use, as well as for fresh eating.

Availability: September - January

FORELLE

Crisp, tangy, and refreshingly sweet

The Forelle is a medium-to-small bell-shaped variety. Forelle is German for “trout,” named for the natural freckles found on the pear’s skin. As it ripens, the Forelle gains a golden yellow skin with brilliant red blush and pronounced freckles, or lenticels. The flesh is crisp, sweet and juicy. Forelle pears are perfect for snacking and cooking.

Availability: September - March



SECKEL

Bite-sized, crunchy and ultra-sweet

The Seckel is the smallest of the USA Pears varieties. Seckels are elliptical in shape with either a coloring of dark maroon or olive green with maroon blush. Its sweet, aromatic, and spicy flavor rates the Seckel among the best dessert pears.

Availability: September - March



OTHER RED VARIETIES

















































Several other varieties of red pears are available, each with a slightly different shade and flavor. All are attractive and eye-catching.

Availability: August – March



AVAILABILITY

Today, USA Pears are available year-round. Below is an average availability period for the major Northwest pear varieties.

	AUG	SEPT	OCT	NOV	DEC
GREEN BARTLETT					
RED BARTLETT					
GREEN ANJOU					
RED ANJOU					
BOSC					
STARKRIMSON					
COMICE					
CONCORDE					
FORELLE					
SECKEL					
OTHER RED VARIETIES					

JAN	FEB	MAR	APR	MAY	JUN	JUL
						
						
						
						
						
						
						
						
						
						
						



HARVEST

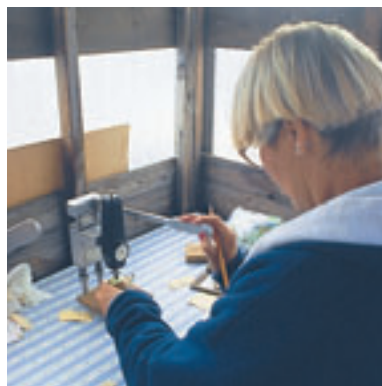
As pears are one of the few fruits that do not ripen successfully on the tree, they are harvested when they reach full maturity. Then, after a period of cold storage, they ripen at a later date. Each and every pear is picked by hand to avoid bruising, and then carefully placed in orchard bins.



HARVEST PROCEDURES

Growers use several methods to determine when harvest should begin, including measuring firmness, sugar content, and sometimes, skin color:

- Firmness is determined by a force gauge called a penetrometer that measures the pounds of force it takes for a rounded plunger to penetrate a peeled section of the pear.
- A sample of juice is tested to estimate the soluble solids or sugar content.
- For some varieties, the skin of the pear while on the tree is compared with standard color plates to determine proper color.



As their growing season progresses, pears are tested for maturity. Indices such as firmness of flesh, soluble solid content of the fruit and, in some varieties, skin color are used to determine the best time to harvest.

These tests help ensure that the pears will have maximum storage life and fine eating quality.

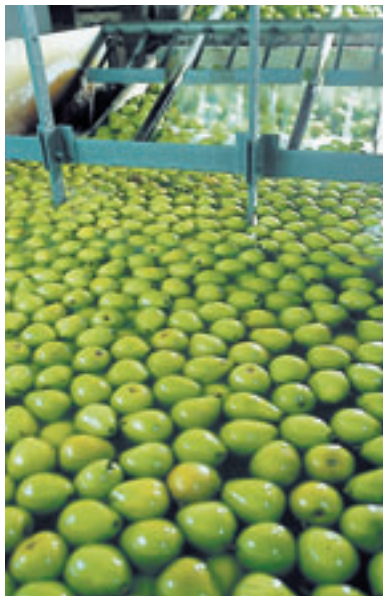
Once the harvest begins, pears are individually picked by hand and placed gently into orchard bins, then brought to the packing house for cooling, sorting, grading, packing, and storage.

POST HARVEST

Freshly harvested pears are stored in bins for 3 to 5 weeks to cool and slow the ripening process, so pears arrive at their destination fresh and ready to ripen.



