

Hard apple cider results from a fermentation process in which yeast converts the sugar in apples into ethanol (alcohol) and carbon dioxide (CO₂). This guide will get you started with the basics of making your own cider from fruit.

Equipment and supplies

- Grinder (aka mill)
- Press
- Filter (e.g. cloth, strainer)
- Plastic siphon tubing
- Funnel
- Fermentation & storage vessel (glass jug or carboy)
- Airlock
- Hydrometer
- Thermometer
- pH strips
- Sanitizer

Ingredients

Apple juice
(unpasteurized & preservative free)

Optional:

- Commercial yeast
- Nutrients
- SO₂ (in the form of campden tablets)
- Sugar
- Malic acid
- Precipitated chalk



image by CityFruit

Step 1: Harvest or acquire fruit

Cider requires apples with a balance of four key qualities: sugar, acid, tannin and flavor.

Sugar – since the fermentation process converts sugar to alcohol (ethanol) and CO₂, the amount of sugar in the apples (and their juice) will determine the final alcohol content of the cider.

Acid – apples contain mostly malic acid and some quinic acid. Acid inhibits microbial infection and is important for flavor. With too little acid, the cider will be dull; with too much acid, it will be tart.

Tannin – contributes bitter and astringent flavors. Crabapples can be used to add tannins to otherwise non-tannic juice.

Flavor – opinions vary on which source apples produce the best cider. Since few apples have the ideal balance of all qualities, most ciders include several varieties of apples. (Kingston Blacks are one exception to this and contain a nearly ideal balance for a single varietal cider.) Traditional cider making apple varieties have been cultivated over time for their contribution to the blend. Examples include:

Quality	Ratio needed	Examples
Sweet	30-60%	Baldwin, Cortland, Dabinett, Henry Masters Jersey, Golden Delicious, Golden Russet, Mutsu, Rome Beauty, York Imperial
Tart / acidic	10-40%	Ashmead's Kernel, Bramley's Seedling, Calville Blanc d'Hiver, Granny Smith, Gravenstein, Jonathan, Newton Pippin, Rhode Island Greening, Wealthy
Bitter / tannic	5-20%	Kingston Black, Cortland, Foxwelp, Liberty, Northern Spy, many russets and crabs
Aromatic	10-20%	Black Twig, Cox's Orange Pippin, Fameuse, Grimes Golden, McIntosh, Ribston Pippin, Red Delicious, Roxbury Russet

Source: Cider Hard & Sweet, Ben Watson

Step 2: Wash, mill and press fruit

Wash the apples to remove unwanted bacteria and other surface contaminants. Also remove any rotten, wormy or moldy parts of the fruit.

Mill the apples by passing them through a hand or electric-powered mill to allow the juice to be extracted and press the pomace (milled apples) as soon after milling as possible into a clean stainless steel or plastic container. Keep the juice from the different apple varieties separate while pressing so that you can taste and blend the raw juice.

Strain the juice into the fermentation vessel (e.g. jug, carboy, stainless steel tank) by passing the juice through a strainer and/or cheesecloth to pull out larger pomace pieces. It isn't necessary to get the juice entirely clear since you will be clarifying through a racking process later on. Set aside a small amount of fresh juice so that you can "top off" the cider as fermentation slows.



Cider press - image by Doug Kerr

Step 3: Measure gravity & adjust juice for acid and sugar

The specific gravity (S.G.) of the juice should be around 1.050 – 1.055 as measured with a hydrometer. If the S.G. of the juice is too low, add sugar to bring it to this level. About 2- 1/2 ounces of sugar (~ 1/3 cup) added to a gallon of juice will raise its gravity by approximately 5 degrees (.005 on a hydrometer). You can either dissolve the sugar in a small quantity of juice and add this to the bulk of the juice, or if very fine (caster) sugar is used, stir it directly into the juice.

Source: <http://homepage.ntlworld.com/scrumpy/cider/cider.htm>

To determine the final potential alcohol by volume (ABV) based on the starting sugar content use this equation:

$$ABV\% = [(SG - 1.0) \times 1000] / 7.5$$

The pH of the juice should be in the range of 3.3 to 3.7 as measured by a pH strip (not an ideal measuring tool, but cheap and easy to acquire. An electronic pH meter is more accurate and costs about \$100.) The lower the pH, the stronger the acidity and the less risk of microbial problems. For this reason, try to be as close to 3.3 as possible, especially if you don't plan to add significant levels of (or any) sulphur dioxide. To lower the pH, add malic acid (the principal acid in cider). To raise the pH, add precipitated chalk (calcium carbonate).

Step 4: Add sulphur dioxide (SO₂), yeast and nutrients

At this point you need to decide if you will ferment using native or commercial yeasts. Commercial yeasts are more predictable and ensure more consistent results. If you decide to use native yeast, skip the following section and move to step 5.

If you use commercial yeast, you can add campden tablets to the juice at this point to inhibit native yeast and prevent oxidation. Each tablet contains enough sodium metabisulphite to result in 50 ppm of sulphur dioxide (SO₂) when diluted in 1 gallon of cider. While there are other ways of adding SO₂, these portioned tablets are a convenient solution. Crush the tablets (roughly one per gallon of cider) and dissolve in water/juice before adding to the fermentation vessel.

If you do add SO₂, wait 24 hours before adding the yeast.

Many types of wine or cider-specific commercial yeasts can be used: a traditional Champagne yeast is common and gives good results. Do not use bread yeast!



