

Brewing with Bugs

A Beginners guide to enjoying and making sour/wild
beers

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Shawn McBride, VP-Education

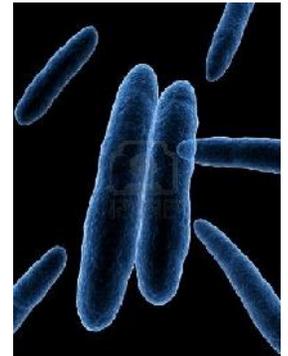
What is a Sour/Wild Beer?

- A sour beer is a beer that traditionally has some sort of sour or tartness to its flavor profile. This is typically in the form of acetic or lactic acid produced from using yeast/bacteria that produce these compounds during fermentation.
- A wild beer is a beer fermented with yeast/bacteria other than just traditional brewers yeast, *saccharomyces*. These sometime have sour notes to them but not always.

Sour/Wild Beer Cast of Characters

- Acetobacter
- Brettanomyces
- Enterobacter
- Lactobacillus
- Pediococcus

Acetobacter



- Produces vinegar by oxidizing ethanol to produce acetic acid
- Excessive amounts of acetic acid or the derived ester, ethyl acetate can destroy beer
- Acetic acid has a sharp, sour flavor only palatable in low to moderate levels
- Acetobacter largely contributes the acidic bite in Flanders Red beers, smaller role in the profile of Lambics and should not be evident in Flanders Brown.
- Require oxygen to convert alcohol to acetic acid, cannot grow without oxygen
- Commonly airborne and will infect alcoholic beverages anywhere in the world
- May produce a viscous, oily or moldy film (pellicle) on top of wort

Brettanomyces



- Discovered by N. Hjelte Claussen, a lab director for the Carlsberg brewery in Denmark
- Claussen discovered a microorganism that caused a slow, secondary fermentation in English Stock ales.
- Claussen names it Brettanomyces literally meaning "British brewing industry fungus"
- Brett contributes to the flavor profiles of Lambic, Flanders red ales and other "wild" beers
- Five recognized species; *B. claussenii*, *B. bruxellensis*, *B. custersianus*, *B. naardensis*, & *B. nanus*
- Many different strains of each species exist
- *B. bruxellensis* is the species of primary importance to "Wild" brewers. Strains of this species produce the characteristic "horsy" and "pie cherry" profiles.

Brettanomyces Part 2

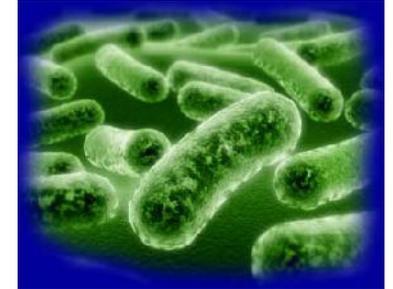
- *B. Claussenii* attributes "wine like" characteristics
- Brett are superattenuating yeast, they will continue to slowly eat sugars, even dextrans that are unfermentable to *Saccharomyces*.
- Brett ferments best in worts with a lower PH with or without oxygen, they cease reproducing below a PH of 3.4
- Brett produces lactic and acetic acid, acetic acid is produced only under aerobic conditions. (with oxygen)
- Brett form pellicle's that are often thick, white, and lumpy. This helps guard against oxidation over a long fermentation process, and protects against unwanted mold and *Acetobacteria*. This should be left intact

Enterobacter



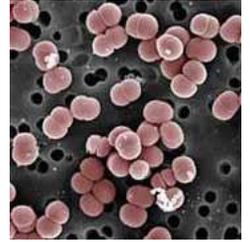
- Produce flavor compounds traditionally present in young Lambic
- Ferment glucose into acetic and lactic acid, also produce by products such as dimethyl sulfide
- Produce many flavor and aroma compounds considered unfavorable in lambic such as vegetal, smoky, moldy, and baby diaper.
- reproduction ceases at a PH of 4.3

Lactobacillus



- Plays a major role in Flanders beers and a minimal one in Lambic
- Can ferment in the presence and absence of oxygen
- Produce lactic acid, an acid less objectionable than acetic, responsible for the pleasant tang found in "wild" beers
- Prefers higher temperatures, much higher than used for fermentation. 98 degrees F ideal for growth
- Reproduction ceases at a PH of 3.8
- Certain hop acids retard growth of most Lactobacillus
- Alcohol and lactic acid destroy Lactobacillus