After cooling, the pears travel through a gentle watercourse to an inspection location where the fruit will be segregated by size and grade. Each pear is examined and judged on standard criteria established by the United States Department of Agriculture (USDA).



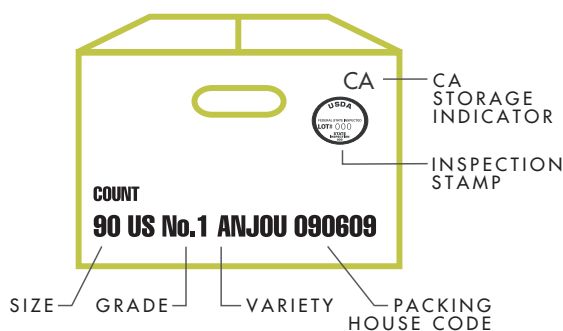
PACKING

When bins of harvested pears are brought from the orchard to the packing house, they are immediately placed under refrigeration to slow the ripening process for short- or long-term storage. In fact, winter pears require time in cold storage or exposure to ethylene to ensure proper ripening.

In the packing house, pears travel through a gentle watercourse and conveyer, where they are sorted by size and grade. Each pear is examined and judged by standard criteria established by the United States Department of Agriculture (USDA).

Grading is based on criteria such as fruit shape and defects. Although the USDA has set grading guidelines, oftentimes packing house standards are even more stringent.

USDA or state inspectors and packing house personnel are onsite to inspect the fruit before it leaves the packing facilities.



A stamped label appears on all boxes of USA Pears.

USDA PEAR GRADES

U.S. NO. 1

1. Puncture: none
2. Scab: none
3. Smooth net-like russetting: $\frac{1}{3}$ surface
4. Frost russet: $\frac{3}{4}$ inch
5. Rough russet showing frogging: $\frac{1}{2}$ inch
6. Limbrub, cracked, soft, more than slightly depressed: none
7. Black limbrubs: $\frac{3}{8}$ inch
8. Dark brown limbrubs: $\frac{1}{2}$ inch
9. Slightly rough, light limbrub: $\frac{3}{4}$ inch
10. Smooth, light-colored limbrub: 1 inch
11. Hail or similar depressions or scars: $\frac{3}{8}$ inch
12. Cork Spot: one inch spot, or if flesh materially affected
13. Blister mite: superficial: $\frac{3}{8}$ inch
14. Healed stings: 2
15. Psylla: thin $\frac{1}{4}$ of surface, moderate $\frac{3}{4}$ inch, heavy $\frac{1}{2}$ inch

U.S. NO. 2 (Fancy)

1. Scab: $\frac{1}{2}$ inch
2. Hail: $\frac{3}{4}$ inch
3. Smooth net-like russetting: $\frac{2}{3}$ of surface
4. Frost type russetting: 15% of surface
5. Excessively rough russetting, frogging: $\frac{3}{4}$ inch
6. Light limbrub: $\frac{1}{10}$ of surface
7. Slightly cracked limbrub: $\frac{3}{4}$ inch
8. Blister mite: $\frac{3}{4}$ inch
9. Healed stings: 3
10. Cork Spot: aggregate $\frac{3}{4}$ inch or flesh seriously affected
11. Psylla: thin $\frac{1}{2}$ of surface, moderate $1\frac{1}{4}$ inch, heavy $\frac{3}{4}$ inch
12. Sunburn: brown color or flattened

SIZING

Pear size is based on the number of pears that fit in a standardized box designed to hold 4/5 bushel of pears. Sizes generally run from the large 60 count to the small 150 count. A range of packaging is used by the industry, all of which reference the same fruit size standards.



Before being placed in a box, pears are either individually wrapped by hand with thin tissue paper then carefully packed into boxes with a plastic liner, or placed on fitted trays. The boxes are stamped with size, variety, grade, and other packing information.

The fruit is kept in cold storage rooms. For late-season shipping, packing houses store fruit in controlled atmosphere (CA) chambers, where the fruit is kept in a low oxygen environment for successful long-term storage.



