Advanced Yeast Handling

BFD education
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Agenda

- Why yeast storage
- Short term
- Long term
- Yeast Harvesting
- Yeast washing
- Sterile techniques
- Yeast propagation
- Equipment

Why yeast storage

- Yeast is this amazing self replicating beer making machine that is ideal for reuse
- The one ingredient that, if handled properly, has to be acquired only once

Harvesting yeast

- Primary Fermentation yields the healthiest yeast
- Ale yeast can be top-cropped:
  - No trub
  - Yeast can be harvested earlier → younger more active yeast
  - Can be done with blow-off tube into sanitized water
- But most brewers harvest yeast from sediment at the end of primary fermentation

Yeast washing

- Commonly used name for a technique that removes trub from harvested yeast
- Does not remove or reduce contamination
- Does not remove or reduce dead cells
- Does not work for all yeast → It doesn't work for most lager yeast or heavy flocculators like WLP 002
- Commercial brewers may use acid for yeast washing which does reduce contamination

Yeast washing

- How it works:
  - Get yeast and trub into suspension by adding sanitary (boiled) water to yeast cake
  - Fill into jars and let the trub settle
  - Pour off cloudy liquid into sanitized jars
  - Once settled use the sediment in future beers.
  - “fridge life”: maybe up to a few weeks. After that propagate new culture from it

Yeast storage challenges

- Yeast death
  - Decomposing yeast creates off flavors
  - Dying yeast is leaking beer quality detrimental enzymes (proteinase- A breaks down foam positive proteins)
- Microbial growth
  - Dying yeast provides nutrients for beer spoilage organisms
  - Unless sterile techniques are used there are always other microbes among the yeast cells.
  - Population of spoilage organism grows while yeast population shrinks.

Sort term storage

- Keep yeast cold at near freezing temperatures
  - Slower metabolism slows cell death
  - Microbial growth is limited
- Minimize transfers
  - Each transfer increases risk of picking up more spoilage organisms
- Storage jars can be sanitized through boiling
  - More effective than chemical means
  - You can use the boil water for yeast washing

Using stored yeast slurries

- Up to a month old slurries can be pitched into beer.
- May benefit from a starter even if not much growth is going to happen
  - Yeast can restore reserves and is thus closer to budding when it hits the actual wort
- For older slurries take a tsp of it and grow new yeast using a starter
  - Reduces the amount of dead cell material
  - Will not remove any contamination

Long term storage

- Only small samples are stored → even with cell death there is not much dead cell material
- With sterile equipment and media there will be no other organism than the yeast → no concern about contamination
- Slow growth and substantial death rate may cause selection for mutated cells → yeast character may change

Long term storage means

- Plates
  - Great for isolating cultures
  - Large opening makes them susceptible to spoilage
  - Dry out easily
- Slants
  - Small opening keeps microbes out
  - Screw cap allows for airtight closure
  - Yeast slowly dies → mutation issue
  - Requires reculturing every 6-12 months

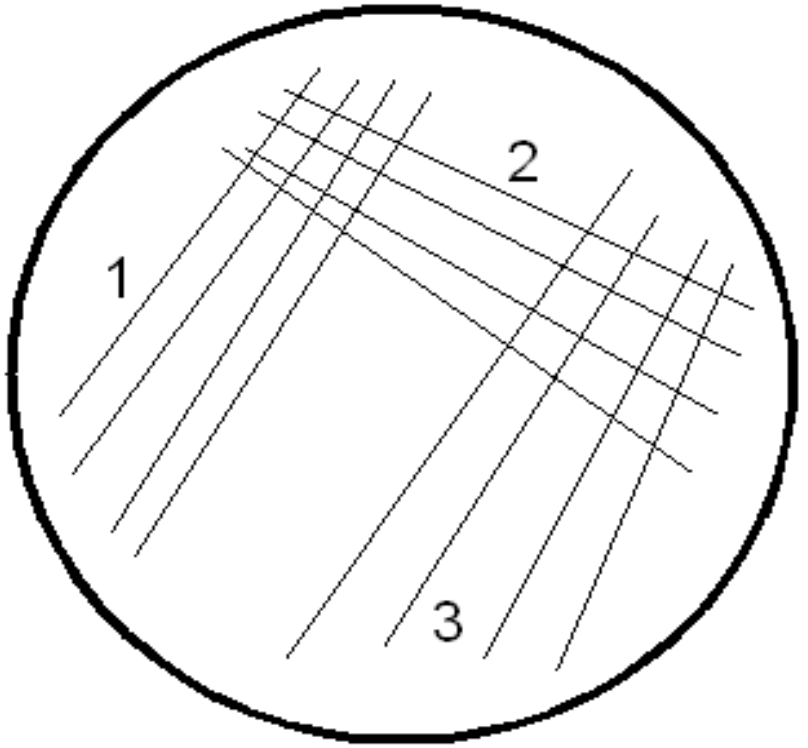
Long terms storage means cont.

