

Sour and wild beers – A home brewers overview

Belgian and American
Wild fermented and acid ales

Basic Styles

- This is a high level overview of 4 styles of sour beers and the microbes that ferment them.
 - **Flanders Red**
 - **Oud Bruin**
 - **Belgian Lambic and Geuze**
 - **American Wild Ales**
- Other subsets of sours are for another time, such as Berliner Weiss and Gose

A cautionary tale

- When brewing sours always be careful to not cross-contaminate your equipment.
- Keep a separate set of plastic and vinyl on the cold side of your brewery to minimize the chances of infecting your non-sour beers.
- Don't reuse plastic or vinyl for non-sours after using them with sour beers.
- This is only a worry after you pitch your mixed culture. All hot side equipment is exactly the same.
- Sanitation is still needed on the cold side. Use the same process of cleaning as you would with non-sours.

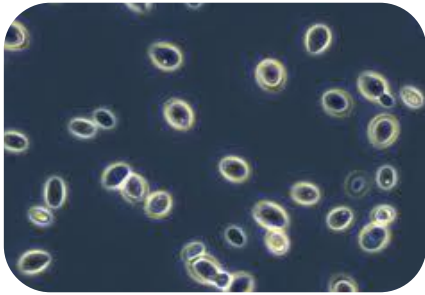
Where the wild things are

- There are thousands of wild yeast and bacterial strains that ferment sugars in nature. Only several dozen have been cultured and are available to home brewers.
- Standard sources like White Labs and Wyeast have yeast and bacterial cultures for sale.
- Also, more obscure sources like East Coast Yeast, BKYeast, The Yeast Bay and Bootleg Biology are available.
- Cultures from commercial examples can be captured from bottle dregs. That's how the pros got started.
- So far I have used WLP665 Flemish Ale Blend, WLP650 *Brettanomyces Bruxellensis* and bottle dregs.

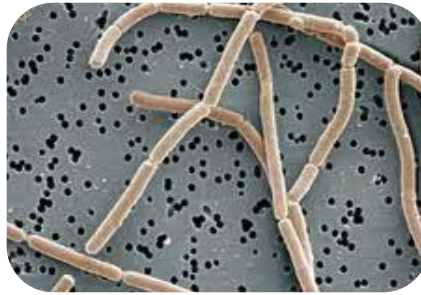
Yeast and bacteria are your friends

- There are four main microbes that add wild character aside from standard yeast in sour and wild ales.
 1. Brettanomyces – a yeast that adds “wild” character
 2. Lactobaccillus - a bacteria that adds lactic acid
 3. Pediococcus- a bacteria that also adds lactic acid
 4. Acetobacter - a bacteria that adds acetic acid

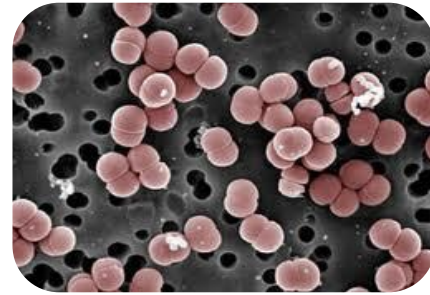
Photos of relevant microbes



Brett



Lacto



Pedio



Acetobacter

Brettanomyces

- Brett is an oxidative yeast. The production of acids is an oxidative process.
- Common Brett strains are:
 - *B. anomalus*
 - *B. bruxellensis*
 - *B. bruxellensis* trois (via Drie Fontenein)
 - *B. lambicus*
 - *B. clausenii*
- Brettanomyces can also eat the sugars (cellobiose) from an oak barrel.
- Brettanomyces can even eat normally un-fermentable dextrans.
- Malto-dextrin is sometimes added to give Brett a little extra to chew on and create different acids and esters. There's no real science to back this up, it just makes sense.

