A Compendium of Mead Knowledge

Kyle Byerly Various Other Contributors

November 5, 2011

Contents

1 Fermentation

This is perhaps the most important aspect of mead making. You can have the best ingredients, but if you don't have a healthy fermentation, your honey, and other ingedients, won't shine. This section is ordered in approximate order of the magnitude of impact. The farther you read and apply, the better your meads will go. The earlier topics have more "bang for your buck" and are usually quite easy to implement.

Nutrient addition and yeast pitching rates are quite easy to implement. Temperature control can be done quite low-tech (with manual effort) or high-tech with automation. Oxygen stones aren't incredibly cheap but they do have a fair bit of benefit. The usage of pH meters, while relatively expensivee, can give you quite a bit of useful information on the current status of your mead.

1.1 Yeast

There is a vast variety of high quality yeasts available to the average meadmaker. Highlighed below are a few of the favorite more easily available ones. In general, the best results from a given yeast are usually obtained when fermenting in the lower third of the yeast's fermentation temperature range.

D-47: A classic yeast for white wines which is often used to great effect in traditionals. Be careful of letting it get to warm (above 70°F) as it throws off fusels and harsh alcohols. It can Sur Lie (age on yeast) for quite some time, adding floral characteristics.

DV10: A champagne isolate of a bayanus strain that produces minimal esters and phenols. Also tends to not blow off more delicate honey aromas. Ferments to 18% regularly. Good for dry meads and high alcohol sweet meads. It is a low nutrient yeast, but tends to produce sulfur unless front-loaded with nutrients (50/25/25 schedule or 75/25 seems to work well).

71B-1122: Narbonne yeast that can metabolize some malic acid. Useful for young meads (low alcohol) or those with a significant portion of an acidic fruit.

K1V-1116: A generic fruit wine yeast. Good results have been reported in high temperature fermentation environments such as in excess of 75°F.

Uvaferm 43: A bayanus yeast strain that has an alcohol tolerance of 18%+. It is commonly used for high alcohol wines and tends not to blow off delicate aromas. Also commonly used with dessert wines and stuck fermentations.

1.2 Yeast Nutrients

Nutrients are used to make up for the lack of proper nutrients in the must, to aid in fermentation speed, or to overcome a stuck fermentation. They are typically added in relatively small amounts throughout the fermentation process. Because of the small amount needed, adding too much can be done easily, so care should be taken when calculating and adding nutrients to the must.

GO-FERM: Used in rehydrating yeast. 1.25g of GO-FERM per gram of yeast with 17g grams of water. Mix GO-FERM and water together and add yeast at re-hydration temperature (typically 104-109F).

DAP: Also known as Di-ammonium phosphate, chmical name $(NH_4)_2HPO_4$ is a source of inorganic nitrogen, which provides YAN (Yeast Available Nitrogen) for nitrogen deficient musts (such as honey). 1g/L provides 210ppm of YAN. 1g/Gallon provides 50ppm of YAN. Do not add past 2/3 sugar break. The yeast cannot consume the nutrient at this stage and it will likely result in Urea type aromas and flavors in the finished mead. Do not add to hydrating yeast as DAP is somewhat toxic to re-hydrating yeast.

Fermaid K: Provides micro-nutrients and YAN for yeast health. Pyridoxine and Patothenate are two of these micro-nutrients. 1g/Gallon provides 25ppm of YAN.

Yeast Hulls: also called Yeast Ghosts, are dried yeast cells. Used to aid in unsticking of a stuck fermentation or to combat H_2S formation at the end of a fermentation (usually past 2/3 sugar break).

1.3 Yeast Feeding

The process of yeast nutrient additions is relatively simple at the core. Yeast need nutrients and honey does not have enough, therefore small amounts of nutrients need to be added in order to keep the fermentation healthy. The Nanaiomo Winemakers have additional detail on nutrient addition for fermentation [1].

It is a very good idea to mix powders in liquids that you plan on putting into a fermenting liquid. Adding a powder to a fermenting liquid will introduce nucleation points which will in turn produce lots of foam. Mixing the powder into the foam allows one to gently stir the mix into the must without huge amounts of foam.

1.3.1 Guidelines

There isn't a set amount of nutrients to add, although there are guidelines. One of the easier (and common) to use nutrient combinations is Fermaid K and DAP at a ratio of 70% Fermaid K and 30% DAP. Ratio is based on weight.

1.3.2 Calculating YAN

1.4 Yeast Pitching Rate

Yeast need to be pitched at the proper rate in order to have a high enough cell count to ferment cleanly. There are numerous calculator online, although most are focused on beer. Generally, one 8g packet of yeast is enough to properly ferment a 5 gallon batch of an under 1.120 O.G. mead. If over 1.120 O.G. pitching two packets is recommended.