Controlled atmosphere chambers enable shippers to store fruit at optimum temperature, humidity, and atmosphere composition (oxygen and carbon dioxide) to maintain high quality for extended periods of time.

Box (Internal Sample)	Sample Value	O ₂	CO ₂	Humidity	Weight	Temp
A1	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A2	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A3	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A4	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A5	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A6	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A7	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A8	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A9	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A10	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A11	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A12	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A13	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A14	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A15	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A16	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A17	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A18	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A19	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F
A20	10.1%	0.0%	10.0%	95.0%	10.0%	35.0°F

Sophisticated facilities and instrumentation ensure exact temperature, humidity and atmosphere composition.

RETAIL OR WHOLESALE WAREHOUSE PROCEDURES

The key to having pears at the desired condition for retail display is based on holding temperatures over the life of the pears once they are harvested, the relative humidity the pears are exposed to throughout their post-harvest life, and their exposure to ethylene. Like any produce, USA Pears should be handled carefully and the cold chain maintained.

Upon arrival at the warehouse, pears should be promptly moved from the loading dock and placed under refrigeration to hold and/or slow further pear ripening.

Ethylene is a naturally occurring hormone generated by many fruits including pears, apples, bananas, and tomatoes. Since ethylene can trigger and speed a fruit's ripening process, it is best to avoid long-term storage next to high ethylene-producing fruits such as avocados and bananas if pear ripening is not desired.



PEAR CONDITIONING OVERVIEW

Conditioning is a process that involves the introduction of ethylene that brings pears to the 'just starting to ripen' state, enhancing a pear's sweetness, juiciness, and flavor while preserving color and firmness. Properly conditioning pears with ethylene provides for a more controlled and uniform ripening. Studies have identified enhanced flavor attributes when pears are ripened with ethylene.*

Consumers have also shown preference for ethylene-conditioned pears.**

Conditioning fruit is a combination of art and science. This section will discuss pear ripening procedures step by step.

Depending on a range of factors, pears may react to temperature and ethylene treatment differently.



Any existing ripening room can be used for ripening pears, such as a banana, tomato, or avocado ripening room.

RECOMMENDED EQUIPMENT

- Airtight ripening room
- Warming and cooling capabilities (31°F to 72°F)
- Good airflow
- Capacity to maintain 90-95% relative humidity
- Ethylene gas introduction device, e.g. cylinder or catalytic generator
- Penetrometer with 5/16-inch (8mm) tip
- Knife and/or peeler
- Pulp thermometer
- Conditioning Log (see page 35)

For sources of needed equipment, visit the UC Davis website: <http://bit.ly/Aw3rTw>

* Rapparini and Predieri, 2003 *Pear Fruit Volatiles. Horticultural Reviews*, 28:237-324

** Consumer data source: Dr. Eugene Kupferman, Washington State University research study of 360 consumer participants, 2008-09 28:237-324

FRUIT PENETROMETER

To check firmness, a force gauge, or penetrometer, is used to measure the pounds of force it takes for a rounded plunger to penetrate a peeled section of the pear. Penetrometers have two sizes of tips. For pears, you will use the smaller, 8mm tip to ensure an accurate reading.



- Remove a thin layer of skin using a knife, potato peeler, or other scraping tool. Make three thin cuts about the size of a finger print, removing the skin on three sides of the midsection of the pear. The cuts should be consistent. Avoid any kind of scuff mark (bruising, sunburning, etc.) on the pear as the pressure may be higher or lower and inconsistent.
- It is best to stand up and place the pear on a flat, even, solid surface, not in your hand or on a box top.
- Reset the penetrometer with the button on the side and use steady, even pressure from your shoulder, press down on the exposed flesh of the pear with an even, fairly rapid pressure. (The measurement should take about two seconds.)
- Push until the penetrometer punches to the designated line on the tip. Reset the penetrometer and repeat for each cut.
- It is best not to test spongy or shriveled pears. Spongy fruit will give an inconsistent reading. Also avoid rough-skinned fruit.

Record and compare average pressures before and after conditioning.

