



Brewing mead from crushed honey comb



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Documentation for entry in 2017 Arts & Sciences Fair and Pentathlon
Kingdom of Caid, Society for Creative Anachronism

5.12.2 Culinary/Brewing/Wine



Part 1: The Basics

Medieval beekeepers and mead:

In medieval times the standard European beehive was an inverted basket woven of sticks or straw. Bees simply lived as they had for millennia, filling the available space with comb, with the brood surrounded by honey. To harvest the honey the beekeeper killed the bees and removed chunks of comb, tossing the bits of honey comb into one bowl, and the chunks of brood comb in another. Given that the bees tend to segregate the two made the beekeeper's job easier, but invariably some brood comb got into the honey. To extract the honey, the beekeeper would crush the honey comb and strain it through a cloth. After squeezing out as much honey as he could, the beekeeper would find that there is always honey left stuck to the crushed comb. The beekeeper would wash the crushed comb and the resulting honey/water was his for making mead.¹

Making mead by washing crushed comb is not a common practice today. Modern mead-makers typically buy their honey in jars. Modern beekeepers avoid destroying comb, and with modern methods for keeping bees and harvesting honey, there is no need to do so. So when I extracted a hive from under a shed, this opportunity arose.

Collecting the raw material

See Part 2. Brood comb and honey comb were separated. I did my best to trim brood off of the honey comb, but there were bits of brood comb that made it into the honey. The honey comb was crushed and strained in several batches. After allowing the crushed comb to drip, it was wrapped in cheesecloth and pressed to extract as much honey as possible. Total weight of crushed/pressed comb: 17.25 pounds

Wash crushed comb:

From previous experience I have determined that the drained/pressed wax comb still contains about 40% honey by weight.² So 17.25 pounds of pressed comb contains about 6.9 pounds of honey (a little more than 2 quarts). To make a sweet long mead, my target is 4 pounds honey per gallon.³ My plan is to wash the crushed comb and end up with a total of 1.7 gallons of honey/water ($6.9/1.7 = 4$ pounds per gallon).

- From this point all vessels and utensils were sanitized with "Io Star Sanitizer" (Five Star Chemical Co., Commerce City, CO). Sterile nitrile gloves were worn when handling crushed comb.
- The crushed comb was broken up and washed with 3 quarts of water, then drained
Note: For this I purchased bottled spring water, I don't want chlorinated tap water to affect the product.
- The crushed comb was washed a second time with 2 quarts of water, then drained.
- The washed comb was wrapped in a clean cloth and pressed to squeeze out as much water as possible.
- The total final volume of honey/water came out close to 1.75 gallons
- SG: unknown⁴

Make Mead:

- This will be a sweet long mead, with no added flavorings. I want to see what the final product of the crushed comb tastes like without masking the natural flavor.
- I was curious to see what difference boiling makes, so the honey/water was split into two parts:
 - 1 gallon was boiled for 20 minutes
 - The remaining 3 quarts were not boiled
- The boiled portion was brought to room temperature and topped off to one gallon with spring water to replace evaporation. This was poured into a sanitized 2 gal glass carboy.
 - Add ¼ tsp Lalvin D47 yeast (Lallemand Inc., Montreal, QC, Canada)
 - A sanitized plastic airlock was inserted, partially filled with vodka to discourage fruit flies.
- The unboiled portion (3 quarts) was poured into a sanitized 1 gal glass carboy.
 - Add ¼ tsp Lalvin D47 yeast (Lallemand Inc., Montreal, QC, Canada)
 - A sanitized plastic airlock was inserted, partially filled with vodka to discourage fruit flies.
- Both batches were stored at room temperature.

Note: Normally I would add yeast nutrient if the mead does not contain fruit juice or other source of nutrients. But, as I am trying to follow a period-appropriate approach, I will rely on the bee parts and larval bits to provide yeast nutrient.

Timetable:

Mar. 27, 2015: Start fermentation. OG: unknown⁴

Jun 27, 2015:

- The boiled batch is doing well, still very sweet. This was racked into another sanitized jug.
- The unboiled batch was terrible, something very wrong was happening. It was dumped down the sink.

Sep. 20, 2015: Bottle it. Bottles were sanitized as described above.

January 22, 2017: Open one bottle. FG: 1.113⁵

March, 15, 2017: The three remaining bottles each had a layer of dregs at the bottom. I was concerned that jostling in transit would stir up the dregs, so the clear supernatant was decanted into a 2 pint bottle for judging. Note that when the storage bottles were opened there was no apparent internal pressure or carbonation.

March 17, 2017: A sample was tested on a clinical chemistry analyzer to determine ethanol concentration.⁶
Alcohol content: 9.8%

March 25, 2017: One bottle (2 pints) submitted for judging.

