Understanding Your Mead: a User's Manual for Beekeepers and Homebrewers

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THE HISTORY OF MEAD

Mead is most likely mankind's oldest fermented drink, made of honey, water and yeast.

The first mead was very likely the result of an accident of nature occurring perhaps 150,000 years ago, long before beer, wine and other fermented beverages. Our hunting and gathering ancestors, perhaps returning with a mastodon in tow, carelessly left some honey out in the rain. When some adventurous humanoid tried it a few weeks later, he or she had a mystical experience and the first mead was born. The word "mead" comes from Sanskrit, and the word for "mead" is similar in most languages, further proof of the brew's ancient and venerable origins.

Since its early beginnings, mead has been linked with spirituality and mysticism. The ancient Greeks believed mead to be the drink of the gods, believed to have descended from the Heavens as dew gathered by the bees. In ancient India, mead was believed to water the root of the Tree of Life. It is certainly at the root of human history.

With the onset of agriculture, mead's popularity declined, elbowed out by beer and wine. But in places where vine fruits were less available, mead remained popular. The Vikings continued to drink mead, believing it gave them courage. During the Middle Ages the English nobility, including Queen Elizabeth I, enjoyed a good mead with a fine dinner. Today, mead is reclaiming its place among the burgeoning market for craft beers and ciders. Preppers and preppies alike appreciate mead for the simplicity of its recipe compared to brewing beer or fermenting wine.

HONEY, THE SOUL OF MEAD

Honey is the main fermentable ingredient in mead. The concept of "terroir" is widely used in winemaking. It usually refers to the unique gustatory impact of the land, sun and moisture on the flavor and fermentation of grapes. Terroir can play an important role in honey production, too. The flavor, viscosity and sugar content of honey can vary according to the terroir of weather, humidity, sun and the flowers that provide nectar. To bring out the best in a mead recipe it is helpful to take the terroir of honey into account.

When honey and water are combined together for the purpose of fermentation, it is called "must". In making mead, the choice of honey is similar to the choice of grape variety when making wine: the flavor of the honey affects the flavor (and color) of the final product. If honey is from a non-specific nectar source, it is usually called "wildflower" honey. Wildflower honey can vary greatly according to region and season. For a rich, deep flavored mead try a dark wildflower. For a lighter, more subtly flavored mead, try a light honey such as clover. Once you start mead-making you might like to explore the flavor differences of honey, based on the flower source(s). If you plan to add additional flavors to the mead, such as fruit, spice or oak, think about how your initial honey will combine with those components. For example, dark honey with hints of caramel will likely combine well with blackberries, coffee or chocolate while more delicate fruit, such as strawberries might be more successful when combined with a lighter

honey.

Because of its high sugar, low protein composition, honey has a natural "antimicrobial" property that limits the growth of bacteria. But those same qualities can also present a challenge for the yeast. More about that later.

WATER

Don't underestimate the water. Water is, by volume, the largest ingredient in mead, amounting to as much as 80% of the finished product. The minerals in water can enhance or detract from a mead. If you trust your tap water to be pure, try using it. The mineral content of a safe water supply might add interesting complexity.

Clean spring water, rain water or well water are other excellent options. You might consider purchasing spring water or purifying water using reverse osmosis. Distilled water is the last choice, since distilling removes all minerals, leaving the water a bit flat. It is possible to compensate for a lack of character in reverse osmosis or distilled water by adding pinches of minerals such as gypsum, magnesium or calcium.

YEAST, THE TRANSFORMER

Brewers have a saying, “Brewers make wort, yeast make beer.” The same is true in making mead. We create the must that the yeast transform into mead (though the bees deserve some of the credit, too!).

A packet of yeast contains hungry little single-celled fungi that love to eat. In a mead, their favorite food is sugar from honey. The more they eat, the more they reproduce. When they eliminate waste, they produce alcohol, carbon dioxide, and other by-products. The result is the fabled brew of the Vikings.