PEAR FIRMNESS LEVELS - BY VARIETY

If you choose to ripen different pear varieties, the following pounds-force guidelines can be utilized as a general reference:

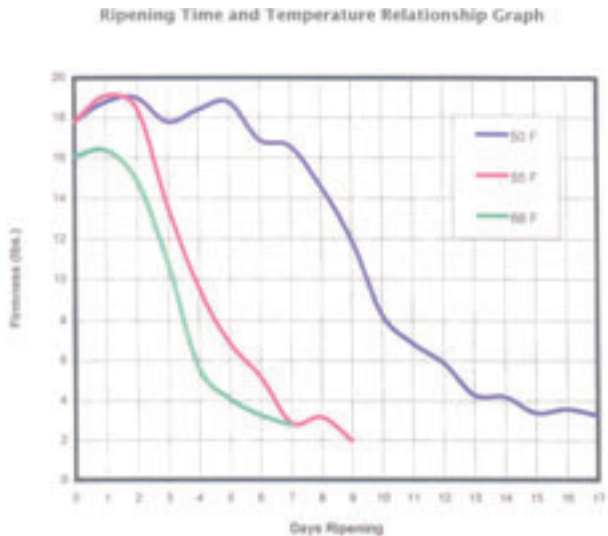
Initiate ripening with ethylene if the average is over:

Bartlett	Anjou	Bosc	Comice	Seckel	Forelle
13lbs	12lbs	12lbs	12lbs	12lbs	12lbs

Depending upon retail desire, there may be no need to condition with ethylene if the average is under:

Bartlett	Anjou	Bosc	Comice	Seckel	Forelle
12lbs	10lbs	10lbs	10lbs	10lbs	10lbs

Ripening Time and Temperature Relationship Graph (Bartlett)



Changes in firmness during ripening will vary based on the fruit temperatures during storage after being conditioned. The chart above shows the time and temperature relationship for Bartlett pears after conditioning.

Source: E. Mitcham, University of California Davis

Research and sales results underscore that conditioning boosts pears sales:

- In a 2002 test*, stores carrying conditioned Anjou pears gained a **16% purchase increase** over control stores selling non-conditioned Anjous.
- Retailers undertaking a conditioned pear program have reported **average sales increases of 25%-50% in the first year.**
- Consumers report they're **willing to pay more** for conditioned pears than non-conditioned pears of the same firmness.**

Conditioned pears meet consumer desires:

- Consumers prefer ripe pears. They want pears to ripen within one to four days of purchase. Only 10% are willing to wait five to six days.**
- Conditioned pears are consistently sweet, juicy, and flavorful.
- Consumers say "sweetness" is the most important reason for liking pears. "Lack of flavor" is the principal reason for disliking an unripe pear.**
- Eliminate shopper confusion. Shoppers learn that pears on display are ripe or will be shortly, rather than having to guess—especially with Anjou pears, which do not dramatically change color as they ripen.

* Conditioned pear impact study conducted by The Perishables Group, 2002.

** Consumer data source: Dr. Eugene Kupferman, Washington State University research study of 360 consumer participants, 2008-09.

PEAR CONDITIONING PROCEDURES

Room Loading

Conventional Rooms

When loading a conventional room, stack and load the fruit to ensure maximum airflow in and around the boxes. The stacking pattern should facilitate airflow around and through the boxes to be most effective in removing heat and carbon dioxide produced by the ripening pears and to ensure uniform distribution of ethylene. Airflow all around each box is necessary to evenly warm the fruit in the middle of the box and pallet. It is also best to leave 1½ feet between the walls and pallets and at least 6 inches between pallets. For effective ripening, it is best if box design has sufficient venting to allow air to flow through the boxes.

Forced Air Rooms

If a forced air ripening system is used and the boxes have proper venting for introducing air through the box, pallets of pears can be loaded into the ripening room without special stacking patterns.

