Sour Differences 11/24/07 By Ted Hausotter

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1. **General Information:** Sourness in beer can contribute to the overall flavor of beer, however it is normally considered to be a defect. Generally brewers try to avoid sour flavors and the bacteria that produce them. Sourness is one of the basic 4 groups that give balance to alcoholic beverages and can be an important part of a beers profile, helping to balance the sweet malt profile. IT can be used in addition to hop and tannins as in a dry stout.

    - Sour: Acetic and Lactic acid found in Lambics, Berliner Wiese, Old Bruin and Dry Stouts
    - Tannins: Common in wines, dark beers and highly hopped beers
    - Alcohol: Strong Belgian beers let the alcohol help the hops balance the malt sweetness.
    - Spice: Can be hops, smoke or spice, either kettle added or yeast produced. Common in most beers for hops, spice gruit, German wheat beers for yeast derived spice.

Bacteria are usually avoided in brewing because they can quickly dominate a beers profile. They can grow at a faster rate than brewers' yeast which is why continuous repitching yeast is avoided. Only a few are significant in brewing and are broken down into Gram Positive and Gram Negative groups. The Gram Positive bacteria are inhibited by isohumulones from hops and will rarely exist in aged beers due to this and nutritional requirements.

- Pediococus: Breaks down sugar to form lactic acid anaerobically (without oxygen). They also produce Diacetyl from dextrins and glucose. Heterofermentive strains ferment fructose, sucrose and maltose producing acetic acid as well. Generally produces flavors and odors that are not desirable in addition to turbidity. They are Gram Positive bacteria.
- Lactobacillus: Forms lactic acid by the fermentation of carbohydrates anaerobically. They do not cause odors but produce sourness and turbidity in beers. They are Gram Positive bacteria.
- Acetobacter: Produces acetic acid by oxidizing ethanol. Because of the oxidation requirement, they are most commonly found in draft equipment. They are not inhibited by isohumulones. They produce vinegar flavors and a pronounced sourness. Often times the aroma is considered to by like sour fruit. They can cloud a beer. They are Gram Negative bacteria.
- Brettanomyces: A wild yeast that does not produce spores. The name literally means "British brewing industry fungus". They can oxidize acetic acid and alcohol in the presence of oxygen. Produces many flavors and aromas beyond the acidic contributions. Commonly defined as mousey, horse blanket or wet dog. Very slow fermenter and usually requires over 3 months and temperatures over 60° to develop character. Lambic take 16 month for the brettanomyces to complete their fermentation.

2. **Flavor and Aroma Profiles:**
    - Acetic: Threshold = 175 mg/l. This is vinegar and is noticeable in flavor and aroma, reminds me of coloring Easter eggs as a child. It is sharp and pungent, similar to sour fruit that goes bad on its own. Easy to notice as the aroma is strong and intense, usually

highlights the problem prior to high acid development. Overall it is sharp and pungent. Fruit notes can be common such as apple, black current and pineapple. It can go into harsher aromas such as solvent and nail polish. Sometimes noted as musty.

- Lactic: Threshold = 400 mg/l. With lactobacillus as a source it has very little aroma, generally just developing a sourness, that can range up to intense. Common in soured milk. Contributes a tangy character. The pediococus does produce an undesirable aroma along with the sourness. Diacetyl is a common indicator of a pediococus infection. Overall tart, sour and tangy. It can have buttery expressions and produces a softer profile than acetic.
- Brettanomyces bruxellensis™ is noted for sweaty horse blanket profiles.
- Brettanomyces lambicus™ is noted for the pie cherry profiles.
- Brettanomyces anomalous is noted for its pineapple character.

3. **How to doctor:** Flavoring beer with sour flavors is easy for acetic (vinegar) and lactic acid, brettanomyces is not and best shown with commercial examples. In Evaluating Beer Greg Noonan has recommended dose rate of 30 ml per bottle of beer with white vinegar. Since we are all experienced judges my highest rate is much less, we are looking for the nuance of the flavor, not the vinegar bath. It is important to know where your personnel taste thresholds are.
   - Acetic acid: Use malt vinegar for beer, apple cider vinegar for cider and cyser, rice vinegar for sake. For the class I used London Pub malt vinegar. It is 5% acidity. Use and eyedropper to measure out 2.75 ml for a light dosage. I found this to be preceptable but not overwhelming. The higher dosage is 4.5 ml. With chilled beer I just opened 6 bottles, measured out the vinegar and recapped.
   - Lactic acid: It is available at homebrew supply stores as a common PH adjustment for mashes. It is 88% acidity and quite strong. The aroma of the acid is very bland and neutral. For easiest use, it needs to be blended with filtered water prior to doctoring beer samples due to the high strength. I blended it with 35 ml water and added 4ml creating a 10% acidity solution. Of this weaker solution I used an eyedropper as above, measuring 1.75 ml for a light dosage and 3.5 ml for a stronger dosage. With very little aroma, matching the vinegar in acidity was bland so I added more to a rate 27% greater in acidity than the vinegar for the light solution and 55% stronger for the higher solution.

4. **Suggested Reading**
   New Brewing Lager Beer by Gregory Noonan
   Principles of Brewing Science by George Fix
   Wild Brews by Jeff Sparrow

5. **Class Beers**
   - ESB: This is a blend of homebrews 4# ofest, 13.5# blond ale, 5.75# trad bock and 6.75# pale ale
   - Dry stout homebrewed
   - Orval
   - Berliner Kindl Weisse

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6. Tasting Notes

- ESB Base

- ESB Light Acetic

- ESB Heavy Acetic

- ESB Light Lactic

- ESB Heavy Lactic

- Dry Stout Base

- Dry Stout Light Acetic

- Dry Stout Heavy Lactic

- Orval

- Kindl Weisse