Sometimes a starter is necessary. The ideal starter for wine yeast is generally 1.070. Using a stir plate is generally a good idea since it oxygenates and stirs, which keeps the yeast in solution and pushes off CO_2.

1.5 Stirring

Something as simple as stirring during fermentation can be one of the most important steps in producing an amazing mead. Stirring drives off CO_2 which is a toxin to yeast. It mixes together the yeast and the must, bring the yeast back into suspension, thus making it more readily able to consume the sugars. It also allows a slight mixing in of oxygen which is necessary for yeast growth. Mixing makes it easy to add your nutrients. Having a touch-point with your mead often makes it easy to check for H_2S or other issues.

Stirring tends to make fermentations faster and healthier.

There is a higher risk of infection with frequent stirrings. However, if you are careful with sanitation and keep your fermentation area clean, the risk is minimal. The rewards of a proper stirring schedule far outweigh the risks of infection.

1.5.1 Stirring Schedule

The easiest schedule to follow for a traditional mead is every 12 hours until 50% sugar break or 2/3 sugar break. Stirring much past that tends to introduce oxygen at a stage that oxygen is less than ideal. You also want to let the yeast drop at some point.

1.5.2 Stirring Schedule with Fruit

1.5.3 Tricks and Tips for Stirring

Get a drill attached stirring device.

When beginning to stir, start slowly so as not to be overwhelmed by foam.

Put a Star-San soaked rag around the top of the carboy or under the drill to help prevent infection or particles from the drill dropping into your mead.

1.6 H_2S and Mercaptans

One of the simplest indicators of yeast stress is the production of H_2S. H_2S smells of rotten eggs or sulfur. Yeast stress indicates that there is something off in the fermentation dynamics. The most common reason for H_2S is low nutrients. Other causes are temperature (either too low or too high for the yeast) and pH (too low or too high).

1.6.1 Eliminating Before 2/3 Sugar Break

The easiest thing to add here is DAP. If you've added no DAP or Fermaid K you should add a 70/30 mix of Fermaid K and DAP. Add at a dosing rate of [RATE], stir and the H_2S should lessen in under 5 minutes. If it doesn't, then add [RATE] and stir again. If, at this point, it is still smelling of H_2S then the issue is likely not because of lack of nutrients, but rather from a low pH, low temperature, or insufficient yeast pitching rate.

1.6.2 Eliminating After 2/3 Sugar Break

If you smell H_2S after 2/3 sugar break you should not use DAP or fermaid K to remidy the situation. Both of those contain inorganic nitrogen (DAP) that the yeast can't metabolize very well at that point of the fermentation. The best thing to add is Yeast Hulls at .5g to .9g per Gallon. Start with .5g/Gallon, and then, if after stirring and waiting 5 minutes the H_2S smell doesn't go away, add additional Yeast Hulls in .2g/Gallon increments (stirring and waiting inbetween additions).

1.6.3 Eliminating After Fermentation is Complete

If all else fails, and there's still H_2S in your mead after the fermentation is done you still have a chance of fixing the mead. It is more difficult and must be caught and fixed quickly. The earlier you catch the H_2S and deal with it, the less mercaptans you'll have in your mead.

Grapestompers[5] recommends sulfiting and doing what is often called "Splash Racking." This is a technique to aerate the sulfited mead to blow off the H_2S. If that's not sufficient to remove the H_2S it is recommended to rack the mead over copper.

The British Columbia Amatuer Winemakers Association[6] recommends aerating and racking the wine through a one inch PVC pipe with copper pot scrubbers inside, mentioning that the surface area is critical. They also do not recommend waiting, but doing the aeration and copper treatment as soon as possible as H_2S is converting to sulfides and then disulfides within 2 days of the beginning of H_2S production.

You will also likely want to fine and/or filter your mead after using copper as some report a decrease in shelf life of beverages treated with Coppper.[CITATION NEEDED]

1.7 Temperature control

This is a very important part of a proper fermentation.

1.8 Oxygenation

1.9 Must pH

Important in maintaining a healthy fermentation. Keeping the pH between 3.7 and 4.6 for initial fermentation is key.

1.9.1 H_2S or Sluggish Fermentation

If you're finding that your mead is producing a large amount of H_2S and that temperature, and/or Yeast Hull or nutrient additions are not eliminating it, chances are your pH is off. You will need to measure your pH to see if that is the cause. If you can measure your pH and it is below 3.5 then you'll want to add some $CaCO_3$ (Calcium Carbonate) at [DOSING RATE] until you've reached a pH of 3.7. If your pH is too high, above 4.8, you can add some acid blend to adjust below 4.6. There are issues with using too much acid blend or $CaCO_3$.