Pediococcus



- Responsible for bulk of lactic acid found in Lambic, shares responsibility with lactobacillus in Flanders beers.
- Ferments glucose into lactic acid but unlike Lactobacillus produces no carbon dioxide
- Ferments poorly if at all in presence of oxygen, grows slowly if at all
- Produces a layer on top of wort that resembles long elastic threads, described as ropey and having a hazy viscosity like oil. This "slime" is harmless and given time Brettanomyces will break it down
- Reproduction ceases at PH of 3.4

Beer Styles considered sour/wild

- BJCP currently recognizes 5 styles as Sour Ales:
 - Berliner Weisse
 - Flanders Red Ale
 - Flanders Brown Ale/Oud Bruin
 - Straight(Unblended) Lambic
 - Gueuze
 - Fruit Lambic
- Non BJCP styles include:
 - Saison/Farmhouse Ale
 - Faro
 - American Sour/Wild Ale

Berliner Weisse

- Referred to by Napoleons soldiers as the “Champagne of the North”
- Sour, wheat- based effervescent, low alcohol beer traditionally brewed and drunk in Berlin, Germany.
- Trademark sourness is from Lactobacillus
- A sharply sour, somewhat acidic character is dominant. Can have up to a moderately fruity character. The fruitiness may increase with age and a flowery character may develop. A mild Brettanomyces aroma may be present. No hop aroma, diacetyl, or DMS
- Often served “mit Schuss”, meaning to be served with a shot of flavored syrup, that changes both the flavor and color. Woodruff, raspberry, and lemon are popular syrups for this use.

Flanders Red Ale

- Traditional Belgian style distinguished by red color and by sharp, sour, and tart flavors from using yeast and bacteria.
- Acetic acid appropriate for style; most undergo long aging in barrels and are blended before being served.
- Complex fruitiness with complementary malt. Fruitiness is high, and reminiscent of black cherries, oranges, plums or red currants. There is often some vanilla and/or chocolate notes.

Flanders Brown Ale/ Oud Bruin

- Traditional Belgian sour beer brewed and blended for long aging.
- Strong malt flavors complement lactic acid and acetic sourness.
- Sourness not as pronounced as in Flanders Red Ale, brett character usually absent or understated.
- Complex combination of fruity esters and rich malt character. Esters commonly reminiscent of raisins, plums, figs, dates, black cherries or prunes. A malt character of caramel, toffee, orange, treacle or chocolate is also common.

Straight(Unblended) Lambic

- Traditional Belgian style that is sour and flat, with no hop flavor or aroma.
- Traditional lambic brewers use open fermentation allowing the wild yeast and airborne bacteria to inoculate the beer. Also known as “Terroir”
- Characteristic sour, barnyard taste of *Brettanomyces* dominates.
- A decidedly sour/acidic aroma is often dominant in young examples, but may be more subdued with age as it blends with aromas described as barnyard, earthy, goaty, hay, horsey, and horse blanket. A mild oak and/or citrus aroma is considered favorable. An enteric, smoky, cigar-like, or cheesy aroma is unfavorable. Older versions are commonly fruity with aromas of apples or even honey. No hop aroma. No diacetyl.

Gueuze

- Produced by blending different vintages of Lambic together. Traditionally one, two, and three year old versions.
- Bottle conditioned and carbonated by the sugar remaining in the younger Lambic in the blend. Gueuze is then traditionally finished using the Methode champenoise.
 - In this process the beer is carbonated in the bottle through a secondary fermentation; the bottles inverted so that the yeast collects in the neck; the neck of the bottle is frozen to create a plug of ice encapsulating the yeast; and the temporary cap is removed, allowing the existing pressure to force the ice-yeast plug out through the neck of the bottle, which is then recorked to preserve the remaining carbonation.
- A moderately sour/acidic aroma blends with aromas described as barnyard, earthy, goaty, hay, horsey, and horse blanket. While some may be more dominantly sour/acidic, balance is the key and denotes a better gueuze. Commonly fruity with aromas of citrus fruits (often grapefruit), apples or other light fruits, rhubarb, or honey. A very mild oak aroma is considered favorable. An enteric, smoky, cigar-like, or cheesy aroma is unfavorable. No hop aroma. No diacetyl.

