Bench Trials

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B. Nektar Meadery

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Who is this Guy?

- Hello, my name is: Brad Dahlhofer
- Started homebrewing in 1998
- Founded B. Nektar Meadery with wife in 2006
- Opened in 2008 in a very small warehouse outside of Detroit, MI
- Early pioneers of the more modern meads (aka: *Weirdo*-mels)
- Coined the phrase and popularized Session Meads.
- We now also make cider and beer.
- Produce about 400,000 liters of mead and cider per year.

What is a Bench Trial?

Definition

“A bench trial is a small-scale test that simulates the effect the product will have on a large volume of ~~wine~~ mead. Bench trials are used to evaluate the efficacy of treatments, determine proper dose rate, and gain familiarity with addition methods. By working in small volumes, large volume mistakes can be avoided.”

Source: Scott Labs

Why Do Bench Trials?

- Does not take away the ART in what you do. It’s just another tool.
- Play with flavors. Fine tune your meads to exactly what you want.
- Trial and error can happen in the lab without risking the entire batch.
- Fermenters are expensive, and mead is time consuming. Mistakes take time to fix and hold up production.
- Develop exact recipes for your brands that your staff can follow to ensure consistency and repeatability.

Tools of the Trade

- Switch to the Metric System. Seriously, do it now. I'll wait. Thank me later.
- Inexpensive lab equipment (links will follow)
- Technical Data Sheets (what are the recommended dosages?)
- Spreadsheets (people make mistakes, and nobody really likes math anyway, right?)
- Outcome / Results (Tasting notes, addition rate g/L, kg/hL, etc.)

So, Why Metric?

- Metric was created to make measurements easier.
- The nature of the metric system makes scaling up and down easy
- We can use metric to calibrate our equipment
- Today will focus on scaling by 1000 times.

Metric Basics

- Volume - Base Unit: **Liters**
  - 1 liter (L) = 1000 milliliters (mL)
  - 1 milliliter (mL) = 1000 microliters (µL)
- Weight - Base unit: **Grams**
  - 1 kilogram (kg) = 1000 grams (g)
  - 1 gram = 1000 milligrams (mg)

Volume, Weight…convert?

- Convert Volume to Weight and Weight to Volume
  - 1 liter (L) of water = 1 kilogram (kg)
  - 1 milliliters (mL) of water = 1 gram (g)
  - 1 microliter (µL) of water = 1 milligram (mg)

The Specific Gravity Variable

Specific Gravity

- Specific Gravity is the ratio of the density of a solution as compared to the density of water (which is SG: 1.000)
- Weight, Volume, Specific Gravity. Measure 2 and calculate the 3rd
- 100mL of liquid that weighs 113 grams is 1.13 times the weight of water
- A liquid at 1.13 SG that weighs 1.13kg has a volume of 1 Liter

Micro Pipette Dispenser

Dosing Very Small Volumes of Liquid

- Accurate and repeatable.
- Pipettes measure in milliliters
- Micro Pipettes measure in microliter
- Different ranges available.
- Use with pre-mixed solutions like acids, extracts, sulfites

Milligram Scale

Milligram Scale

- Capacity of 100g
- Resolution to 0.001g (1 milligram)
- Inexpensive (approx $24)
- Very accurate
- I’ve tried MUCH more expensive scales and this is my favorite.

Stir Plate

- Use these to make sure your scale reads correctly before any trial.
- Confirm your scale is performing correctly across across its entire weight range.
- Calibrate your volumetric measuring tools.

Stir Plate and Heated Stir Plates

- Thoroughly mix your ingredients
- Uses spinning magnets to quickly rotate a pill-shaped bar (stir bar)
- Some models also have heaters so you can heat/boil your solutions.
- Great tool for building up yeast starters