Pressing apples - image by CityFruit



Carboy - image by Joshk at en.wikipedia

Do not use bread yeast!

When you choose a yeast, note its optimal temperature range and be sure your cider's fermentation area is within that range. Otherwise you could end up with either a "stuck" or an overly active fermentation, both of which affect flavor. Generally, a longer and slower fermentation best maintains the flavor of the juice.

Adding nutrients (thiamine and amino acids) to help the fermentation along is optional. Some commercial yeasts (e.g. wyeast) are sold with nutrients included. In traditional cider making it was common to add red meat to the fermentation vessel: do not try that at home! It's possible to wait a few days into the fermentation to add nutrients. If the fermentation slows or seems "stuck" entirely, even though sugar remains, you can add a bit of nutrients to kick start the fermentation.

Some yeasts need to be 'proofed'— that is, hydrated in a small amount of warm water. Other yeasts can be pitched directly into the fermentation vessel. Instructions are on the yeast packet. Wait until the juice has stabilized at the appropriate temperature for the yeast you're using, typically around 60 degrees, before adding the yeast. Leaving some room for bubbles to form and CO₂ to escape, cover the top of the fermentation vessel with an airlock that allows the gas to escape and prevents air contaminants from entering.



Bottle airlock - image by Joshk

Step 5: Ferment

Fermentation will be noticeable within 12-48 hours as escaping gas causes the airlock to move. Bubbles will form on the surface of the cider. If there are no signs of fermentation within 48 hours, you may need to adjust the ambient temperature (up usually) or add additional nutrients or yeast.

Over time a layer of "lees" will form at the bottom of the vessel. These consist of solids that have settled and yeast cells that have died as the sugar was consumed. If the cider is left on the lees for longer than 6 to 8 weeks the lees may impart off-flavors to the cider.

A slowdown in fermentation is indicated by reduced activity of the airlock. When this happens, measure the specific gravity of the cider on a weekly basis using a sterilized hydrometer. The goal is to ferment the cider "dry"—that is, so little or no sugar remains. You can also taste the cider as it ferments. (At this point it may have a slightly sulphurous smell, similar to rotten eggs; this will likely dissipate as the process continues.) The initial fermentation takes from two to four weeks, depending on ambient temperature, nutrients available and the particular strain of yeast.

It should be noted that the sulphurous smell can also be a sign of a "struggling" yeast—probably the case if fermentation has slowed while residual sugar remains. Adding nutrients and oxygen can help.

The initial fermentation takes from 2 - 4 weeks, depending on ambient temperature, nutrients available and the particular strain of yeast.



Bottle capper

Step 6: Rack

Racking is the process of clarifying the cider and maintaining clean flavors by moving it from one vessel to another, leaving the lees behind. Do this by siphoning the cider from the source vessel to the receiving vessel while keeping the siphoning hose above the level of the lees.

Racking should be done once after the initial fermentation is complete and then once or twice more before the cider is allowed to mature undisturbed. Racking and bottling the cider (or any significant disruption) can reduce the level of free SO₂ in the cider. At these times it's advisable to add additional SO₂ in the form of campden tablets at the rate of one tablet per two gallons. Note: If you'd like the cider to undergo malolactic fermentation then you shouldn't add sulfites to the cider until that has completed.



Racking - image by Maky0

Online Resources

Wittenham Hill Cider Pages

www.cider.org.uk

Northwest Cider Association

www.nwcider.com

The Cider Workshop

www.ciderworkshop.com

Step 7: Mature

Once fermentation is complete and the cider has been racked to another container to clarify it, the maturation process begins. Be sure that the cider is dry—that is, that the S.G. has dropped to .998 or below.

Mature the cider in completely full and airtight glass or stainless steel containers in a cool dark place for up to 6 months. Keep the temperature stable. To prevent oxidation and contamination, be sure there's no airspace and tightly cap the container with an airlock.

Step 8: Bottle

Bottled cider can keep for up to three years and continue to develop in flavor.

To bottle a 'still' (non-carbonated) cider, simply siphon the cider into clean bottles and cap with either a corker or a crown capper (commonly used for beer and home cider makers).

To produce a carbonated cider, add enough sugar to the cider to bring it to S.G. 1.010; this allows for ample carbonation but won't explode the bottles. As a guide, you can add four grams of sugar per liter of cider to reach one bar of pressure; this will provide adequate carbonation.

Store the bottles in a cool, dark place and enjoy!

Where to buy equipment and ingredients in Seattle

Bob's Homebrew Supply

bobshomebrew.com

2821 Northeast 55th Street, Seattle, WA 98105

(206) 527-9283

Sound Homebrew Supply

www.soundhomebrew.com

6505 5th Place South, Seattle, WA 98108

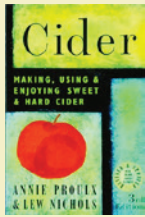
(206) 743-8074

Important Note:



The relatively low alcohol content of cider means it's important to sanitize all tools and containers that come in contact with the cider.

Helpful Publications

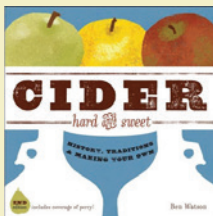


Cider – Making, Using & Enjoying Sweet & Hard Cider

by Annie Proulx & Lew Nichols

Cider – Hard and Sweet

by Ben Watson



Making Craft Cider: A Ciderist's Guide

by Simon McKie

Hard Cider Production & Orchard Management in the Pacific Northwest

WSU Extension Publication
#PNW 621

<http://bit.ly/gjvMk9>