Brettanomyces 2- The Funkening

- Brett is a surviving yeast. It will live up to ¼ inch deep in wood .
- Brett is a super-attenuating yeast.
- Brett will dramatically slow down at 3.4 pH.
- Brett forms a pellicle- a lumpy white film yeast that coats the top of the beer in fermentation. The yeast cells form chains that can float on the top of beer making use of atmospheric oxygen, thus, Brett is an oxidizing yeast.
- The pellicle will form in the fermenting vessel (porous or non-porous) and help guard against oxidation during the long aging / fermentation time. The pellicle also guards against Acetobacter and may work in conjunction with Pediococcus.
- Leave the pellicle intact. It will drop on its own.
- A pellicle can form in the bottle as well.

Lactobacillus

- Lactobacillus plays a major role in Flanders type beers and a minimal role in true Lambic.
- Lacto can ferment both in the presence or absence of oxygen but prefers reduced levels.
- The Lactobacillus commonly used by brewers, Lactobacillus Delbrueckii produces both lactic acid as well as carbon dioxide as a by product of fermentation.
- For the most part, Lactobacillus will cease to reproduce at a pH of around 3.8.
- Temperature of 98F is ideal for Lactobacillus growth.
- As a gram-positive bacteria, the presence of certain hop acids will slow the growth of most Lactobacillus. Higher alcohol concentration also retards growth.
- Stick to under 10 IBU and lower alcohol % for max Lacto growth.
- Lactobacillus Brevis is an alternate strain which is more hop resistant

Pediococcus

- Although Lacto plays a role, Pediococcus is responsible for the bulk of lactic acid production in Lambic.
- Pedio ferments glucose into lactic acid, but, unlike Lactobacillus, produces no carbon dioxide.
- Pedio will produce heavy amounts of diacetyl (yuck) which will be cleaned up by Brett and Sacc.
- Pedio is a somewhat hop resilient gram-positive bacteria.
- Pedio reacts negatively to rising levels of alcohol.
- Pedio ferments poorly in the presence of oxygen.
- Pedio grows slowly.

Help, my beer is sick!

- *Pediococcus* produces a slimy elastic thread-like consistency if the conditions are just right. Belgian brewers call this being “sick”.
- This slimy substance is harmless. It is composed of carbohydrates, acids, and proteins, and plays an important role in sours. Brett eats the slime.
- A beer will become “well” after 3 or 4 months.
- A beer that has been “sick” exhibits a deeper acidity and mouthfeel.
- A beer can be “sick” more than once.

Acetobacter

- Acetobacter is responsible for producing vinegar by oxidizing ethanol to acetic acid.
- Many beer souring microorganisms find oxygen or the production of alcohol during fermentation to be detrimental to their viability. Acetobacter requires oxygen to convert alcohol to acetic acid.
- Fruit flies and bees can (and usually do) carry Acetobacter.
- Acetobacter is not deliberately added to the beer, it develops through the type of vessel used to ferment and age your beer.
- The creation of Acetobacter is also based on size and condition of your barrels or fermentor.

Basic rules for brewing sours

- **Be patient.**
- **Don't look or taste every day. (or even month)**
- A brewer of funky beers has little control over the fermentation, barrel aging, and the final product.
- Do not add lactic acid to your funky beer, it will lend a harsh and sometimes medicinal character when compared to the natural taste from Lacto & Pedio.
- **The beer will tell you when it is ready, not the other way around. A beer is ready when it tastes ready.**
- Let time be your friend. Some styles take up to 3 years to finish.
- If you are just starting out making funky beers, making a beer that is palatable will be considered a success.

Flanders Red

- OG 1.048 to 1.057 - - FG 1.002 to 1.012
- 4.5 to 6.5 % ABV - Low AA hops -10 to 25 IBU -10-16 SRM
- Vienna, Munich, light to med crystal, Special B, and 20% corn.
- Rodenbach step mash is used. See next slide.
- Fully mixed culture should be used. Wyeast Roeselare or White Labs Flemish Ale is also used.
- Some use Sacc to start, then add the bugs. I just pitched the mixed culture ,WLP 655 White Labs Flemish Ale blend.
- This beer is traditionally aged in oak barrels for up to 3 years. Adding Oak chips is to style. Look up the Raj Apte oak dowel method.
- OK to blend with a younger beer if too acidic.
- Some acetic acid character is desirable.