Fruit Lambic

- Traditional Belgian style that is sour and flat, with no hop flavor or aroma.
- Traditional lambic brewers use open fermentation allowing the wild yeast and airborne bacteria to inoculate the beer. Also known as “Terroir”
- Characteristic sour, barnyard taste of *Brettanomyces* dominates.
- The fruit which has been added to the beer should be the dominant aroma. A low to moderately sour/acidic character blends with aromas described as barnyard, earthy, goaty, hay, horsey, and horse blanket (and thus should be recognizable as a lambic). The fruit aroma commonly blends with the other aromas. An enteric, smoky, cigar-like, or cheesy aroma is unfavorable. No hop aroma. No diacetyl.

Saison/Farmhouse Ale

- Traditionally brewed to be consumed throughout the summer months.
- Very complex style; many are very fruity in the aroma and flavor. Look for earthy yeast tones, mild to moderate tartness. Lots of spice and with a medium bitterness. They tend to be semi-dry with many only having touch of sweetness. A low to moderate sourness or acidity may be present, but should not overwhelm other characteristics. Spice, hop and sour aromatics typically increase with the strength of the beer. Alcohols are soft, spicy and low in intensity, and should not be hot or solventy. The malt character is light. No diacetyl.

Faro

- Made by blending lambic, usually low-gravity Unblended Lambic or a blend of Lambic and Mars, with burnt sugar or dark candi sugar to form a sweet and sour beverage.
- Traditionally, the sugar was added directly to the mug and served with a mortar with which the drinker could crush it into the beer; therefore the sweet beer remained uncarbonated, as with an Unblended Lambic.

American Sour/Wild Ale

- Style refers to a wide range of beers brewed using wild yeast and/or bacteria
- Flavors range from a slight sour tang to a complex Brettanomyces barnyard flavor, often with a wood-aged character as well.
- American sour ales range from golden to deep copper to brown in color. These beers may or may not be fruit-flavored. Horsey, goaty, leathery and phenolic character evolved from Brettanomyces organisms and acidity may be present but should be balanced with other flavors.
- Residual flavors that come from liquids previously aged in a barrel such as bourbon or sherry should not be present. Wood vessels may be used during the fermentation and aging process, but wood-derived flavors such as vanillin should not be present
- In darker versions, roasted malt, caramel-like and chocolate-like characters should be subtle in both flavor and aroma.

Brewing Sour/Wild Beers

Equipment Needed

- All equipment that touches the wort after yeast is pitched should be separated from your regular brewing equipment to prevent cross contamination.
- These include; fermenters, transfer tubing, airlocks, bottling equipment, hydrometers, kegs. ANYTHING that touches the beer after you add the wild yeast/bugs.
- A place to store the beer while it ferments, preferably in a temperature controlled environment.
- PATIENCE, plan on waiting at least a year for many styles.

Fermenters

- Better Bottles are generally considered the best vessels to ferment sour/wild beers in at home. They are cheaper than glass carboys and they also allow some oxygen permeability to encourage growth of certain souring organisms for certain styles. Downside is that they flex when moved.
- Glass Carboys will work just fine but they allow very limited oxygen permeability, which can be detrimental for certain styles.
- Plastic Buckets can allow too much oxygen permeability, encouraging the excessive growth of acid producing bacteria.
- Barrels can also be used, but homebrew sized barrels should be used a few times by other beers to leach out the “wood” flavor. They should also not be stored in barrels for the entire length of fermentation as too much oxygen can permeate through the wood.

Hops/Bittering Rates

- Sour/Wild beers usually range from 1-40 IBU's with most being under 25.
- Aged hops are traditionally used, the brewers are primarily interested in the preservative/antibacterial properties from beta acids and polyphenols.
- Alpha acids can retard the growth of bacteria such as Lactobacillus and Pediococcus.
- Low alpha, low co-humulone hops can be used as a reasonable substitute.

Grain/Mash Considerations

- Consider adding a portion of wheat or oats in your brew, this helps improve mouthfeel in wild/sour beers that are well attenuated. Many traditional styles have a portion of wheat in them.
- Alternately if you are brewing a wild/sour beer that is supposed to be dry you can use maize or corn sugar, since they will completely ferment out.
- Considering using a portion of acidulated malt in styles with a lower PH. Be very careful with how much you use as it can drop the mash PH to low, hindering conversion. Typical amounts for 5 gallons is 8 ounces.
- Consider using a portion of crystal malts to leave residual sugars for the bugs to munch on.
- Mash at higher temperature to increase the production of more complex longer-chained sugars. A mash temp of 156 f is a good starting point. This leaves more sugars for the yeast/bacteria to eat, ensuring that the *Saccharomyces* don't get to eat all the sugars before the bugs get a chance to go to work.
- A Turbid mash is another consideration but will not be covered here