Yeast break down sugar for their growth and energy through the process of fermentation. The source of sugar for fermentation is different for mead (honey) and wine (grapes) versus beer (grain), but the process is the same. Sugars (glucose and fructose) are first metabolized to a chemical called pyruvic acid, and then pyruvic acid is converted to ethyl alcohol and carbon dioxide. Fermentation is considered an anaerobic process (without using oxygen), though in yeast, fermentation occurs in high sugar environments even if there is oxygen present.

Different strains of yeast consume different amounts of sugar. The greediest yeast can eat almost all the sugar, leaving the mead dry, sometimes so dry that your tongue puckers as if sucking a lemon. Champaign yeast is an example of a dry yeast. Instead of brewing to this level of dryness, you might wish to aim for semi-sweetness by choosing a strain of yeast that stops eating and starts flocculating before all the sugar in the honey is gone.

But yeast does more than just contribute to sweetness and dryness. Different yeasts imbue the mead

with subtle flavors, "esters." Be it flowery, fruity, earthy, or mineral, the choice of yeast leaves its footprint. Analyzing the flavors of a particular yeast strain in the must can be a useful springboard for the creative mead-maker. (More about this later, in the section on secondary fermentation.)

Types of Yeast. Yeasts used to make mead, wine, and beer are all species of *Saccharomyces*. Many are strains of the species *Saccharomyces cerevisiae*. Some are *Saccharomyces bayanus* (wine yeasts). Special strains of yeast have been developed for mead and cider making but other types of *Saccharomyces* can also be used to make mead. Most yeasts used to make meads must have a high tolerance to alcohol.

Most commercially available yeasts available in North America are provided by the following companies: Wyeast, White Labs, Lallemand (Lalvin), Fermentis, and Red Star. These companies subject their yeasts to rigorous testing for quality. Yeasts can be purchased in either dry or liquid form. Dry yeasts, sold in either 5 gram or 11 gram packets, have the advantage of longer shelf life.

If you ask 20 mead makers what yeast they prefer, you will probably get 21 different answers. An online mead resource Gotmead.com has an extensive table of wine yeasts available for home hobbyists (https://gotmead.com/blog/making-mead/making-mead-articles/yeast-what-to-use/). Some yeasts are more suitable for dry (less sweet) meads and some for sweet meads. Parameters to consider are:

- Temperature range: optimal temperatures for the yeast to carry out fermentation.
- Attenuation: How much of the sugar the yeast can convert to alcohol.
- Alcohol tolerance: at what level will the alcohol become toxic to the yeast cells. A yeast with higher alcohol tolerance will tend to provide a dryer mead, as more sugars will be used up. A yeast with lower tolerance will stop fermenting at a certain point, leaving residual sugars.
- Flocculation: how easily and quickly the yeasts settle out after fermentation is done. High flocculation will become clear faster.

The number of choices can be overwhelming to a beginner. Here are two recommendations to get started:

- Lalvin 71-B (*Saccharomyces cerevisiae*) This is a wine yeast is used for blush and semi-sweet wines. It has pronounced fruitiness. It has a moderate fermentation rate, medium flocculation, and has an alcohol tolerance of 14%.
- Fermentis SafAle S-04 (Sachharomyces cerevisiae). This is a British ale yeast that produces balanced floral and fruity. notes. It has an alcohol tolerance of 9-11%. It has high flocculation, producing good clarity in less time. Its fermentation time is slower than 71-B. This yeast, according to the manufacturer, can be added directly to the must without re-hydrating.

The fun part of any hobby is the chance to experiment, so once you have the basics down, feel free to try to new yeasts. One can also experiment by splitting a larger batch of mead into two or more

separate smaller batches, each with a different yeast. When the two batches have finished fermenting, compare their flavors.

How much yeast to use. The amount of yeast per volume of must (the unfermented mead) is termed the "pitching rate." One can express pitching rate in terms of cells per liter, or by grams of yeast. The typical "rule of thumb" is 1 to 2 grams per gallon of must. More may be needed for higher gravity musts. The amount is based on the sugar content of the must (measured by specific gravity or Brix scale units). A 5-gram packet of yeast (suitable for a 2 to 5 gallon batch) contains an estimated 50 billion cells. For "normal" meads up to 25 Brix (specific gravity <1.110)[1] use 1 gram per gallon. For higher gravity meads >25 Brix (specific gravity ≥1.110) use 2 grams per gallon. When in doubt go higher. It's almost impossible for an amateur mead maker to overpitch but underpitching may result in the yeast producing off-flavors.