Equipment

Gram Scale

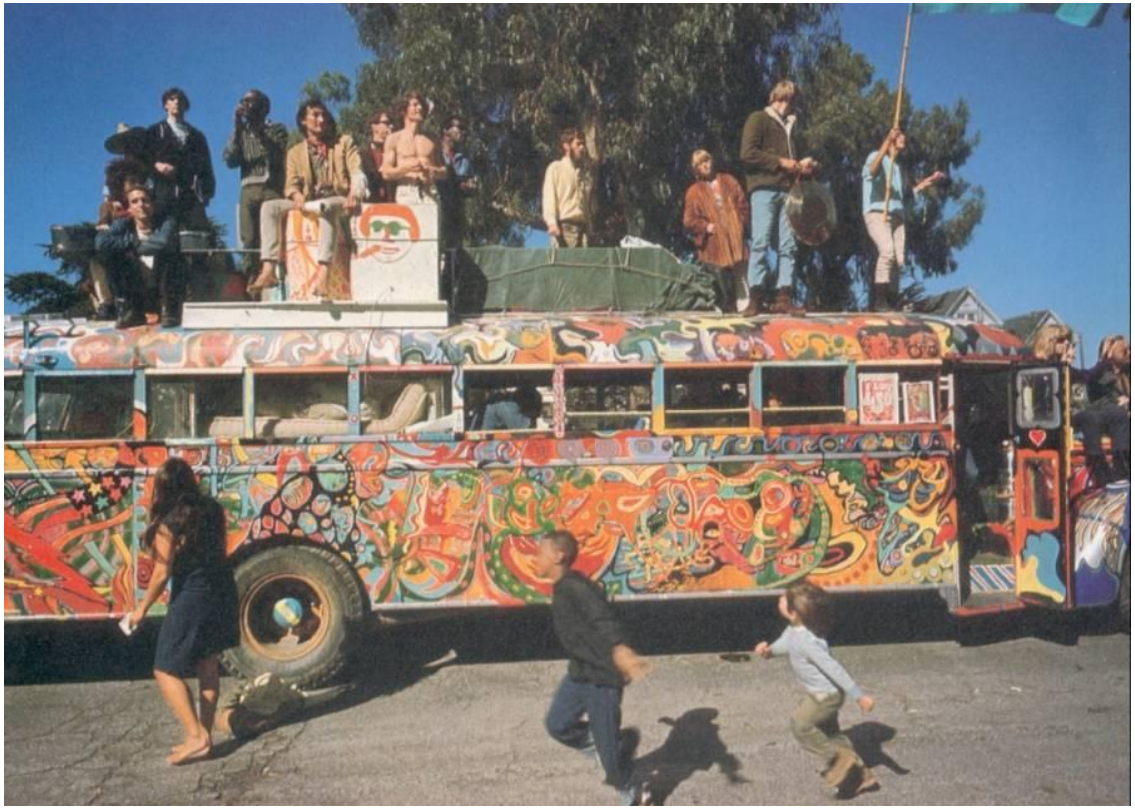
- Capacity of 500g
- Resolution to 0.01g (10 milligrams)
- Lots of options in this weight range
- A good one can be found for under $100
- Make sure you get one with a calibration weight

On to the Fun Stuff

Today’s Bench Trials

- Acid Tests
- Fining Agent Comparisons
- Backsweetening and Flavors
- Other Ideas for Trials

The Electric ~~Kool-Aid~~ Mead Acid Test



Acid Test

But First….Stock Solutions

> “A stock solution is a highly concentrated solution. These solutions are very useful because we can dilute a portion from the stock solution to get a desired concentration. These stock solutions are important in saving preparation time of chemical reagents. Moreover, it helps us to conserve material.”

Source: Difference Between Stock Solution and Standard Solution

Acid Test

Let's All Try Acid

- Detailed Instructions. Testing with a 10% stock solution.
- Our goal is the find the desired amount of grams of acid to add per liter of mead.
- Mix 10g of acid into distilled water to get 100mL total solution
- Measure out 100mL of mead into 5 glasses
- Dose stock solution into the first 4 glasses.
    - #1: 0.5mL, #2: 1.0mL, #3: 1.5mL, #4: 2.0mL
- Do not add any acid to glass #5. This is our control.
- Which one do you prefer? If the range is too wide, you can narrow it down.
- **Pro Tip:** Try this test with Malic, Tartaric and Citric acids. Make your own blend.