- Freezing
  - Cryoprotectant is needed to suppress formation of yeast killing ice crystals → glycerol is commonly used for this
  - Yeast is not growing and death is limited → no mutation issue
  - Requires expensive equipment
  - Household freezers do not work well. At least in my experience

Using plates

- Agar plates allow isolation of single yeast cells
- They are **the only tool** that allows a brewer to completely remove any contamination from a yeast sample
- A yeast sample is repeatedly spread out using a streaking pattern
- Colonies that originated from a single cell can be identified and “picked”
- Picked colonies can be propagates or streaked onto agar slants for longer term storage
- With this technique you don't have to worry about sanitary yeast collection

Streak pattern



- “flame” loop between each streak section
- Depending on the initial cell density you'll find single cell colonies in section 3, 2, or even 1

Properly streaked and grown plate

Growing yeast from slant or plate

- Small yeast population requires sterile practices for 1st and 2nd stage propagation
- Pick yeast colony(s) or scrape yeast “lawn” and inoculate 5-10 ml of sterile wort.
- I sterilize wort in 12 ml vials for this
- Once grown dump yeast into 50-100 ml sterile wort.
- I use sterile wort in 4 oz Mason Jars for this
- Once grown inoculate 300-400 ml wort. Doesn't have to be sterile anymore. Boiled wort will do.
- I use pressure canned wort for this

Growing yeast

- Stage 3 yields about 60 B cells
- Final stage is sized to give desired cell count
- Stir plate grows about 1.4 Billion cells per gram of extract (DME)
- Use that to determine how much wort you need
- MrMalty calculator doesn't work like this but my data doesn't agree with that calculator.
- Check out Brewer's Friend Yeast Calculator
- Keep wort gravity around 10 Plato (1.040 sg)
- I use frozen left-over wort from past batches

Equipment I

- For basic yeast management
  - Erlenmeyer flasks for boiling wort → ability to boil, cool and grow yeast in one vessel eliminates wort transfer
  - Stir plate → allows you to grow about twice as much yeast as a non agitated starter.
  - Mason Jars → great for storing yeast slurries

Equipment II

- Advanced yeast handling
  - Pressure canner → allows preparation of sterile media. It's nice if it can handle 1 qt Mason Jars
  - “autoclavable vessels” → this is for holding the sterile media. Can be as simple as mason jars of different sizes. But vials and plates are very useful to have.
  - Flame source → can be as simple as Butane burner
  - Inoculation loop → can be home made. But they are cheap anyway
  - Agar → necessary to make solid media. Gelatin doesn't work. Best bought at health food stores. Much cheaper than lab grade agar.

Links

- braukaiser.com yeast handling:
  - http://braukaiser.com/wiki/index.php?title=Yeast_culturing_gear
  - http://braukaiser.com/wiki/index.php?title=Making_Plates_and_Slants
  - http://braukaiser.com/wiki/index.php?title=Inoculating_Plates_and_Slants
  - http://braukaiser.com/wiki/index.php?title=Growing_Yeast_from_a_Plate
  - http://braukaiser.com/wiki/index.php?title=Yeast_Bank_contents
  - http://braukaiser.com/wiki/index.php?title=Microscope_use_in_brewing
- Brewer's Friend yeast growth calculator:
  - http://www.brewersfriend.com/yeast-pitch-rate-and-starter-calculator/