Feeding your yeast. Besides adequate cell numbers, proper temperature and nutrient "feeding" levels play important roles in successful fermentation. Mead makers have a challenge that beer brewers do not have; unlike malt derived from barley, which has virtually all the nutrients that yeast need (sugars, amino acids, phosphates, and vitamins), honey is low in nutrients needed to sustain the yeasts. Struggling yeasts can produce "off flavors." To help yeast thrive, mead-makers usually feed nutrient supplements to the yeast for the first few days or weeks of the primary fermentation. Happy, well-fed yeast is likely to yield happy flavors in your mead. But not all "yeast nutrients" are the same. There are several products sold on the market that can be used, alone or in combination. The two are commonly paired together are DAP and Fermaid (see recipe).

- **DAP**: Diammonium phosphate. This provides both a source of nitrogen for proteins, and phosphorus (in the pure chemical form of phosphate) for nucleic acids and membranes. Diammonium phosphate is a salt that is manufactured artificially (though it is a natural compound found in nature). Sometimes, DAP is combined with food grade urea and is labeled "*yeast nutrient*."
- **Yeast energizer**: a blend of diammonium phosphate, yeast hulls, magnesium sulfate, and vitamin B complex. It is useful to prevent or restart a "stuck fermentation" by replenishing depleted nutrients. A half teaspoon per gallon of must is the recommended dosage.
- **Fermaid O™**, sold by Lallemand for winemaking: a blend of inactivated yeast fractions rich in organic nitrogen[2]. Fermaid O™ does not contain added ammonia salts (DAP) or micronutrients (trace minerals). Some mead makers prefer to use this type of nutrient because they consider it more "natural." Lallemand's recommendation is to add 1.5 g/gallon, half at the start of fermentation and the rest at one-third sugar depletion. Many mead makers use it in their step feeding program.
- **Fermaid K™** (also by Lallemand): a complex nutrient mixture similar to Fermaid O. In addition to amino acids and lipids from inactivated and autolyzed yeast, it contains magnesium sulfate, vitamins (thiamin, folic acid, niacin, calcium pantothenate), diammonium phosphate. According

[2] The term **organic** refers to the chemical form, not how it is produced. Organic nitrogen means that the element nitrogen is part of a carbon-based molecule (for example, an amino acid).

to the manufacturer, the addition of magnesium increases alcohol tolerance. Pantothenic acid also reduces the production of hydrogen sulfide that is a byproduct of amino acid metabolism. Lallemand's recommended use is to add 0.75 g/gallon at the beginning of fermentation and also half as much seven to ten days after starting the mead (total about 1 g/gallon).
Note: if you do not have a way to weigh ingredients, a half teaspoon of Fermaid is about 1.5 grams.

Oxygenation. The yeast must have oxygen early in the fermentation in order to be able to synthesize their cell membranes. This is accomplished by vigorous mixing of the must before pitching.

Yeast starters. *What is a starter?* A starter (short for starter culture) is a small volume of sugar-rich liquid used to grow yeast cells. It can be done to is done to "kick start" your fermentation or to bump up your population of yeast cells that will be is added to the must. Starters are typically prepared at least a day ahead. A starter is not really necessary for dry yeast, which can simply be rehydrated, but it can be useful for liquid cultures.

Benefits of a starter. A starter has a several benefits. First, it can verify that you have a viable package of yeast. Packaged yeasts (especially those that are in liquid form) have a limited shelf life. If the yeast is past its "best-by" date, that doesn't mean it's completely dead and useless. It still could have many living cells, as long as the package has been kept refrigerated. However, if it's way past its expiration date, or if it hasn't been kept in cool conditions, you might be taking a chance on it. If you attempt to make a starter and there is good activity (lots of bubbling), you know your fermentation will proceed well. If there is little to no activity, you might consider buying fresh yeast.