Ripening with Avocados and Bananas

Pear ripening can also be done in conjunction with avocado or banana ripening as the temperatures used are very similar. This is a good option if there is limited ripening room availability. Warm pears to an average of 65°F pulp temperature and place the pallets of pears in with the bananas or avocados. Follow the conditioning procedures for those fruits, removing the pears after 24 to 48 hours. Note that if a forced air room is being used, venting on the pear boxes is important. Be sure to pull the pears out to cool them after conditioning as banana and avocado rooms are not designed to pull fruit temperatures down to 32°F.

Relative Humidity

Maintaining 90 to 95% relative humidity in the ripening room will help minimize water loss and shrivel. This can be accomplished with the aid of commercial humidifiers installed in the room. Another way is to soak the floor of the room before the fruit is placed inside. Be sure that boxes are not stacked on the floor if the latter procedure is used.

PEAR CONDITIONING PROCEDURES *continued*

Ethylene Application

The ethylene concentration recommended for ripening pears is 100 parts per million (ppm). However, more ethylene will not be detrimental. The size of the room will determine how much ethylene to introduce. To determine the size of the room, cubic feet can be determined by multiplying height x width x depth.

Once you determine the volume of the room, follow the directions of the company from which you buy the ethylene in order to determine the quantity to use. Note: Ethylene gas is explosive in concentrations greater than 2.8% (28,000 ppm). However, the amount of ethylene needed for ripening pears is only 100 ppm. You would need 280 times this amount for any chance of explosion. Consult the manufacturer of the system you intend to use for instruction on proper safety procedures. The Pear Bureau's ripening technician can measure the ethylene level.

It is important to note that most pears may not show any visible sign of ripening. Bartletts do change color from green to yellow as they ripen, but winter pears don't significantly change color.

Maturity, fruit firmness, humidity, fruit/room temperatures, and ethylene concentration are all important when ripening pears. The less time in cold storage after harvest and the higher the fruit firmness, the longer the duration of time for ripening fruit. Likewise, late-season fruit will need a shorter period of time for ripe initiation.

CONDITIONING STANDARDS

Based on years of university and government research conducted in Washington, Oregon and California, the Pear Bureau has adopted a set of minimum standards for conditioning Anjou pears with ethylene.*

Recommendations for time, temperature, and ethylene application for red and green Anjou are as follows:

Before and during ethylene introduction, average pear pulp temperatures should be maintained at 65°F, with a minimum concentration of 100 ppm (parts per million) ethylene being applied for a minimum of 24 hours.

As these are minimums, ripeners may choose to lengthen conditioning times depending upon fruit characteristics, pressure, and time of the season.

The industry also agreed to adopt the terminology “conditioned” when talking about the process within the industry and with retailers. The term “conditioning” is not recommended for use when talking to consumers. The words “ripe” or “ripening” are simple, accurate, and easier for consumers to understand.

** Max Villalobos-Acuña, Elizabeth J. Mitcham Ripening of European pears: The chilling dilemma*

PEAR CONDITIONING PROCEDURES *continued*

Conditioning Steps

- Measure firmness on a sample of pears using a penetrometer before loading pears into the ripening room and record the information on the room's ripening log. For each room, keep track of the fruit firmness, room temperature, and pulp temperature after each visit. See page 22 for instructions on proper usage of a penetrometer. A conditioning log is located at the back of this book that can be reproduced on a copier.
- Pears should be warmed to a pulp temperature that measures between 60-70°F (16-21°C) before ethylene introduction, which takes approximately 12 hours. For consistency, an average pulp temperature of 65°F is optimal. Do not allow pulp temperatures to exceed 75°F (24°C), as this can cause breakdown of the fruit flesh. Fruit in boxes with little to no venting will require considerably more time to warm to an average pulp temperature of 65°F.
- Introduce ethylene for at least 24 uninterrupted hours at a minimum concentration of 100 ppm. Note: Ethylene initiates the ripening process, so it is not detrimental to over-expose fruit.
- If rooms are not auto-venting, vent rooms for 20 to 30 minutes after each 24-hour exposure period to remove excess carbon dioxide. Excess carbon dioxide slows fruit response to ethylene, and therefore slows the ripening process. Less than 1% CO₂ concentration is recommended. Avoid entering ripening rooms when ethylene is being introduced. Opening the door will prematurely lower the ethylene concentration. It may be helpful to hang a sign on the ripening room door during ethylene introduction as a reminder to keep the door closed. In a retail warehouse, be careful not to vent ethylene into an area where other ethylene-sensitive items such as leafy green vegetables, cucumbers, and broccoli are stored.