Acid Test

Now Scale your Favorite Sample to grams per Liter (g/L)

- Steps to Scaling our Results
  - We started with 10g of acid in 100mL water.
  - Every 1mL of acid solution is equal to 0.1g of acid per 100ml of mead.
  - 100ml is 1/10th of a liter. So simply move the decimal of both the acid and mead and you get 1g/1000mL of mead. 1000mL is the same as 1L
- For every 1mL dosed in your samples you added 1g/L
- Make a simple spreadsheet to do these calculations for you.
- Multiply your batch size (in Liters) by the grams/Liter of acid to add.
- Test it against your samples (pH, TA, taste). Did it match? If not, why?

Clarification / Fining

- Some ingredients make clarification more difficult.
  - Yeasts, Pectins, Spices/Herbs etc.
- The wrong fining agent can cost you time and money.
- Seeing is believing, but I can’t see through stainless steel.
- You can get samples of different clarification products for lab trials.
- Always use a Control. Over the period of the trial, the mead may settle out naturally.

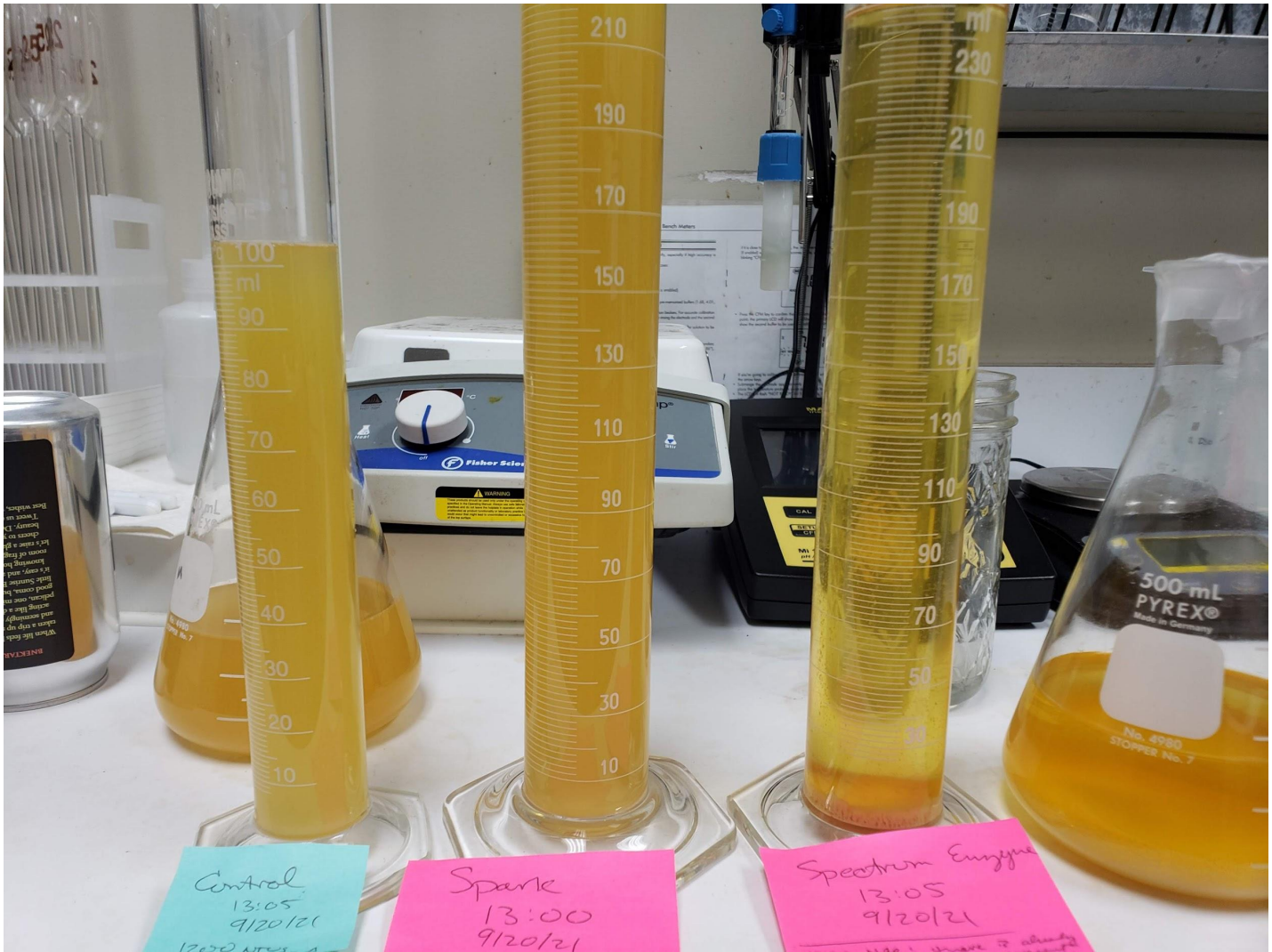
Clarification / Fining

Case Study: Lemon in Backsweetening

- Lemon juice at backsweetening our Kill all the Golfers mead was clogging our expensive filters. Our usual method of fining wasn't working.
- We expected that the pulp from the lemon juice was the culprit.
- As a simple trial, we tested our usual method (sparkolloid hot mix) against a pectic enzyme (Spectrum from Scott Labs) to see if there was any improvement.
- Using the manufacturers directions, we scaled down their recommended dosage (in mL/hL) down (using a Stock Solution) to test in 250mL
- Using 250mL graduated cylinders gave us a tall column of liquid to visually compare how fast the solids fell from suspension. We observed daily.
- Long pipette to grab samples from the bottom and test NTU (turbidity)

Clarification / Fining

NTU Meter


Control
13:05
9/20/21
Spark
13:00
9/20/21
Spectrum Enzyme
13:05
9/20/21
500 mL
PYREX
Made in Germany
No. 4980
STOPPER No. 7

Treatments / Backsweetening Trials

Try it Before You Commit

- Chili peppers, vanilla beans, oak chips
  - How much should I add? How long will it take to pick up the flavor?
- What amounts and ratio of Passionfruit to Guava to Honey per Liter should I add to get the flavor I want?
- I’ve never used this vendor for puree/juice/etc. Will it be a good substitute for my usual supplier?
