

Beer Knowledge Overview

Here's a brief overview on the basics of beer. It's not a bad place to start!

Beer Ingredients

1. Grains

- a. The base of almost all beers: malted barley
 - i. Used for brewing for its large starch reserve, naturally occurring starch-converting enzymes, and husk that allows grain beds to drain smoothly in the mashing process.
 - ii. To be used for brewing, barley is **malted**, which is when the grain is germinated by soaking it in water and then kilned to stop germination. This allows the starches in the barley to be converted into fermentable sugars.
 - iii. The time and temperature at which the barley is kilned, the pH when its soaked, and the moisture content of the barley will affect the type of malt that is produced (and thus the color and flavor of the beer made with it).
- b. Wheat, oats and rye are sometimes used in conjunction with barley to affect the flavor or mouthfeel of the beer. Oats and wheat are commonly used for the creamy mouthfeel and head retention they offer, while rye is used primarily for its spicy flavor.
- c. Corn and rice are used in many mass-produced, industrial beers because they lighten body, are fairly neutral in flavor, and are cheap and stable. The use of these grains is generally frowned upon in the craft brewing community.

2. Hops

- a. Hops are grown on trellised vines called "bines." Harvested in the fall, brewers use the cone-shaped flowers, which are immediately dried upon harvest and used throughout the year. Some are ground and pelletized to stabilize the product and lower shipping costs.
- b. Oils in the plant dictate the hop aroma and flavor imparted to the beer, while hop resins contain acids that provide bitterness and anti-microbial properties.
- c. Most hops are grown in Germany, the Czech Republic, Belgium, France, Britain, the US (specifically in the Pacific Northwest), Australia and New Zealand
- d. There are dozens of varieties of hops (approx. 75 used in beer), and each has its own flavor and bitterness characteristics.
- e. The point at which hops are added during the boiling of the pre-fermented beer will dictate how the hops will be expressed in the final beer. Adding hops early in the boil will extract the bitter resins but burn off most of the aroma-packed oils, while adding hops late in the boil will extract the aromatic oils and not all of the bitter resins.
- f. Dry hopping is when hops are added after fermentation to provide extra flavor (but very little bitterness). Wet hopping is unrelated--this is when hops that have just been picked in the fall are added to beer without drying them.

3. **Water** is extremely important to beer flavor. Mineral content will not just affect the water flavor in the beer, but also how other beer ingredients are expressed and how well fermentation will work.

4. Yeast

- a. All beer (with some exceptions) can be classified as ale or lager.
 - i. Ales are fermented at higher temperatures (think 55-70°) with the yeast *Saccharomyces cerivisiae* while lagers are fermented cooler (think 45-55°) with *Saccharomyces pastorianus*.
- b. Yeast is usually added by the brewer, but some beers are fermented spontaneously--natural yeast in the air settles in beer and ferments it.
- c. Commercial brewer's yeast labs culture many strains of yeast, each with their own fermentation temperature preferences and flavor characteristics. The strain of yeast chosen has a huge impact on the flavor and style of the resulting beer.

The Brewing Process

1. **Milling:** Crushing/cracking the grain for brewing
2. **Mashing:** Crushed malt is mixed with hot liquor (what water is called when used for brewing) and let to sit for about an hour to allow natural enzymes in the malt convert starch in the grain into sugar.

3. **Lautering:** is when the mash is separated into wort (the liquid, pronounced “wert”) and residual grain.
4. **Boiling:** the wort is then boiled (usually for 60-90 minutes) in order to sterilize it and extract oils and resins from the hops, which are typically added at multiple points during the boil.
5. **Whirlpool:** Wort is swirled so that leftover bits of grain and hops (called “trub”) collect in the middle of the boiling vessel. This makes it easier to remove clear wort free of particulate matter.
6. **Chilling:** In order to create a healthy environment for yeast, the wort must be cooled to about 70°F.
7. **Aeration and Pitching:** Wort is **aerated** to provide oxygen for the yeast to consume. **Pitching** is when the yeast is added.
8. **Fermentation:** Generally takes 1-2 weeks for ales, 2-4 for lagers. Yeast produces alcohol and CO₂ by eating sugar in the wort.
9. **Lagering:** Some beers are stored at cool temperatures for about a month to smooth out flavors.
10. **Aging:** Beer can be aged in order to allow flavors to mature or to extract character from an aging vessel such as an oak barrel.
11. **Clarification:** Beer is most commonly clarified via filtration, but can also be clarified with the use of enzymes/additives added during the boil or by giving the beer time to settle before packaging.
12. **Carbonation:** can be achieved two ways: naturally, by sealing the beer in its serving vessel with some active yeast and added sugar in a process known as “conditioning,” or via force carbonation, in which pressurized CO₂ is applied to the finished beer until it is absorbed.

Beer Styles

1. The development of traditional beer styles has classically been dependent on available ingredients, equipment and water profile. New beer styles are developed through innovation and imagination.
2. Beer styles are cataloged in the US by the Brewers Association and Beer Judge Certification Program
3. Quantitative parameters of beer character used to define beer styles:
 - a. **Original gravity/final gravity (OG/FG)** is a measure of wort/beer density expressed as a specific gravity, which is the weight of the wort/beer relative to the weight of water
 - b. **International Bitterness Units (IBU)** is a representation of the parts per million of dissolved alpha acids present in the beer. It is a rough measure of hop bitterness.
 - c. **Color** is most commonly measured in terms of **SRM** (Standard Reference Method), which is referred to by a measure known as “degrees Lovibond.” The science behind determining the SRM is complex, but the scale ranges from pale straw (about 2 degrees Lovibond) to medium amber (12 degrees) to black (40+ degrees)
 - d. Carbonation is measured in **volumes** of CO₂, which is the volume of gas dissolved in a volume of beer. For example, 2 volumes of CO₂ means that the CO₂ in one liter of beer would occupy 2 liters of space at 20°C at an atmospheric pressure of 1. Beer almost always contains 1.2-4 volumes of CO₂, but most commonly contains 2.2-2.8 volumes.
4. Major Styles Originating in Germany/Bohemia/Austria
 - a. Ale: Kölsch, altbier, hefeweizen, dunkelweizen, weizenbock
 - b. Lager: helles, Dortmunder export, Pilsner, Vienna, Märzen/Okttoberfest, dunkel, schwarzbier, Maibock, bock, doppelbock, eisbock, rauchbier
 - c. Sour Ales: Berliner weisse, gose
5. Major Styles Originating in Belgium/France
 - a. Ale: witbier, Belgian pale ale, saison, bière de garde, Belgian blonde, dubbel, tripel, Belgian strong pale/golden, Belgian strong dark
 - b. Sour Ales: Flanders red/brown, lambic, gueuze
6. Major Styles Originating in the UK
 - a. Ale: bitter/ESB, Scottish/Scotch, Irish red, brown, mild, brown/robust porter, dry stout, sweet/milk stout, oatmeal stout, foreign extra stout, Russian imperial stout, English IPA, old ale, English barleywine
 - b. Lager: Baltic porter
7. Major Styles Originating in the US
 - a. Ale: cream ale, California common/steam, American pale, American amber, imperial red ale, blonde ale, American IPA, imperial/double IPA, American barleywine, American wild
 - b. Lager: Standard/Premium/Lite Lager