PEAR CONDITIONING PROCEDURES *continued*

- After conditioning, pears should be cooled back down to slow ripening while in transit. For maximum holding, or for long-distance shipping, pears should be cooled to a pulp temperature of 32°F (0°C) before loading into the trailer for transit. Cooling the pears down quickly will help the pressures from falling too low for shipping. Pears do not have a “kill zone” like stone fruit or other produce items. Be aware that cooling can only slow, not stop, ripening. Conditioned fruit will ripen faster once in ambient temperature and needs gentle handling, especially as the firmness decreases. Always handle pears with care.

To allow pears to continue ripening quickly, pulp temperatures can be maintained at 50-60°F (10-16°C). The higher the temperature, the more rapidly the pears will ripen. Remember that the faster a pear ripens, the shorter its shelf life will be.

- Note that immediate drop in pressure or firmness after conditioning may be slight. However, firmness may drop 1 lb-force per day on average once pears reach room temperature.

SHIPPING CONSIDERATIONS

It is important to consider time in transit and on the supermarket shelf in order to determine the best firmness for each situation. Retail or wholesale organizations that are receiving conditioned pears from their pear supplier should ensure that there is timely, accurate, and ongoing communication between supplier and receiver.

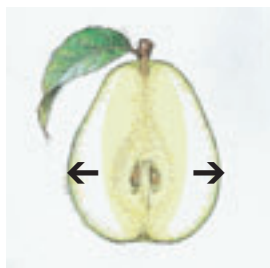
Example: A supermarket may want a lower firmness if fruit has less travel time and will be on the shelf sooner after ripening. Pears will continue to ripen even when refrigerated. However, the closer the fruit is kept to 32°F (0°C), the slower they will ripen. It is important to bring the temperature of the fruit rapidly back down after conditioning, as warmer temperatures will hasten ripening. Cooling should occur within 24 hours after conditioning.

It is also important that receivers and/or QC personnel understand that the company is on a conditioned pear program and they may receive fruit that has a lower pressure upon arrival than they are used to seeing.

DETERMINING RIPENESS

While Bartlett pears change color as they ripen, most other pear varieties do not significantly change color. For winter pears such as Anjou, “check the neck” for ripeness. Pears ripen from the inside out, so it is important to check for ripeness near the stem end (the “neck”). Gently press your thumb near the stem of the pear and if it gives to gentle pressure, it is ripe. By the time a pear is soft around the middle, it may be overripe, so be sure to check the neck for ripeness.

For more accurate firmness determination, use a penetrometer or other firmness tester. See page 22 for details. To slow the ripening process, keep pears under cooler temperatures. Conversely, keep pears at warmer temperatures to maintain or speed up ripening.



Pears ripen from the inside out. Check the neck to determine ripeness. If it gives to gentle pressure near the stem, it is ripe. Pears that are soft around the middle, may be overripe.



Bartlett pears
change color as
they ripen.



4 TO 6 DAYS UNTIL RIPE

2 TO 3 DAYS UNTIL RIPE

READY TO EAT!

Anjou and other
varieties show
little color change
as they ripen.
*Check the Neck
for Ripeness™*



4 TO 6 DAYS UNTIL RIPE

2 TO 3 DAYS UNTIL RIPE

READY TO EAT!

RETAIL PROCEDURES

Retail Receiving and Handling

Like any produce, USA Pears should be handled carefully. Care should be taken to maintain the cold chain throughout the handling process.

- Boxes should be promptly removed from the trailer and placed under the desired holding conditions: store under refrigeration to slow ripening or in ambient temperature to accelerate ripening.
- Regardless of where pears are stored, keep the boxes off wet floors to avoid box breakdown.
- If restacking of boxes occurs, stack pear boxes no more than 5 or 6 boxes high to avoid crushing the fruit in the bottom boxes.
- Rotate on a first in, first out, or ripeness basis.
- Inspect pears daily to judge their degree of ripeness.



