Cider: America's First Fermented Beverage
Cider Making 101

John Biondi
Deirdre Birmingham

The Cider Farm
deirdre@theciderfarm.com
john@theciderfarm.com
www.theciderfarm.com

Step-by-step Cider Making

I. **The Front-end: Apple Selection, Crushing and Pressing**

(*Equipment and ingredients needed: mix of apples, mill, press, sanitizer, sanitized vessels to receive the juice and air locks for the vessels)*

1) Apples

- Harvest when fully ripe
  - Falling from trees
  - Seeds are dark brown
  - Iodine test for starch (put Iodine on cut apple, if it turns dark blue-black it isn't ripe)
- Strive for a balance
  - Sweets plus sharps
    - Gala or Fuji plus McIntosh (for instance)
  - Look for wilds and crabs to add tannins
- Wash before crushing and pressing
  - Don't use bleach
  - Bruises and soft spots OK
  - Avoid rot
- Juice measurement
  - Sugar with hydrometer
    - Juice at a Specific Gravity (SG) of 1.060 is ideal
  - Acid with pH strips
    - pH between 2.6-3.8 is ideal
- Blend juices of mixed apples before fermentation

- (Cider from a single table fruit variety will be thin and uninteresting)

2) Crushing and Pressing Options
   - Crushing
     - Many types of crushers produced
     - Low-cost options
       - Garbage disposal repurposed
       - Hand cranked (Weston)
       - Small rotary blade
       - Garden chipper-shredders
       - Used commercial mills

   - Pressing
     - Multiple technical options for presses
     - Most common small/inexpensive types:
       - Tub-type (cheapest commercially available option-available occasionally used)
       - Rack and cloth (can be expensive new, sometimes available used)
       - Plans for home built on web (Google: home made cider press)

II. Fermentation Steps
(Equipment and ingredients needed: sanitizer, sanitized vessels and air locks, measuring spoons and cups, hygrometer, pH strips, sulfite or Campden tables (potassium metabisulfite preferred) and cultivated yeast if desired, racking siphon, bottle caps or corks, crown capper or cork inserter)

1) Capture the juice from the crushing and pressing operation in sanitized vessels. Food grade buckets with tight lids and air locks can be used for the primary fermentation. Plastic carboys (not plastic 1 gallon jugs i.e. milk-type jugs) or glass jugs or carboys with air locks can be used as well (glass preferred). All vessels and airlocks should be sanitized using sanitizer or potassium metabisulfite.

2) Measure the SG (using hygrometer) and pH (using pH strips) of the juice (must).

3) Determine to sulfite or not to sulfite
(See notes on wild yeast types at the end of the Step-by-Step Instructions)
WARNING: failure to sulfite or to have a strategy to deal with bad strains of wild yeasts places your juice and the effort you put into attempting to make your cider at risk.

- No sulfite options:
  - Do nothing, allow wild yeasts to run the fermentation (see warning, above)
  - Don't add sulfites but add extra cultivated yeasts to have the cultivated yeasts drive over the spoilage yeasts in the wild yeasts (lowers risk but still some risk)

- Sulfite options:
  - Sterilize with sulfites and then add cultivated yeasts
    - Wait a day or more between sulfite and yeast applications
  - Sulfite with half dose and allow wild yeasts to run the fermentation (better chance of killing yeasts in the spoilage yeast group and keeping interesting yeasts)
  -

4) Add cultivated yeast (if desired).
- Good cider yeasts:
  - Pasteur
  - EC1118
  - Champagne
- Rehydrate before adding to must
- Follow package instructions for dosage

5) Establishment of yeast population
Following the inoculation with yeast (or through allowing wild yeast to begin fermentation) the must will enter a period where the yeast are growing and reproducing but there is little visible activity. Vessel can be open at this point—yeast need oxygen.

6) Primary or turbulent fermentation
Fermentation vessel for primary fermentation can be a food-grade bucket with tight lid and air lock, or plastic carboys or glass jugs or

carboys, preferably with air locks as mentioned above. Leave room above the must for air contact and for the bubbling of the primary fermentation.

After some number of days following inoculation, the must will begin frothing and bubbling. This is the beginning of the primary fermentation.

Yeast at this stage need oxygen, so don't fill vessel to the neck, have the surface of the must = the size of the vessel. Buckets do this naturally, just don't fill a jug or carboy up all the way at this stage.

While allowing initial contact with oxygen, having an air lock in place keeps additional oxygen from entering the vessel. The initial oxygen in the vessel is displaced by the CO_2 given off by the fermentation reaction. This natural reduction in oxygen in the vessel reduces the opportunities for the spoilage yeasts.