Another reason a starter is beneficial is that it reduces the lag time between introduction of the yeast and start of fermentation. The yeast cells are activated and acclimated to the environment they will be in. They start producing the enzymes necessary to break down the sugars available in the must. Also, there are more cells tackling the job of fermentation.

Some mead makers use starters just to give their yeasts a day's head start, but starters can also be used to increase the number of cells (let's call this a multiplier starter, see below). If you are making a larger batch of mead or a high gravity mead, a starter can save you money. By preparing a starter, you can buy fewer packets of yeast. You can double the amount of yeast you have. The more workers, the faster the job gets done.

If it's just a head start you want, be aware that whatever medium you grow your yeast in will affect the flavor of the mead. If you want to double your yeast population, then you want to grow the starter for a day or two and then allow the yeast cells to settle out by placing the starter in the refrigerator. This is termed "cold crashing." After the yeast settle out, the used growth medium can be decanted off, avoiding undesired flavors from the used growth medium.

How to prepare a starter. One way to make a starter involves fruit juice, either white grape juice or apple juice. Apple juice is less pronounced than grape juice. Make sure that the juice does not have preservatives such as potassium sorbate. (Ascorbic acid is OK.) Pasteurized juices are preferable, as

chemical preservatives will prevent yeast growth. Avoid raw juices as they will have wild yeasts and other microbes that can produce off-flavors.[3] A cup (8 ounces) is good for a gallon of mead. A quart is good for five gallons.

1. Make sure the juice is at room temperature.
2. Sanitize a glass mason jar with boiling water or soak in a sanitizer such as StarSan (use manufacturer's directions). For a cup of starter, use a pint sized jar, to leave some room for gas to escape.
3. Add the juice to the container and then sprinkle in the dry yeast or pour in the well-mixed liquid yeast.
4. Either use a cover with a top fitted with an airlock (look into fermentation kits sold online or make your own), aluminum foil or keep the lid on loosely. Let sit 12 to 24 hours. When it's vigorously fermenting, the starter is ready to pitch.

An alternative to juice is diluted must (1:1 with boiled and cooled water, with a pinch of yeast nutrient).

"Multiplier Starter." Dry malt extract (DME, used in home brewing) can also be used to make a starter to propagate your yeast population. You will need a larger volume than just the "kick starter" version. To make a multiplier starter:

1. Heat a quart of water to a boil in a kettle.
2. Add about two-thirds of a cup dry malt extract (100 grams). If you have a scale, you can prepare a 10% dry malt extract solution by weight (95 grams per quart). The specific gravity should end up about 1.040 (10 Brix). Mix well.
   Note: You can use liquid malt extract but will need to use 20% more because it contains water. Adjust starting volume of water accordingly.

Materials to prepare a pint of malt extract starter.

3. Mix well and return to a gentle boil. Boil 10 minutes. Put the lid on the pan for the last few minutes.


A malt starter approaching a boil.

4. Remove from heat and add a half teaspoon of yeast nutrient such as Fermaid O.
5. Cool in a sink with ice water (be careful not to let non-sterile water or ice get into the cooling liquid.)
6. When the kettle feels cool to the touch, pour the liquid into a sanitized half gallon glass jug. Allow the liquid to finish cooling to room temperature. We do not want to shock the yeast by adding it to a liquid that is warmer than the

[3] You can pasteurize juice yourself by heating it at 60°C (140°F) for 30 minutes. Alternatively, to really make sure you've killed off any spoilage bacteria or yeasts, you could also just boil for 10 minutes and allow to cool.

recommended fermentation temperature range for your particular yeast.