- Play around and take notes. How many grams/mL/etc. did you use in your favorite sample. How many mL of base was your sample? Scale it up using metric in your spreadsheet.

Treatments / Backsweetening Trials

Orange Cream Delight

- We wanted our new Orange Cream Delight mead to taste like an Orange Creamsicle popsicle. But we weren't able to get the orange flavor I wanted using juice or concentrate.
- I found a really good orange extract that I really liked. The recommended dosage was between 0.1% and 0.3% of the batch size.
- To test at different amounts within the recommended range, I used 50mL samples of mead and a micropipette.
    - 0.1% of 50mL is 0.05mL of extract OR 50.0 microliters (µL)
    - 0.3% of 50mL is 0.15mL of extract OR 150.0 microliters (µL)
- I found 0.1% to be too much, so I ended up scaling it down even further.
- Altogether, I was able to dial in EXACTLY the flavor I wanted.
- We scaled it up to 80hL with no noticeable difference. Trials used about .25L of product

Equipment

These Affiliate Links Help Support my Family

- Pipette and Hand Pump
- Lab Scoops/Spoons
- Beaker & Graduated Cylinder Set
- Heating Stirplate
- 500g scale
- Calibration Weight Set
- Milligram Scale (100g)
- Micro Pipette

If There is Time Left

And…. I haven’t put everyone to sleep

Brix - What Does it Really Mean?

A Measure of Sugar by Weight

- Most specifically, Brix is a measurement of the grams of sucrose in a 100g solution.
  - Another way to say it is that it's the percentage of sugar (by weight)
  - Sucrose and other sugars are so close that for all practical purposes they're considered the same.
  - Honeys are around 80 brix. Juice concentrates are around 60-70 brix.
  - Fun Fact: Brix measurements are standardized at 20C/78F (aka: Room Temperature)
- You can Convert from Brix to SG
  - Unfortunately, there is no exact way to do this. But through many trials there are formulas out there that use empirical methods.
  - =SUM(0.00000005785037196 * (BRIX^3) + 0.00001261831344 * (BRIX^2) + 0.003873042366 * BRIX + 0.9999994636)
- **Pro Tip:** If you know how many grams of honey or concentrate you're adding to a mead, and you know it's brix, you can calculate your final volume after backsweetening.

Thank You!!

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