

The Four Beer Components

Beer is the most consumed alcoholic drink worldwide. It is traditionally made from four key ingredients: malted cereals (barley or other), water, hops, and yeast. Each of these ingredients contributes to the final taste and aroma of beer. The solids are removed by various methods.

Water

The amount of minerals in brewing water affects the beer in several ways.

- The pH (acidity) affects the efficiency of the brewing process (as does hardness) as well as how the beer flavours appear to your palate.
- sulphates will tend to give the beer a drier, more assertive hop balance, while chlorides will tend to have a less bitter, rounder, and maltier balance.
- chlorine or contaminants can cause off-flavours

The overall recipe for the beer will take these into account; a consistent quality of water thus being highly desirable.

Malt

Malt is really any type of grain that has gone through the malting process to bring out sugars. The basic malting steps are steeping in water, resting under precise conditions to encourage enzymes and germination, and kilning (drying and curing). For many specialty malts, two other steps—stewing and/or roasting, preferably both in a roasting drum—are used as well.

There are several different categories of malt: base malts, caramel/dextrin malts, crystal malts, chocolate/roasted malts, and roasted raw grains. Base malts are gently kilned and are usually pale and highly enzymatic. They account for at least half the grist in most mashes. All other non-base malts are considered “specialty malts.” These add varying degrees of colour, flavour, aroma, and texture to the finished beer. There are over 1000 malts on offer.

Caramel malts require stewing. Chocolate malts are slightly stronger in colour and aroma than caramel and crystal malts and are roasted. These later treatments reduce the enzymes which convert the grains' starches into sugar.

The malt is then mixed with the water and milled, mashed and lautered to provide the wort and separate out most of the discarded solids.

Hops

While not as significant for flavour and aroma as the malts, brewers use hops in beer to varying degrees. In some styles, like the ubiquitous IPA, hops take centre stage. In other styles, like stouts, they add backbone and depth,

There are many different kinds of hops available to brewers. And just like wine grapes, hops of different strains and from different growing regions bring different flavours, aromas, and bittering capabilities.

Noble hops, from Germany and the Czech Republic are considered the most classic. They are what lend traditional German and Czech pilsners and lagers their characteristic flavour profiles

English hops (e. g. Fuggle) have lower levels of the oil myrcene, allowing more subtle aromas of other essential oils to shine through. The profiles of English hops, therefore, tend to be more delicate and milder, notes of earth, molasses, herbs, spice, and wood.

American hops, (e.g. Cascade and Centennial) tend to be. In general, they have higher amounts of the essential oil myrcene, which gives them their bold, highly aromatic characteristic citrus and pine notes.

Hops are added at different stages of brewing to have different effects.

There are over 170 different varieties. See

https://www.morebeer.com/articles/homebrew_beer_hops/

Hops are added to the wort, which is boiled and then the solids separated out in a whirlpool

Yeast

Yeast is used in fermentation, acting on carbohydrates to create CO₂ gas bubbles and alcohol. Its contribution to the aromatic profiles of beers and wines is often underestimated.

During the fermentation process, yeast modifies carbohydrates into a variety of metabolic by-products. These compounds give fermented products distinctive taste and flavour, but also texture.

The white foamy top on beer produced by yeast consists of carbon dioxide gas, produced during the fermentation process, trapped into proteins that gather around it creating bubbles. Proteins from the yeast contribute to the stabilization of ale or lager's foam, which keep the beer's "head" from dissipating quickly.

During fermentation, yeast cells convert cereal-derived sugars into ethanol and CO₂. At the same time, hundreds of secondary metabolites are produced that influence the aroma and taste of beer. Variation in these metabolites across different yeast strains is what allows yeast to so uniquely influence beer flavour.

Two different species of yeasts relate to the two main families of beers: lagers and ales. For lagers, *Saccharomyces pastorianus* is favoured. These drop to the bottom while fermenting. It produces relatively few esters and makes light and thirst-quenching beers, such as pilsners, although dark beers are equally possible. For ales, *Saccharomyces cerevisiae* is favoured. These rise to the top while fermenting. It produces beers that are more complex and aromatic and that often have a higher alcohol content. *Cerevisiae* is also used in bread and wine making.

The chilled wort is pumped into tanks for fermentation under strictly controlled temperature. Brewer's yeast turns the wort into alcohol and carbon dioxide. The kind of yeasts used, and the fermentation temperature will determine whether the final product is an ale or a lager beer.

Finally, the beer is chilled and allowed to settle. Filtration and period of settlement depend on beer style. Not all beers go through filtering.

Other ingredients

Traditionally, in Belgium, fruit is added to some beers to counteract sharpness. This and other flavourings have become popular elsewhere with the craft beer craze. Each to his own taste!

Before hops were used, a gruit was added to flavour and preserve the beer, typically composed of bog myrtle, yarrow, and rosemary, but could also include other botanicals such as heather, juniper, ginger, caraway, orange peel and cinnamon.