Part 2: History, Bees and Gathering Raw Material

An interesting sideline of being a beekeeper is that all of your friends (and their friends, and complete strangers) want you to come over and remove an unwanted swarm or hive from their wall, barbecue, attic, shed, shop-vac, compost bin, bird house, dog house, ...etc. Since I have the equipment and the know-how, I have done a lot of extractions of this type (it's actually kinda' fun), and if the bees are fairly well-mannered I try to rehome them.

This batch of mead originated in a call to remove a hive from someone's backyard toolshed. I preserved as much brood (eggs and larvae) as I could and packaged the brood comb with a lot of bees in one of my boxes to rehome the hive. The extraction yielded about 28 pounds of excess honey comb. This gave me the opportunity to try something that most modern mead-makers normally can't do...brew mead from crushed comb.

Modern honey vs medieval honey.

Modern mead-makers typically buy their honey in jars from the local farmer's market (for the more discerning palate) or in plastic bottles at Costco (for the budget conscious). Modern honey is clean and pure, there should only be honey in that jar. Thus the modern mead-maker can choose to skip the historical step of boiling their must before adding yeast. Morse states: "*... since people then did not understand pasteurization any more than they did fermentation, this does not explain why the early recipes called for boiling.*"⁷ Even without an understanding of microbiology, ancient brewers would have learned empirically that boiling the must avoided bad things. This is because their honey was not so pure as ours. They were not able to separate bee-stuff from their honey as well as we can today, so there was a much higher chance of their honey being contaminated with a variety of unintended ingredients.

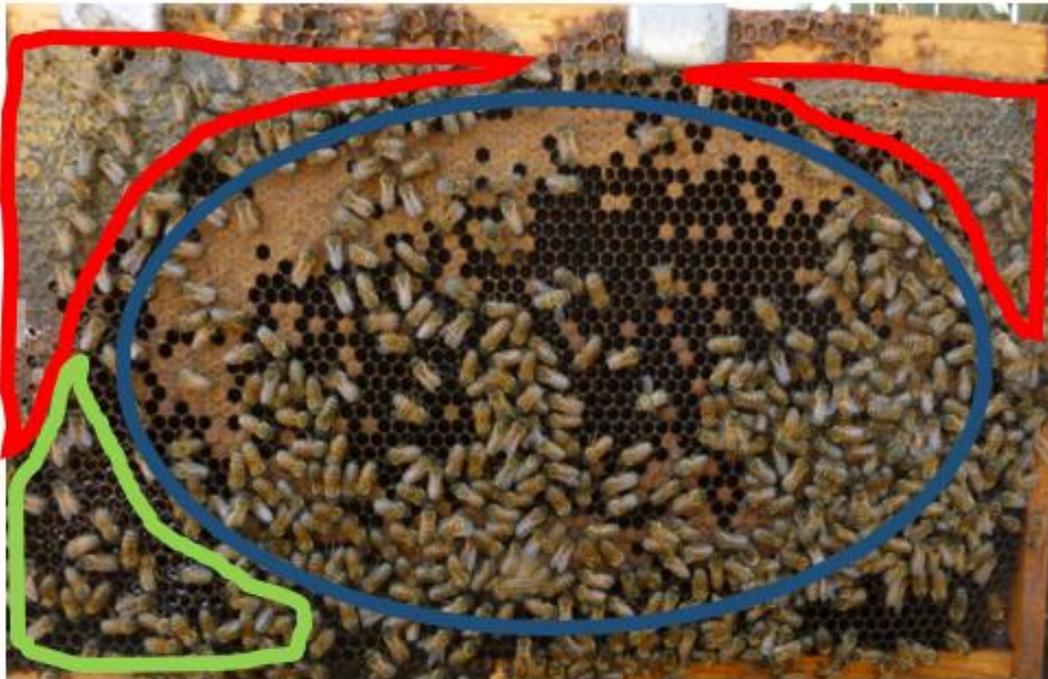


How bees store honey: Bees segregate honey storage from their brood (child-rearing areas). If you think of the hive filling a three-dimensional space, they will place the brood in the center of that space and surround it with honey storage. This makes sense as the honey-filled comb makes good insulation. The brood is often described as a football-shaped mass suspended in the center of the nest, with honey and pollen stored around the edges. A modern 10-frame box allows one to remove cross-sections of that three-dimensional shape.

The following frame from one of my hives illustrates this.



The light brown covered cells and the uncovered cells in the center of the frame contain “brood”, baby bees in different stages of development: egg, larva and pupa (blue oval in the lower picture.). The upper left and right corners (red areas in lower picture) are honey storage. The lower left corner (green area in lower picture) is honey in-process, you can see the glistening liquid ... that’s nectar. In a few days it will be mature honey and get a wax cap as you see in the upper corners.