If your temperatures are outside the recommended yeast temperature range, slowly adjust the temperatures up or down with a water bath with ice to cool or warm water and/or a heating device such as a fermwrap or brewbelt. You'll want to slowly adjust the temperature, going fast will likely shock the yeast which could stop fermentation. Generally, changing the temperature of the must/mead faster than RATE] can make the yeast drop out and end fermentation.

1.10 Step Feeding

1.10.1 Classical Step Feeding

1.10.2 Bottom Dwelling Continuous Diffusion Yeast Feeding (BDC DYF)

2 Honey

3 Spices

3.1 While Aging

3.2 Tinctures

3.2.1 Alcohol Tinctures

3.2.2 Water Tinctures

4 Oak

4.1 Benefits

4.2 Barrels

4.3 Cubes, Chips, and more

5 Fruit

6 Fermentation Vessels

6.1 Carboys

6.2 Kegs

6.3 Connicals

6.4 Buckets

7 Sanitation

8 Aging

8.1 Bulk Aging

8.2 Bottle Aging

9 Recipes

9.1 General Process

Mix your honey with some warm water (in order to make the honey easier to work with). Gradually add cool water until you've reached your volume. Make sure the honey and water is completely mixed. At

this point take a gravity reading. If you're shooting for a gravity add honey or water if you're gravity is low or high respectively. Keep in mind that the sugar in honey varies from year to year and hive to hive.

At this point you should create your 109°F water for rehydrating your yeast. You will also want to use GO-FERM when hydrating. Mix the water and GO-FERM, then add the yeast and let sit for 15-20 minutes. I recommend you cover the yeast with sanitized tinfoil.

Three useful resources for when you are crafting a recipe are the Gotmead Mead Calculator[3], the Lallemand Yeast Chart[2], and the Nanaiomo Winemakers YAN Yeast Calculator[4].

9.2 Dry Traditional

Ingredients

12 – 14	lbs. Quality Honey
5	gal. water (to volume)
1	pkt. re-hydrated Yeast (D-47, DV10, 71B-1122, K1V-1116...)

Notes

This will make a standard strength dry mead. You'll want to shoot for around 1.085-1.100 for original gravity and look for a final gravity between 0.992 an 1.004 with final alcohol around 12-14% ABV.

9.3 Semi-Sweet Traditional

Ingredients

15 – 17	lbs. Quality Honey
5	gal. water (to volume)
1	pkt. re-hydrated Yeast D-47

Notes

This will make a standard strength semi-sweet mead. You'll want to shoot for around 1.110-1.120 for original gravity and look for a final gravity between 1.004 and 1.014 with final alcohol around 14% ABV. 1.004 is usually considered dry, but there can be some perceptual overlap. If it goes dry, you can always backsweeten by adding more honey. The reason this uses D-47 is because it is a 14% alcohol tolerant yeast and many of the others will take this all the way dry. If you use a stronger yeast, you may need to add more honey or backsweeten.

9.4 Sweet Traditional

Ingredients

18 – 21	lbs. Quality Honey
5	gal. water (to volume)
1	pkt. re-hydrated Yeast D-47

Notes

This will make a standard strength semi-sweet mead. You'll want to shoot for around 1.130-1.150 for original gravity and look for a final gravity between 1.025 and 1.045 with final alcohol around 14% ABV. The reason this uses D-47 is because it is a 14% alcohol tolerant yeast and many of the others will take this into semi-sweet or dry territory or into higher alcohol (and longer aging). If you use a stronger yeast, you may need to start with a higher gravity or backsweeten.

9.5 Semi-Sweet Session Mead

TODO

References

[1] Nanaiomo Winemakers, Adding Nitrogen to Fermentations. http://www.nanaimowinemakers.org/Winemaking/General/AddingNitrogen.htm

[2] Chart of Lallemand Yeasts. http://www.lallemandwine.us/products/yeast_chart.php

[3] Gotmead's Mead Calculator http://www.gotmead.com/index.php?option=com_content&task=view&id=745&Itemid=16

[4] Nanaiomo Winemakers, YAN Yeast Calculator http://www.nanaimowinemakers.org/Winemaking/General/YAN-YEAST-Calc-Nov2010-rev2.xls

[5] Grapestompers, How to fix rotten egg smell in wine http://www.grapestompers.com/hydrogen_sulfide.asp

[6] British Columbia Amatuer Winemakers Association, Hydrogen Sulflide and its Derivatives http://www.bcawa.ca/winemaking/h2s.htm