Rodenbach Step Mash

- Assume 1.33 Qt/Lb Liquor to Grist ratio.
- Mash corn adjunct and 10% of grist at 145F
 - Hold for 15 minutes
- Dough in remainder of grist to hit 122F for
 - Hold for 20 minutes.
- Add adjunct mash to main mash and heat to 145F
 - Hold for 40 minutes
- Raise to 162F
 - Hold for 30 minutes
- Raise to 169F for mash out
 - 10 minutes.
- Sparge with 176F liquor

- Note- Steps related to adjunct mashing may be skipped when using ***flaked*** corn.
- Infusion or direct heated mash steps at 122F, 145F, 162F and 176F sparge liquor still apply.

Note- Steps related to Adjunct mashing may be skipped when using flaked corn.

Flanders Brown/Oud Bruin

- OG 1.040 to 1.074 - - FG 1.008 to 1.012
- 4 to 8% ABV - Low AA hops - 25 IBU -15-22 SRM
- Pils, dark Cara Vienna and Cara Munich, flaked corn.
- Single infusion mash is used. High mash rest temp 154F to 158F.
- Sacc, Lacto and Pedio only
- Only moderately sour, no Brett character and is malt forward, sometimes back- sweetened.
- Fermented up to two years in stainless steel.
- No oak, Brett character or acetic acid.

Lambic and Geuze

- OG 1.048 to 1.057 - FG 1.001 to 1.010
- 5% ABV - Aged hops 0-10 IBU -3-7 SRM
- 60-70% Pils 30-40% un-malted wheat
- Turbid mash schedule is used. 2-6 hour boil. See next slide.
- Spontaneous ferment or a mixed culture and whatever else you can throw in. Lots of bottle dregs! Use wild yeast!
- Aged 1-3 years in oak barrels . Usually blended.
- Fruit may be added 6 months prior to packaging for a fruit Lambic. Cherry and raspberry are most common.
- Geuze is a blend of 1,2 and 3 year old Lambic.