How modern beekeepers collect honey

Modern beekeepers use their knowledge of bee behavior in order to obtain clean honey, free from brood.

1. The queen bee is larger than the workers. This difference in size is significant (she’s about 50% larger) and consistent. This allows us to use a mesh screen called a “queen excluder” that will allow workers to pass through

but the queen cannot. In this way we can prevent the queen from entering certain parts of the hive. If the queen can't enter, then she can't lay eggs there, so no brood.



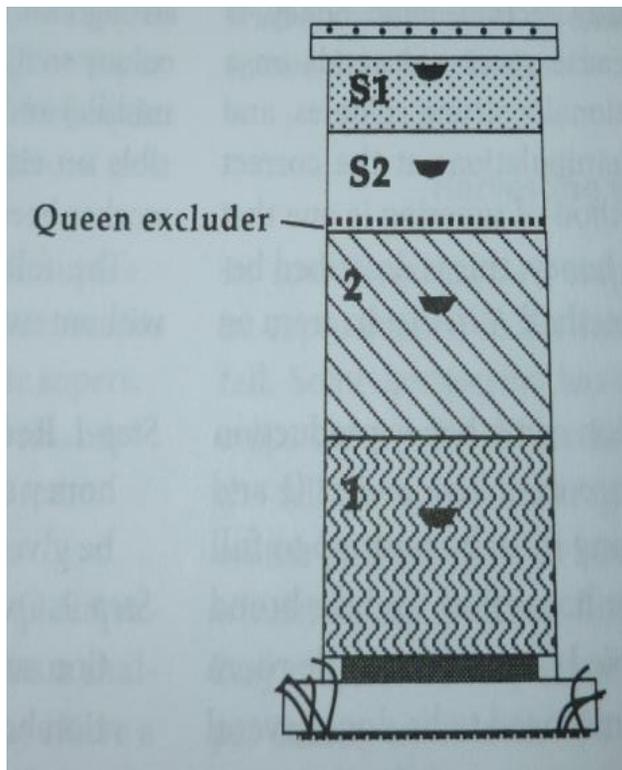
Queen bee (center) and workers⁸



Queen Excluder⁹

2. As we saw above, the bees store honey separate from the brood. And, as is shown on the previous page, they will preferentially store it overhead.

These facts allow the modern beekeeper to use the following setup to obtain clean, brood-free honey:¹⁰



- a) The bottom two boxes (labeled 1 & 2) are reserved for brood (each one is about an 11 gallon volume). The queen has full access to both boxes and can lay eggs throughout. There will be some honey in these boxes, but the beekeeper doesn't disturb that, the bees need it for feeding the children. Bees come and go through an entrance (usually) at the bottom of box 1.
- b) The queen excluder is placed on top of box 2.
- c) Boxes S1 and S2 are placed above the queen excluder. These are smaller boxes, called "supers". The queen cannot enter these boxes, so there is no brood. Following their instincts, the worker bees will use this space for excess honey storage.

When it is time to harvest honey, the modern beekeeper simply removes one of the supers and takes it

to his shop to extract honey. The brood chambers are not disturbed, and the honey is clean and free of brood juices and bee parts. The modern beekeeper uses a centrifuge to pull honey out of the comb, leaving the honey comb intact. This he can return to the beehive, where the bees will repair any damage and refill the old comb. The modern beekeeper avoids destroying comb as much as possible, because when the bees are making comb they are consuming honey.

Normally when I make mead I do not boil the honey first, as boiling will destroy the subtle flavors of raw honey.¹¹ This works if your honey is extracted with modern procedures. But it was not always thus.

Medieval beekeepers and mead:

In medieval times the standard European beehive was a hollow log or an inverted basket woven of sticks or straw.¹² The queen excluder and moveable frame beehive had not yet been invented. Bees simply lived as they had for millennia, filling the available space with comb, with the football-shaped brood surrounded by honey. Today this is referred to as “fixed hive” beekeeping. To harvest the honey from a fixed hive, the keeper killed the bees and removed chunks of comb, tossing the bits of honey comb into one bowl, and the chunks of brood comb in another. Given that the bees tend to segregate the two made the beekeeper’s job easier, but invariably some brood comb got into the honey.

To extract the honey, the beekeeper would crush the honey comb and strain it through a cloth. Here’s where you run into problems. By crushing the honey comb, the beekeeper is also crushing any brood that ended up in the honey, plus pests and parasites that also inhabit the brood area. The juices from crushed brood and parasites contribute enzymes and microorganisms, contaminating the extracted honey. These contaminants can compete with the fermentation process to produce off-flavors or simply a really bad drink. At some point early mead makers discovered that one could avoid bad things by first boiling the honey. We know now that this would inactivate enzymes and kill microorganisms. They just knew that it worked. Beneficial yeasts, necessary for fermentation, would be introduced through the brewing equipment, or by adding a dose of a previous successful batch.