7. Sanitize the outside of the yeast packet (wipe with alcohol or Starsan®, and make sure you sanitize your scissors as well).
8. Open the packet or pouch and add to the jar. Attach a sanitized airlock or cover with plastic wrap or aluminum foil. Carbon dioxide must be allowed to escape.
9. Shake the starter vigorously to aerate it (oxygen is needed for the beginning phase of growth).
10. Allow to sit at room temperature for 24-48 hours, periodically swirling. Within 12 hours, foam should appear.
11. Many homebrewers use an electric stir plate (with a magnetic stir bar) to continually aerate their starters for beer. That approach works very well. The constant aeration allows the yeast to grow faster. The downside is the extra cost for the equipment.
12. After 24-48 hours, a yeast sediment should start to appear at the bottom. Place the container in the refrigerator. Chilling it speeds up the sedimentation of the yeast. Allow to sit 1-2 days.
13. When the yeast have settled out and the above liquid has become clearer (though not entirely clear, depending on the strain of yeast), the yeast is ready to pitch. It will keep a few more days in the cold, as the yeast have built up energy reserves. But the longer it is in the refrigerator, the more it will use up those reserves and start to become starved.
14. Before pitching, pour off the used DME starter solution, leaving just enough to resuspend the yeast. You do not want to pour the used solution into the must with the yeast as it will adversely affect the flavor of the mead.
15. A five-gram packet of yeast (containing about 50 billion cells) can be doubled in a quart of starter. The equivalent of two packets (100 billion cells) would need to be grown in two quarts of starter to approximately double the population size.[4]

A starter culture (fitted with an airlock) just beginning to ferment (notice the foam).

Good sanitation is critically important. Introduction of bacteria or spoilage yeasts can ruin the fermentation. In addition to StarSan (which can also be used in a spray bottle), Everclear grain alcohol can be diluted to 70% and used as a sanitizer.

As fermentation slows, the yeast grab onto each other for dear life and gradually sink to the bottom of the brew. This is called “flocculation”. The layer of flocculated yeast at the bottom of the brew is known as the “lees”. A less technical – but more descriptive -- term is “sludge.” We remove the mead from the lees by racking. (More about racking later.)

SPECIFIC GRAVITY, THE NORTH STAR OF MEAD

[4] Source: John Palmer’s *How to Brew* (available in book form or online)

Using a mead recipe as a guide, we can adjust a recipe to the particular moisture content and sweetness of a honey by using specific gravity. Specific gravity is the density of a solution relative to pure water. It is a way to measure the amount of sugar in the must. Adding sugar to water increases its specific gravity, and as the sugar is converted alcohol, the specific gravity decreases. When you are mixing up a mead, the recipe usually calls for a 1:4 ratio of water to honey. However, this ratio can vary according to the moisture content of a specific honey. The good news is, by monitoring specific gravity, a mead-maker can stay on the course for success.

Monitoring specific gravity requires the help of a scientific instrument called a refractometer. A refractometer costs from under $20 (for a simple one) to $150 (for a digital one). Using a refractometer is an easy way to take the guesswork out of mead-making. Simply place a drop or two of must on the stage of your refractometer. If the reading is low, add some more honey. If it's high, add some more water. Work the water to honey ratio up and down, guided by the specific gravity readings until you arrive at the level of specific gravity that is desirable for your mead.

Specific gravity is usually expressed according to measurements from the Plato or the Brix scales. Plato, the specific gravity scale that is similar to the scale commonly used by brewers, is a measure of the weight of the solids dissolved in water. Brix, a scale commonly used in industrial brewing, is used for measuring the amount of sucrose dissolved in water. (To convert Brix to brewers specific gravity, please see http://www.brewersfriend.com/brix-converter/)

GotMead.com has a useful online calculator to determine the amount of water and honey for a targeted specific gravity. (See the Mead Batch Calculator.)

When making mead, try aiming for a specific gravity for semi-sweet mead around 1.110 (Brix 26). Semi-sweetness leaves some room for the possibility of additional sweetening down the line. Remember, if you want it sweeter, you can add more honey after the initial fermentation. If the initial fermentation is very sweet, it is much harder to adjust it later.

Original gravity (OG) is the specific gravity before fermentation has begun. Mead-makers might differ in their OG readings, but the sweetness levels below are generally accurate. Mead-makers might aim for the semi-sweet range, since it is easy to add sweetness and very hard to remove it later on.

A refractometer.