Yeast

- Choose yeast/bacteria that are appropriate for the style you are trying to brew.
- Some homebrewers pitch with regular yeast in primary and then add the “bugs” in secondary. Others recommend pitching the “bugs” in primary if you want more pronounced sourness.
- Reuse of sour blends (Wyeast Roeselare, WLP Sour Mix) are not encouraged as the ratio of the individual fermenting organisms becomes unbalanced from the manufacturers original specs. (This doesn't mean you shouldn't do it though, many brewers reuse yeast cakes with great results)
- Using “bottle dregs” from commercial beers can be a great way to add “bugs” to your beer. Madfermentationist.com has an updated list of beers you can harvest from as well as a good indication of what is in them.

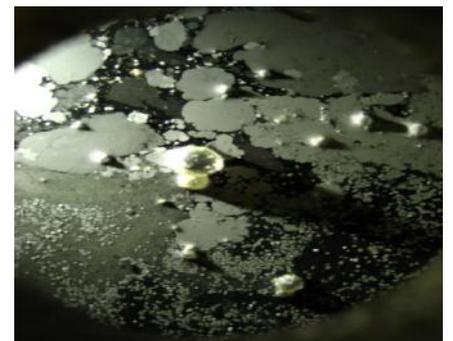
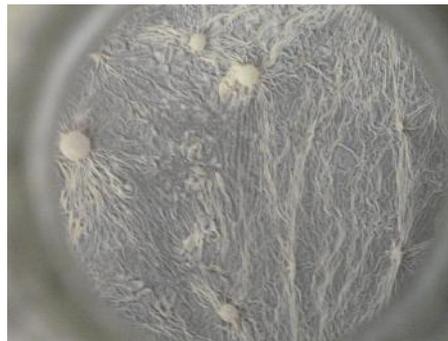
Fermentation/Ageing

- Fermenting wort should be kept in a dark, temperature controlled environment. Typically at ale temperatures.
- Carboy movement and opening should be minimized to encourage the growth of the pellicle (if it has one), and keep oxygen supply limited. Too much oxygen and the beer becomes more vinegar like in nature.
- Check your airlocks frequently throughout the long fermentation/maturation cycle. The liquid inside will evaporate over time.
- Make sure the beer is finished fermenting before bottling. This is especially important since many of these organisms can take a long time to ferment all the sugars out. Most online recommendations say to wait till the beer reaches a FG of 1.008 – 1.006, Although not all beers will ferment that low.
- Patience is key, give the beer time to develop before you start disturbing it. Most sour/wild beers take at least 9 months to develop, many take a year or more.

Blending

- Many producers of sour/wild beers blend their product for consistency between batches and to accentuate certain characteristics.
- Consider experimenting with different percentages of different sour/wild beers until you get something that excites you.

Pellicle's



Pure Brettanomyces Fermentation

- Brettanomyces has only recently been used for pure fermentation in craft brewing
- Very little research exists as to the use of Brettanomyces as a primary fermenter in beer.
- Chad Yakobson of Crooked Stave Artisan Beer has published a dissertation on the use of Brett as a primary fermenter entitled “Brettanomyces Project”. He specializes in beers made with Brett yeast, plus sometimes other bacteria added after primary.
- Brettanomyces acts almost exactly like saccharomyces when used as a primary fermenter.

Brewing a 100% Brettanomyces Beer

CBM did 6 beers with WLP 644. “Brettanomyces bruxellensis Trois” here is what we found in our research on the topic and some of the experiences we had:

- Studies suggest using lager like pitch rates.
- Brettanomyces grow slower, suggest making a starter 5-7 days before brewing.
- Fermentations can seem to stall, brettanomyces like to eat and then take a nap before finishing the job.
- Fermentations can be complete in as little as 4-6 weeks.
- Aerating your wort can bring out some mild sour notes, no aeration of wort can bring out pineapple/tropical notes.

Sources

- “Wild Brews” By Jeff Sparrow (Brewers Publication)
- “Yeast” By Chris White and Jamil Zainasheff (Brewers Publication)
- “Embrace the Funk”:
 - <http://embracethefunk.com/>
- “Brettanomyces Project”:
 - <http://www.brettanomycesproject.com/>
- “The Mad Fermentationist”:
 - <http://www.themadfermentationist.com/>