So back to the beekeeper and his crushed honey comb in a cloth. After squeezing out as much honey as he could, the beekeeper would find that there is always honey left stuck to the crushed comb (retained honey is about 40% of the weight of crushed and pressed comb, in my experience). The crushed comb itself will be melted down for wax, but there’s no sense in wasting that honey. So the beekeeper would wash the crushed comb and the resulting honey/water was his to use for making mead.¹³

Making mead by washing crushed comb is not a common practice today. As was stated earlier, modern beekeepers do everything they can to avoid destroying comb, and with modern methods for keeping bees and harvesting honey, there is no need to do so. So when I extracted a hive from under a shed, this opportunity arose.

Collecting the raw material

Beehive under the floor of a friend’s tool shed, as I removed pieces of flooring the comb came out in sheets.





Brood comb and honey comb were separated. Brood was placed in wooden frames to give them a new home, most of the honey comb went into a bucket. Newly-made comb is clean and white, older comb turns dark as it accumulates the waste products of generations of bees. I did my best to trim brood comb off of the honey comb, but bits of brood made it into the honey plus a few adult bees that simply wouldn't go away. In all I collected two buckets full of honey comb. The honey comb was crushed and strained in several batches.



Crushed comb and honey



Cake of pressed wax

After allowing the crushed comb to drip, it was wrapped in a clean cloth and pressed to extract as much honey as possible. The final cakes of pressed wax still contained honey, which would be used to make this batch of mead.

Results:

- Total honey comb: 45 ¼ pounds
- Honey extracted: 28 pounds
- Pressed wax: 17 ¼ pounds
- One strong, happy hive.

Wash crushed comb and Make Mead:

Oh yes, this was all about making mead, wasn't it? Please see Part 1 for the rest of the story.

ADDENDUM: Rescued bees in their new home, living the dream in the country.



Extracted brood comb was arranged in frames, using rubber bands to hold it in place until the bees were able to glue everything down.

Her Majesty

ENDNOTES

Cover Page: Unknown Artist, England ca. 1200. *The Aberdeen Bestiary: Of Bees*.
University of Aberdeen (MS 24, Folio 63R) <https://www.abdn.ac.uk/bestiary/ms24/f63r>

¹ Schramm, Ken. *The Compleat Meadmaker*. (Boulder, CO: Brewers Publications, 2003): 11.

² A mechanical press (like a wine or cider press) could extract more honey from the wax, but at my small scale that just makes a mess and would not increase yield. For my limited operation I will stick to pressing the wax in cheesecloth.

³ Sibley, Jane. *The Compleat Anachronist #5: Handbook of Brewing* (Milpitas, CA:SCA, 1983): 22.

Sibley (Long Mead, p. 22) recommends 4 pounds honey added to 1 gallon of water. This works out to 4 pounds in 1.34 gallons of must, or about 3 pounds honey per gallon of must. I wanted a sweeter mead, so I targeted 4 pounds of honey in one gallon of must.

⁴ The honey/water from the washed comb gives a SG reading that is off the scale of my refractometer (its highest reading is 1.13.) 4 pounds honey in 1 gallon should produce an OG of about 1.16 (Schramm, 63), but this is an estimate based on several assumptions. In reality I have no idea what the OG is. If I had thought of it at the time I could have made dilutions to bring the SG within range of my measuring device, but I did not do that.

⁵ ATC Portable Refractometer

⁶ Ethyl Alcohol was measured on a Beckman Coulter AU 480 Clinical Chemistry analyzer using the Emit® II Plus Ethyl Alcohol reagent kit, PN OSR9K229.

https://www.beckmancoulter.com/wsrportal/techdocs?docname=/cis/9K052/%25%25/EN_ETHYL%20ALCOHOL.pdf

⁷ Morse, Roger A. *Making Mead (Honey Wine)*. (Ithaca, NY: WICWAS Press, 1980): 20.

⁸ Photo: Scottsville Supply Co. <http://www.scottsvillesupplyco.com/product/italian-queen-bee-mated/>

⁹ Photo: North Canterbury Bee Club <http://ncbeeclub.org.nz/2015%20club%20updates.html>

¹⁰ Sammataro, D. & Avitabile, A. *The Beekeeper's Handbook*, 4th ed. (Ithaca, NY: Cornell U. Press., 2011): 113.

¹¹ Some modern sources do advocate boiling the honey to help clarify the mead.

¹² Alston, Frank. *Skeps, Their History Making and Use*. (Hebden Bridge, UK: Northern Bee Books, 1987).

¹³ Schramm, 11.