Sweetness level	Original specific gravity (OG)	Starting Brix
Dry mead	Up to 1.110	Up to 25.9
Semi-sweet mead	1.110-1.120	25.9-28.1
Sweet mead	1.120-1.135	28.1-31.2

Specific gravity is used to guide the mead-maker towards the desired sweetness of the mead. It is also used to calculate the desired alcohol by volume (ABV) of your mead. You can use the original specific gravity of your mead to guide the alcohol content outcome of your mead:

Alcohol by volume	Original Specific Gravity (OG)	Starting Brix
Hydromel (low alcohol content, below 12% ABV)	1.035 - 1.080	8.8-19.3
Standard (medium alcohol content, 12-14% ABV)	1.080 - 1.120	19.3-28.1
Sack (very strong, high alcohol content, 14-16% ABV)	1.120 - 1.170	28.1-38.3

MEAD-MAKING TIMELINE

Good mead takes time. The first fermentation, called the primary fermentation, or the “primary”, usually takes several weeks. This is when the yeast takes off, glug-glugging happily then gradually quieting down over the next few weeks.

A mead, like a child, needs a healthy start. Plan on being present to nurture your mead during the initial weeks of its life. During the early stages of the primary you will be stirring your mead almost daily. You will also be giving the yeast its dose of supplemental nutrient every other day. Don’t start a mead if you will be gone during this critical period unless you have a mead-sitter to care for it in your absence.

At the end of the primary, when the glugging has tapered off, the mead-maker will rack the mead, transferring it from its original container to a new one, leaving the old, spent yeast behind. Once you have moved into the second phase of the life of a mead, called the secondary phase, or “the secondary”, you can let your mead sit quietly in a dark, stable temperature environment for up to 6 to 8 months or longer prior to bottling. The ideal temperature for the secondary is usually between 52° to 70°F, depending on the type of yeast. It is recommended that you keep the mead container, also called a carboy, off a stone or concrete floor, perhaps on a palette or a shelf, as the cold stone can cause uneven

fermentation temperatures. Keeping an even temperature throughout the process is important.

Some mead-makers leave their mead in the secondary carboy for years, letting it continue to blend and meld flavors, slowly maturing into a sweet elixir.

A Basic Mead Recipe

(this is a simple or traditional mead, not a fruit or spice mead)

Ingredients for 5 gallons of mead

- 12-15 pounds of honey
- 4 gallons water (spring water preferred)
- 10 grams (2 packets of wine yeast or a single packet of ale yeast) or 1 packet of liquid yeast. Do not use baking yeast
    - If using dry yeast, 10 grams of Goferm-Protect (a yeast rehydration nutrient, available on-line)
- 1 teaspoon (4 grams) Fermaid K or Fermaid O (available on-line)
- 2 teaspoons (8 grams) DAP (available online or from home brewing stores that carry wine supplies)

Equipment for primary fermentation

- 6 gallon food grade plastic pail with grommeted lid
- Airlock to insert in grommeted lid
- Sanitizer for sanitizing equipment and for filling airlock
- Long/large spoon for stirring (to stir must or add yeast)
- Drill with mixing paddle
- Refractometer to test Brix and/or specific gravity
- 5 gallon pail and spray bottle for sterilization
- Pot large enough to heat honey if the honey has crystallized
- Paper and pen to record notes.
- Materials to label finished must in pail.

Equipment for secondary fermentation

- Clean and sanitized carboy (glass or plastic food grade bucket)
- Auto Siphon racking cane (available online or at homebrewing supply stores)
- 5/16 (inside diameter) food-grade polyvinyl tubing

PROCEDURES

For dry yeast rehydration:

- Small bowl or cup to rehydrate dry yeast
- Fork to add yeast nutrient to dry yeast
- Measuring spoons to measure yeast nutrient (Goferm Protect)
- Timer for dry yeast rehydration

For liquid yeast (Keep refrigerated until use):