Remember, while Bartlett pears change color as they ripen, other varieties such as Anjou show little color change. "Check the neck" for ripeness by gently pressing near the stem of the pear. This area will soften as the pear ripens.



RETAIL DISPLAY AND MERCHANDISING

Retail display of pears is the final step in providing premium quality fruit that drives impulse sales. Pear Bureau research has shown that 76% of pear shoppers say display appearance is important in their decision to buy pears. The basket size for pear purchasers is 1.5 to 2 times larger than non-pear purchasers.



RETAIL DISPLAY AND MERCHANDISING *continued*

Pear purchasers have basket sizes 1½ to 2 times larger than non-pear purchasers. Follow the best practices outlined below to increase your pear sales:

- Display pears prominently and provide a generous amount of space allocation. Pears have one of the highest rates of impulse purchases in the produce department when properly displayed and merchandised.
- Don't waste valuable display space on fruit that is already on everyone's list. Display pears toward the front of the produce department with high visibility to drive impulse purchases. Secondary and end cap displays will help increase sales of pears. Secondary displays during key ad promotions can increase sales as well.
- Create and maintain a pear category impact zone, displaying many varieties together.
- Use as many pear varieties as are available. Pears naturally come in a range of sizes and colors; using attractive color variations and selections will appeal to shoppers.
- Offer two or more sizes to provide customers with choices and potentially increase volume purchases. Consider bulk displays, bagged pears, or totes.
- Handle pears gently, as they bruise easily no matter the stage of ripeness.
- Rotate displays frequently, placing the new or firmest fruit on the bottom of your display and older or ripest fruit on the top.
- Dummy up large displays as necessary.
- Build extra displays of pears when on ad or when featured in-store.
- Utilize side wing or spillovers for additional varieties or when on ad.
- Advertise pears with a recipe or a cross-use item, like cheese or yogurt.
- Promote seasonal themes and holidays. Mass displays suggest a festive occasion and will increase impulse sales.
- Use clear signage and advertisements that describe the unique characteristics and usage of each variety.
- Offer informational leaflets and nutritional data for your customers at pear displays.
- Cross-merchandise with cheese, yogurt, or salad items to encourage impulse purchases.
- Utilize bins for introducing new varieties or special events.
- Increase sales with samplings. Customers make impulse purchases and will buy different varieties if they can sample them.
- The Pear Bureau offers attractive point of sale and skirting materials that help make displays pop and provide your customers with the information they seek.

To increase pear sales, educate your customers. Here are some key talking points:

- While Bartlett pears change from bright green to golden yellow as they ripen, most other pear varieties do not change color. So, Check the Neck for Ripeness!
- Pears are versatile and are delicious in salads, sandwiches, and desserts, as well as in savory entrees and side dishes. Visit usapears.org for recipes and serving ideas.
- How to Check the Neck for Ripeness: Gently press the “neck” or stem end of the pear. If it feels soft, your pear is juicy, sweet, and ready to eat! Pears that feel soft around the middle may be over-ripe.
- The USDA’s MyPlate guidelines recommend making half your plate fruits and vegetables at each meal. Pears are a healthy and delicious choice for meeting your daily servings of fruit.
- Simply leave firm, unripe pears at room temperature to allow them time to ripen at home. Once ripe, they can be stored in the refrigerator for 3 – 5 days to slow further ripening.
- Pears are an excellent source of fiber and a good source of the antioxidant vitamin C. One medium sized pear provides 24% of your day’s fiber and 10% of your day’s vitamin C for only 100 calories!





Pear Conditioning Log

Date Loaded _____ Date of Ethylene Introduction _____

For Shipment (date & time) _____

Unloaded (date & time) _____ No. Boxes _____

	Air Temp in room	Pulp Temp Range	PSI Force	Thermostat Setting	Comments
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Scan with your mobile device to contact the
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www.usapears.org/experts

www.usapears.org/trade

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