7) Secondary Fermentation

After the violent foaming of the primary fermentation has subsided (10 days to a month), the must can be racked into a new sanitized vessel that has an air lock and topped off with, preferably, juice fermented to the same level as that in the vessel. Fresh juice can also be used.

Measure the SG of the must prior to topping off the vessel.

At this stage the vessel can be filled to the neck (in the case of jugs or carboys) or to the rim (in the case of buckets). If you continue to use a bucket with lid, make sure the lid is extremely tight. Lids with rubber 'O' rings are preferred. Carboys or jugs are preferred because they make management of outside air leaks much easer.

While the racking after primary fermentation is the general demarcation of the beginning of secondary fermentation there is no specific end to the primary fermentation other than the overall level of activity.

Slower is better for this stage (secondary stage) of fermentation. Things that help to control the speed of fermentation are:

-Temperature: cold slows down fermentation
-Amount of food and biomass available to the yeast: racking removes biomass and reduces speed of fermentation
-Type of yeast and chemical composition of the must also play a role.

If you let the secondary fermentation run its course, you will have a dry cider with all or most of its sugar fermented to alcohol. If you want some residual sugar in the cider to add sweetness, you can rack the cider more frequently in order to stop or nearly stop the fermentation prior to all sugars being turned to alcohol.

To determine the speed of fermentation, measure the SG of the must monthly. (See speed of fermentation calculation at the end of the Step-by-Step Instructions).

8) Maturation and Clearing
Once the fermentation activity of the must has subsided (SG has stabilized and/or no bubbles are visible in the air lock over time), the cider is ready for the maturation and clearing cycle. In this cycle, the must will flocculate or drop nearly all of its particulate matter out of solution.

At the point where fermentation activity has generally ceased but before the cider has cleared, you should check both the SG and the pH of the must. The cider can be racked at this point as well.

If you rack the cider at this point, top off the vessel with fermented cider, fresh juice or water to avoid contamination.

III. Bottling and Capping
After the cider has cleared, it can be bottled and the bottles capped.

If your cider has fermented to dryness and you would like to sweeten it, you can add sugar or dextrose at this time. The cider can also be sweetened with the addition of fresh juice.

All of these methods of sweetening create the potential, if not the certainty, that residual yeasts will continue to ferment the added sugars after bottling. This can add natural carbonation to the cider as

the CO_2 from this fermentation will stay trapped in the bottle and add natural carbonation (can be a good thing). Too much sugar and yeast could lead to production of CO_2 in quantities sufficient to rupture the bottle, causing an explosion and potential safety issues (definitely a bad thing).

Splenda can be used to back sweeten and is not subject to secondary fermentation. (Don't take that as a recommendation, however)

The bottling method is similar to racking. Using the racking siphon you will siphon cider out of its final vessel into the bottles that you have chosen and cap them with the appropriate capping or corking device.

Three Yeast Types –All are found in wild yeasts

1) Saccharomyces group—good guys, strong fermenters; high tolerance to SO_2 (Cultivated yeast strains typically come from this group).

2) Non-Saccharomyces group (starting yeasts), abundant on apples, start quickly, low tolerance to alcohol, sensitive to SO_2, contributes unique flavors.

3) Spoilage yeasts—bad guys, bad flavors, need O_2, sensitive to SO_2

Calculation of Fermentation Speed

1 Fermentation Speed Unit (FSU) = the speed of fermentation that corresponds to a drop in SG of 0.001 in 100 days.

-FSU = $100{,}000\ (SG_2\text{-}SG_1)/N$
- -SG1 = first SG reading
- -SG2 = later SG reading
- -N = number of days

Madison Supply Sources:

Wine and Hop Shop
1919 Monroe St.
Madison, WI 53711
608.257.0099

Brew and Grow
1525 Williamson St.
Madison, WI 57703
608.226.8910

On-line supply sources for supplies and equipment are numerous, search by supply or equipment item.

Bibliography: (Not everything, just some of the better ones)

Cider, Hard and Sweet: History, traditions, and making your own. Ben Watson. 3rd Ed. 2013. The Countryman Press, Vermont.

The New Cidermakers Handbook: A comprehensive guide for craft producers. Claude Jolicoeur. 2013. Chelsea Green Publishing, Vermont.

Craft Cider Making. Andrew Lea. 2008. The Good Life Press (www.goodlifepress.co.uk)
The Wittenham Hill Cider Portal. Andrew Lea.
http://www.cider.org.uk/

Craft Cider: How to turn apples into alcohol. Jeff Smith. 2015. Countryman Press.

Cider Made Simple: All about your favorite new drink. Jeff Alworth. 2015. Chronicle Press

Apples to Cider: How to make cider at home. April White with Steve Wood. 2015. Quarry Press.