The Science of Brewing Beer

By Celeste Silling

Gulf Coast Bird Observatory's biggest event of the year, Brew on the Bayou, is coming up on March 21st. So, in honor of all of the delicious beer samples we will be serving, I wanted to delve into the science behind brewing.

Beer is one of the oldest alcoholic beverages, dating back to at least five thousand years ago in Egypt. The beers commonly found in America originated in Europe, however, and can be traced back to areas in Germany, the United Kingdom, and the Czech Republic. Ancient peoples all over the world figured out how to hijack natural biological processes such as fermentation and germination to create their own versions of this beverage.

The biology of brewing begins with the grains, usually barley. The grain seeds are soaked in water and begin to grow and sprout. This development in plants is called germination and part of the process includes producing enzymes called amylases. These amylases break down some of the seed's starches into sugars. These sugars are essential for brewing the beer.

The next step is to stop the germination process by drying the grain out with hot air. This is done by putting the grain in a roaster or kiln. The resulting product, dry brown seeds, is called malt. Next, the malt is ground up and mixed with water to reactivate the sugar-making process. The seed is no longer germinating, but the amylases are still breaking the starches down into sugar.

The flowers of the hops plant are now added to the brew. The resins in these flowers contain acids that will give the beer its signature bitter taste and aroma. The brew is boiled in order to isomerize those acids, rearranging the atoms into different structures, thereby activating the flavor. Boiling also kills any bacteria that might be lurking in the batch.

Now we have a vat of sugary, bitter seed-water. So how do we turn it into alcohol? Yeast! Yeast are single-celled microorganisms that are members of the fungus family. There are about 1,500 species of yeast out there, but *Saccharomyces cerevisiae* is the one most commonly used for fermentation of food and drink. Fermentation is the chemical breakdown of substances by microorganisms like bacteria or yeast. In nature, this *Saccharomyces cerevisiae* species can frequently be found on ripe fruit.

In the brewing process, yeast is used to ferment the sugars created from the grain germination. The brew is transferred to a container populated with yeast and kept there for weeks as the sugars are fermented. The product of the fermentation is ethyl alcohol and carbon dioxide gas. With this single step, the brew has been turned into a carbonated alcoholic beverage.

Brewers can customize their beers by adding different ingredients, drying and fermenting for different amounts of time at different temperatures, or even adding more carbonation. This allows makers to create countless varieties and hone their own recipes.

Now that you have a new appreciation of the science of brewing, come down to Brew on the Bayou on March 21st at 5 PM. Held at Gulf Coast Bird Observatory (299 Hwy 332 West, Lake Jackson), this event features tastings from eight breweries and four wineries, plus music from the band The Intercoastal Pirates and much more. The proceeds will benefit birds and habitat across the gulf coast and beyond, so come on by!