- Scissors to open liquid yeast if in a package other than a tube

Part 1: Primary fermentation

1. Mix sterilizer. Fill pail and spray bottle with sterilizer. Sterilize all equipment in advance.
2. Rehydrate dry yeast at least 10 minutes before pitching yeast into the must: Pour 1 cup of body temperature water (98-100 F) into a small bowl. Using a fork, stir 10 g. of yeast nutrient such as Goferm Protect into water, removing lumps. Sprinkle the content of the yeast packet on the water. Let the yeast sit on top of the water.
3. If the honey contains lumps or crystals, place it in a pot of hot water and warm it gently until the lumps have liquefied. Honey should be just warm enough to re-liquefy.
4. Pour honey into a sterilized fermenter, either a glass carboy or a food grade plastic pail with a lid. Stir water into honey, mixing well with drill attachment or long spoon. Use some of the water to flush the remaining honey from the container into the must. Continue stirring honey into water until dissolved. Aim for a specific gravity of 1.115 (27 Brix).
5. Using a refractometer, test the specific gravity (SG) and record it. Stir the mixture some more and take another gravity reading. When two consecutive readings are the same, your honey and water are well mixed. If the specific gravity is not around the desired level, add either honey or water to adjust it. When you have reached the desired specific gravity, this is your original specific gravity and you are ready to add or “pitch” the yeast into the center of the mead must and stir gently.
6. Oxygenate the must by stirring or splashing for 5 minutes.
7. Pop the lid onto pail or carboy, add an airlock half filled with sterilizer or grain alcohol and store your mead in a protected area. Some like to keep the carboy in a bathtub or plastic bin in case of an overflow. Others give it a prominent place on the kitchen table to watch it bubble. Protect it from light by covering the carboy with an old tee shirt or other opaque cloth. Fermentation (bubbles and/or glugs) usually begins within 48 hours.

8. Once fermentation starts, de-gas your must every day for the first 7 to 10 days by stirring briskly to release carbon dioxide. This makes the environment for the yeast more hospitable.

9. Prepare the nutrients. Combine 2 teaspoons of DAP (~8 grams) and 1 teaspoon Fermaid K (~4 grams) in a small sanitized container. Feed nutrients to the yeast 12 hours after pitching the yeast: Second feeding: Wait 2 days and feed the yeast again. Third feeding: 2 days after second feeding. Repeat (final feeding) in another two days. After the final feeding, continue to observe the air-lock activity. It should start off with lots of bubbles, and then slack off in about 7-10 days. When bubbling has almost ceased, give it a little more time (at least a week) to flocculate so that much of the old, spent yeast falls to the bottom of the pail. It's time to check the specific gravity. The primary fermentation is finished when the specific gravity reading is the same for 3 days in a row.

10. Weeks to months later, when fermentation is finished, you will measure the final specific gravity (FG). The final specific gravity should be 1.035 or lower. Dry mead may reach 1.005. Once alcohol is produced, measurement of Brix can no longer be used directly to determine specific gravity as it is before fermentation. One can either use a hydrometer to determine final gravity or convert Brix to specific gravity using an online calculator.

11. Use the formula: (OG-FG)/0.00736 to determine the exact alcoholic content of the finished product. You can also plug OG and FG into an on-line calculator, such as the one found on-line at Brewersfriend.com.

Part 2: Secondary fermentation

When fermentation seems to have stopped, it is time to rack (transfer) the must into a new, clean, sterilized container.

1. Store the racked mead in a dark, cool but not cold place for at least 3 to 6 more months. During this time you can rack it again to help it clear if you wish.

2. Prior to bottling: It is preferable to let the mead sit for 6 months or a year or more to give the mead time to stop/slow fermentation, meld flavors and clarify. Optionally you can artificially stop fermentation by first adding Campden tablets, then adding sorbate tablets two weeks later. If the mead is cloudy, you can use optional fining agents to clarify the mead. (Sparkeloid is a good fining agent; use 2 ounces per 5 gallons.) If you use Campden tablets and fining, the mead will be ready to bottle about two weeks later. Alternatively, let the fermentation and clarification come to a conclusion naturally over time, a long time.

Be patient and you will be rewarded with the fruits of your labor--a beautiful clear straw-colored liquid, slightly sweet, alcoholic but smooth on the palate. Enjoy with friends!

More recipes to come….