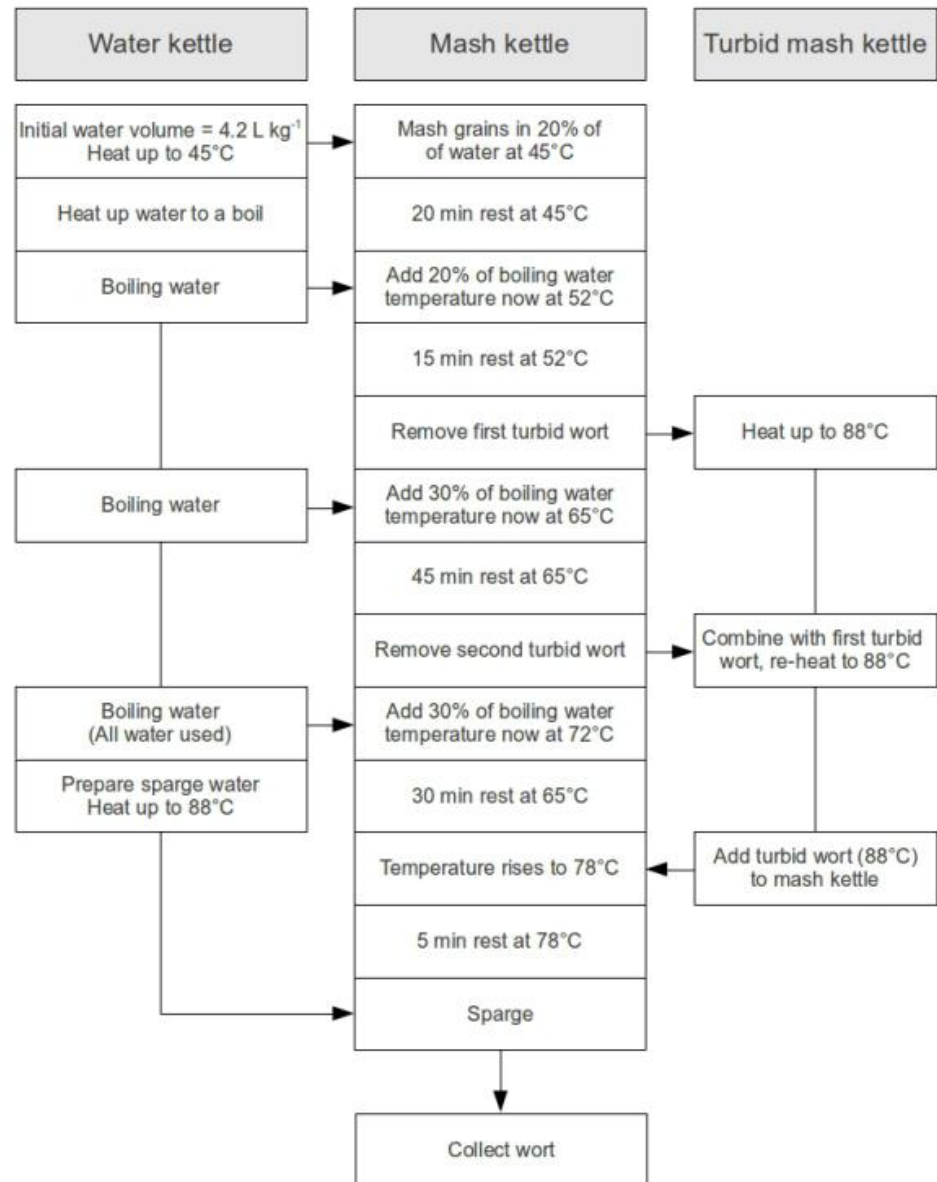
The Turbid Mash Schedule

This is the best visual representation of a Cantillon turbid mash I have found.

There are three kettles required

The goal is to create a starchy and cloudy wort that has a larger percentage of normally un-fermentable dextrins that are available over the long life cycle of the lambic.

This allows the various microbes to have sustenance as they become primary over several years.



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The diagram shows a typical evolution of Lambic fermentation over time.

Key to the diagram:

1: Ethanol

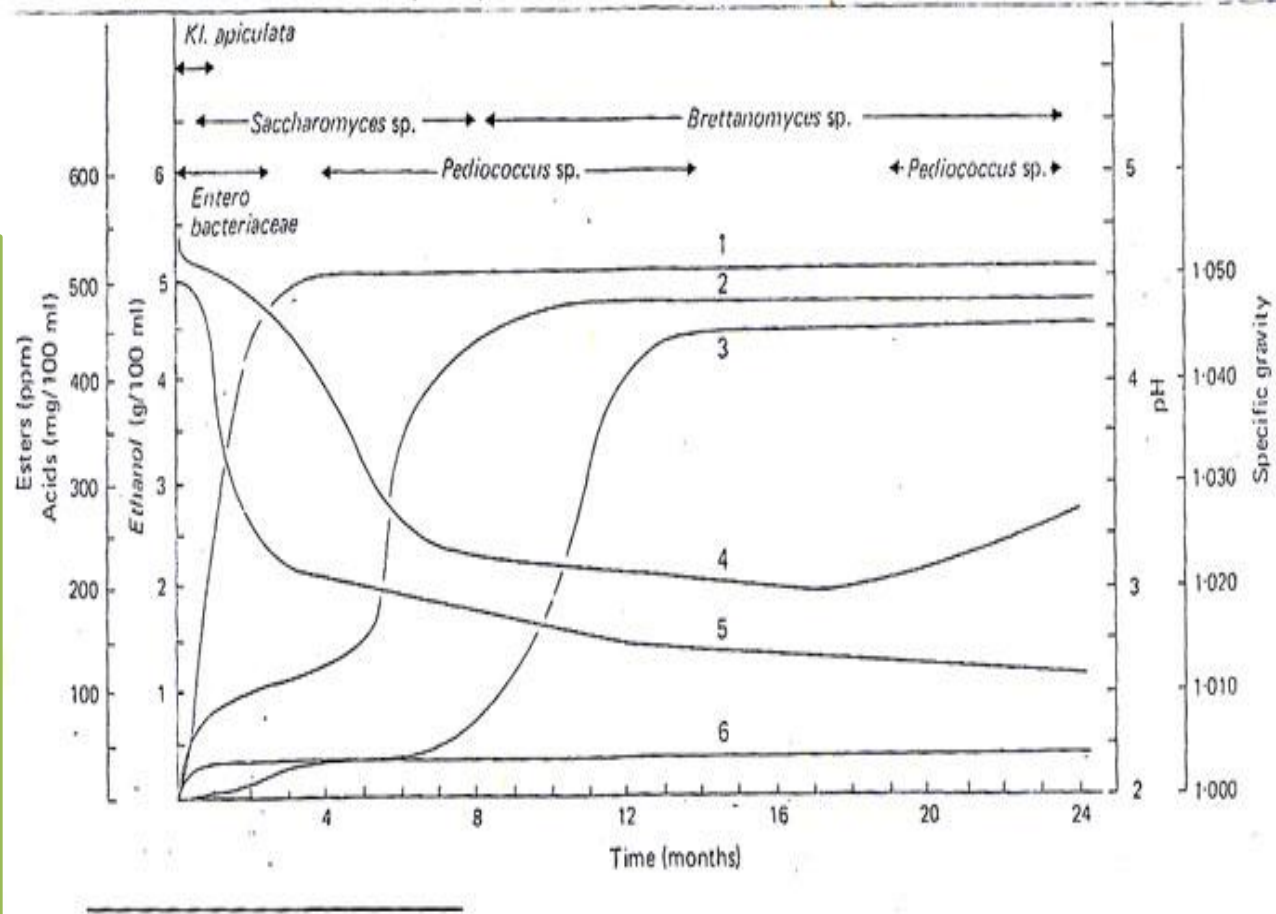
2: Lactic acid,

3: Ethyl Acetate,

4: pH

5: Extract content

6: Acetic acid



American Wild Ales

- Whatever base style you want.
- Whatever mix of cultures you want.
- Both mixed and spontaneous ferment is common. See/drink Jolly Pumpkin or Allagash
- Ferment until done. Usually 6 months to 2+ years in oak barrels. See/drink Russian River or Lost Abbey
- Sometimes 100% Brett is used. See/drink Crooked Stave or The Bruery.
- Usually American versions are less balanced than their Belgian counterparts. I say just give us a 100 years to catch up.

Oxygen Diffusion in Selected Vessels

Type	Volume /gallons	O2 / L / Year
Rodenbach Wooden Tun (Large)	5,280	.53
Rodenbach Wooden Tun (small)	3,168	.86
Wine barrel	79.2	8.5
Glass Carboy w/ silicone stopper	5.3	17
Small Barrel	10.6	23
Homebrew bucket	5.3	220

Web Resources

- Burgundian Babble Belt
 - www.babblebelt.com
- Chad Yakobsen's Brett dissertation
 - www.brettanomycesproject.com
- Michael Tonsmire's blog
 - www.themadfermentationist.com
- Dmitri 's blog at
 - bkyeast.wordpress.com
- Crowd-sourced wild yeast trading
 - bootlegbiology.com
- Lambic & Wild Brewing Forum
 - www.homebrewtalk.com/f127/
- Embrace the funk blog
 - embracefunk.com

Remember these tips!

- We want to make **good** beer, not just **sour** beer.
- This means that the beer should be balanced and drinkable. Not overly sharp or unpleasant.
- All of the BJCP style guidelines say that the sour beer styles should have a “good balance”.
- Feel free to blend multiple batches to obtain the right character you are looking for.